“Down the rabbit hole”

Exploring the role of Psychopathological and Socio-Cognitive Factors in Conspiracy Theory Beliefs and Strategies for Intervention.

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Abstract

The spread of conspiracy theories and misinformation has become increasingly common in recent years, particularly becoming a rather topical area on social media platforms since the emergence of the COVID-19 pandemic. Such theories have been linked to several negative social and health consequences, leading to them becoming a topic of interest for researchers. Research in psychology has focused on factors that contribute to the adoption of conspiracy theories from various levels of approach. This thesis explores the individual differences that may contribute to how conspiracy information is evaluated, and, in turn, may explain why conspiracy beliefs are endorsed as well as the implications for challenging these belief systems.

To this end, I conducted five studies which examined various individual differences, some yet to be explored in the conspiracy theory literature. A particular focus was to extend the range of clinical measures considered in this area, and, to develop a greater understanding of cognitive factors related to conspiracy beliefs through a more integrated approach (e.g., the inclusion of multiple explanatory lines from research). Following the introductory chapter reviewing the relevant existing literature, Chapter 3 presents Study One which focussed on the potential role of autistic traits as a confounding factor between the relationship between schizotypy and conspiracy beliefs. Chapter 4 reports differences in cognitive style, information seeking behaviour and conspiracy theory beliefs for those who scored above the clinical ASD cut-off compared to the rest of the sample. Chapter 5 presents a refined approach towards thinking styles and examined how people engage in the scientific appraisal of conspiracy information. Chapter 6 assessed the within-individual variation of schizotypy, autistic traits, socio-cognitive tendencies associated with conspiracy beliefs and scientific reasoning ability through a Latent Profile Analysis (LPA). Chapter 7 presents the fifth and final study, to which an intervention approach examined whether encouraging a stronger

orientation toward critical scientific appraisal of conspiracy theories could reduce their acceptance.

This thesis closes with a general discussion of how it has made a novel contribution to the area of conspiracy research and other related fields. Specifically, I discuss the theoretical and methodological contributions advanced by this thesis through the inclusion of novel psychopathological and socio-cognitive features, how such advancement improved our understanding of the different pathways which lead to conspiracy beliefs, then, how this research into conspiracy beliefs may represent a novel contribution to clinical research. One of the main contrutions being the significance of scientific reasoning skills as amenable to an intervention approach for conspiracy theory beliefs. I conclude with the implications of this work for future research and the conclusions that could be drawn from this thesis.

Declaration

I certify that this work contains no material which has been accepted for the award of any other degree or diploma in my name, in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. In addition, I certify that no part of this work will, in the future, be used in a submission in my name, for any other degree or diploma in any university or other tertiary institution without the prior approval of the University of Adelaide and where applicable, any partner institution responsible for the joint-award of this degree.

I acknowledge that copyright of published works contained within this thesis project resides with the copyright holder(s) of those works. I also give permission for the digital version of my thesis to be made available on the web, via the University's digital research repository, the Library Search and also through web search engines, unless permission has been granted by the University to restrict access for a period of time. I acknowledge the support I have received for my research through the provision of an Australian Government Research Training Program (RTP) Scholarship.

Signed

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Chapter One: Overview

Over the past few years, information has become easier to disseminate across media platforms. Although this has had many benefits, it has also led to the greater capability for the spread of misinformation and conspiracy theories (Mulukom et al., 2021). Whilst conspiracy theories can appear in many different forms, they have also been associated with a number of negative civic, social and health consequences (Douglas et al., 2021; Jolley & Douglas, 2017). This has led to research and public discourse on conspiracy theories to be more focused on how these theories have led to distrust, polarisation, and antisocial behaviour (Depoux et al., 2020; van Prooijen et al., 2018). Although some suspicion has not been without justification (e.g., social media sites appear to have actively suppressed information at the request of central agencies), many reactions to public policy appear to have been irrational. These have included the promotion of false information about the general efficacy of the COVID vaccine in reducing the severity of COVID symptoms; the QAnon conspiracies that may have contributed to the US capitol riots; and, broader beliefs about the validity of the pandemic itself and the value of vaccination (Cinelli et al., 2020; Jolley & Douglas, 2017; Douglas et al., 2021; Georgiou et al., 2020a; Nisa et al., 2020; Mulukom et al., 2022).

In response to these events, social commentary has increasingly focussed on the role of social media platforms in the spread of conspiracy theories online (Enders et al., 2021; Pertwee et al., 2022). Whilst the concern for how the structure of social media platforms reinforce conspiracy theories is valid, the field of psychology has focused principally on what factors might contribute to individual adoption of conspiracy theories (Douglas et al., 2021). Much of this work has examined whether there are individual differences or cognitive factors that make certain individuals more or less susceptible to conspiracy theories (Dyrendal et al., 2021; Douglas et al., 2021; Usinscki et al., 2021).

This field of research has seen significant change and increased attention since the onset of the COVID-19 pandemic. Such work has tended to follow two principal lines of investigation. One view is that these theories arise from limited education or skills in the ability to understand and process complex information (e.g., scientific claims or the logic of arguments; Evans & Stanovich, 2013; Georgiou et al., 2019; Oliver & Wood, 2014a, 2014b; Swami et al., 2014: 2017; van Prooijen, 2014: 2017). The other principal argument is that CTs are influenced by various forms of neurodiversity or psychopathology, with particular attention being given to characteristics such as schizotypal personality traits and how they might give rise to unstructured, atypical thinking patterns (Brotherton et al., 2014; Georgiou et al., 2019: 2021b; Swami et al., 2016). Schizotypal traits, in particular, have consistently been found to be strong predictors of conspiracy theory beliefs (Georgiou et al., 2019; Goreis & Voracek, 2019; Mulukom et al., 2022). As will be shown in this thesis, both of these approaches have merits, although not all studies have necessarily integrated insights from both of these areas and examined the relationship between individual differences on clinical measures and differences in how people appear to deal with complex information at a cognitive level (Acar et al., 2022; Douglas et al., 2021).

Accordingly, the principal aim of this thesis project was to explore the relationship between individual differences, how people evaluate conspiracy information and held conspiracy theory beliefs and, in turn, what implications this might have for challenging these belief systems. A particular focus of this thesis was to extend the range of clinical measures that has been considered in this area of research. As well as including existing measures of schizotypy, this program of research also considered the potential influence of a known correlate of schizotypy- namely with Autism Spectrum Disorder (ASD) or autistic traits - as this condition is known to be associated with differences in styles of thinking and belief formation often involving highly focused and sometimes obsessive beliefs. Autistic traits

have been well recognised for their overlap with key schizotypal traits associated to conspiracy beliefs (Deste, Nenadic et al., 20121; Kincaid et al., 2017), but have rarely been studied in this context. The study of autistic traits was seen as a potential source of incremental explanation for CTs in that, people with ASD trait have some differences from those with schizotypy, in particular a tendency to engage in very systematic and analytical information-processing rather than the more heuristic style of delusion formation common to the other disorder (Pinkham et al., 2019; Vita, Penn, Pinkham, Nibbio & Harvey, 2020).

The first study focussed on the potential role of autistic traits as a confounding factor between the relationship between schizotypy and conspiracy beliefs, by assessing the relationships between autistic traits, schizotypal traits, preferences for styles of thinking, open-mindedness, need for cognitive closure in uncertainty, and, their relationship to biases in belief formation (e.g., Bias Against Disconfirmatory Evidence) and two measures of conspiracy theory beliefs; presented in Chapter Three.

A second study (presented in Chapter 4) then examined whether there were differences in cognitive style, information-seeking behaviour and conspiracy theory beliefs for those who scored above the clinical ASD cut-off compared to the rest of the sample. In this study participants completed both the measures captured in Study One, but with the addition of measures which gauge the consistency and intensity of how people search for information online, as well as their intensity and focus on specific topics of interest. Both of these studies were designed to establish whether autistic traits are a predictor of conspiracy theory beliefs and whether the hypothesised differences in cognitive style might be explanations for any association detected.

The third study refined the approach towards thinking styles and examined how people engage in the scientific appraisal of conspiracy information. This provided insights

into how cognitive factors associated with conspiracy beliefs could be measured in the future, and the potential role of scientific reasoning as a protective factor against conspiracy belief formation. This study included measures of autistic and schizotypal traits, thinking styles, and the BADE from prior studies. It also included an additional measure scientific reasoning performance included along with an updated method of measuring conspiracy belief. This was justified based on the findings of the second study which showed that individual differences in analytical thinking were not necessarily protective against CT beliefs. It was argued that merely searching for information in a system way (what we inferred to be likely in those with higher ASD scores) did not necessarily imply skill in the ability to make sense of that information in a way that prevented CT formation.

The fourth study assessed the within-individual variation of schizotypy, autistic traits, socio-cognitive tendencies associated with conspiracy beliefs and scientific reasoning ability through a Latent Profile Analysis (LPA). This statistical approach separated the sample into latent profiles (or classes), such that the characteristics of groups could be distinguished based on measures of autistic and schizotypy, scientific reasoning skills, thinking styles and tendencies to engage in bias thinking. The results provide a means to investigate the characteristics of borderline clinical groups and their relationship with conspiracy theory beliefs (e.g., people who may exhibit traits of schizotypy and ASD but do not meet the clinical cut-off). The results for the third and fourth study suggested that poorer scientific reasoning skills appeared to cluster with stronger conspiracy theory endorsement and the other neurological vulnerabilities.

Accordingly, in the fifth and final study, we examined whether encouraging a stronger orientation toward critical scientific appraisal of conspiracy theories could reduce their acceptance. In this study people were exposed to multiple performance tasks measuring conspiracy theory beliefs, with people who were exposed to a designed scientific reasoning

intervention compared to a control group post-intervention. As well as having implications for the design of future intervention studies, the results of the final study encourage greater focus on scientific reasoning skills that may be amenable to a psychoeducation approach in future research.

The following section provides an overview the literature and positions the problem of conspiracy theory beliefs in a contemporary and theoretical context. This is then followed by the series of papers based on the studies described above. A final section of the thesis provides a summary of the overall findings and their theoretical and practical implications.

Chapter Two: Literature Review

2.1 Overview

This chapter commences with a discussion of conspiracy theories in the contemporary context, including definitions; the prevalence of these beliefs; and, their consequences. The chapter also examines how these beliefs are measured and how CTs are differentiated from related concepts such as misinformation. It also examines the psychological factors associated with the selection, interpretation and sharing of conspiracy misinformation as well as the range of individual differences associated with CT beliefs. The introduction finishes by presenting an overview of the current interventions and responses to conspiracy theory beliefs.

2.2 Conspiracy Theories in Context

In order to better understand conspiracy theory beliefs, the definition and the variability in what constitutes a conspiracy theory must first be established. Accordingly, I will provide an account of how research best defines a conspiracy theory; the distinction drawn between conspiracy beliefs and other beliefs; and, their prevalence and consequences in society.

2.2.1 What is a Conspiracy Theory?

Conspiracy theories (CTs) can take many forms and emerge in many different spheres of life. People can suggest conspiracy theories across a variety of contexts, with some concerning government and government institutions (e.g., the secret services; Oleksy et al., 2021), entire branches of industry (e.g., pharmaceutical companies; Grimes et al., 2021) or about scientific research (e.g., climate change conspiracy theories; Biddlestone et al., 2022; Jack et al., 2021). Van Prooijen (2018) proposed that, even within the most basic organisational structure, employees on the work floor often hold conspiracy theories about their management, such as beliefs of the manager's hidden agenda for their own selfish goals. Hence, as CTs can vary in form and degree of veracity/falsity, to provide a singular agreed definition can been a difficult undertaking.

One definition advanced by van Prooijen (2018) has been the more favoured and states that a conspiracy theory is "a belief that postulates that a number of actors join together in secret agreement, in order to achieve a goal which is perceived to be unlawful or malevolent" (pp. 21). Although this definition initially seems broad it generally captures the five factors needed in order to qualify a conspiracy theory (Douglas et al., 2021; Goreis & Voracek, 2019; Leonard, 2021; Nera & Schöpfer, 2022).

First, a conspiracy theory explains an event through the establishment of *non-random patterns*, whereby connections between actions, objects, and people do not occur through coincidence or chance but are purposeful (van Prooijen, 2018). Second, a conspiracy theory assumes that a suspect event was *caused purposefully* by intelligent actors who intelligently developed and carried out said event. This premise implies that the actors suggested to be responsible for an event, do so being privileged to further knowledge, or can enact action over another group or population (e.g., from a position of power or greater sophistication; Srol et al., 2022).

Third, a conspiracy theory always involves a *coalition* or group of multiple actors, not a sole individual, although there can be exceptions to this rule. For example, during the COVID-19 pandemic many conspiracy theories arose regarding the role of Bill Gates in the spread of COVID-19, but, these theories centred on how the individual (i.e., Bill Gates), represented the interests of a group of multiple hidden actors and their interests (e.g., the illuminati or secret elite; Ha et al., 2022). This may also apply to CTs that focus on individuals of political power (e.g., the President of the United States), as they are suggested to be a member of, or act in the interest of a large secretive group of actors (e.g., the global elite; McCauley et al., 1979; Usinscki et al., 2022).

Fourth, a conspiracy theory tends to assume an element of *hostility,* in that the suspected actors behind the event pursue goals that are evil, selfish or otherwise do not act in the best interest of others. Whilst benevolent conspiracies do exist (e.g., the existence of Santa Claus), the term "conspiracy theory" is exclusive to theories that are associated with more hostile consequences (Leman et al., 2013).

Fifth, CTs suggest that the actors involved take action in *secrecy.* Evidence to validate such theory is also often seen as being suppressed by those responsible (e.g., suggesting mainstream media shows bias in favour of the suspected actors; Stecula et al., 2021). It is important to note here that if a conspiracy is exposed and proven true (e.g., The Watergate Scandal), this is no longer "theory", thus, conspiracy theories are by definition unproven (Thalmann, 2019).

2.2.2 The limitations to defining conspiracy theories.

According to Nera and Schöpfer (2022) and Leveaux (2022), there are two key limitations with this approach and definition. First, the premises of van Prooijen (2018) do not necessarily distinguish between conspiracy theories and other conspiracy-based explanations. This has aptly been named the *False Positive Problem* that can lead to the view that any claim could be defined as a conspiracy theory. For example, the belief that Al Qaeda caused the 9/11 attacks, or the belief that Julius Caesar was assassinated in 44 B.C, which are proposed explanations of significant social events widely accepted by epistemic authorities, would qualify as conspiracy theories. Indeed, these are proposed explanations of significant social events relying on the causal role of a small group of actors operating in secret (Keeley, 2-13; Räikkä, 2014; Leveaux, 2022).

On the other hand, there is the *False Negative Problem,* where some notable conspiracy explanations do not qualify as conspiracy theories based on van Prooijen (2018),

as they do not concern either a specific event, or, implications for a particular group or each individual. The factors presented imply that conspiracy theories are often about *events,* whereas there are notable examples which question element of reality. For example, The 'Flat Earth Theory' suggests that the world is flat, and, this truth is being concealed from the public. Similarly, it can be argued that theories which claim the dangers of vaccines are being deliberately concealed by pharmaceutical companies to maximise profits, is not an explanation of an event or circumstance (Douglas & Jolley, 2017; Nera & Schöpfer, 2022).

2.2.3 What are Conspiracy Theory Beliefs?

Within this literature review I will often refer to conspiracy theories and conspiracy theory beliefs, which are different concepts. Conspiracy theory beliefs refer to the decision to accept conspiracies as the best explanation of why certain events occurred – whether that be everyday life occurrences, to macro explanations of how the world works (Napolitano et al., 2021; van Prooijen & Douglas, 2022). By contrast, a conspiracy theory is simply the proposed narrative for how that certain event occurred. As one might expect, conspiracy theory beliefs can be seen to fall across a spectrum in that the more individuals are willing to accept and endorse conspiracy theories, the stronger their conspiracy theory beliefs. This is seen in many psychometric scales that measure the strength of conspiracy belief largely on the basis of how many different conspiracy theories are endorsed (Brotherton, 2013; Swami et al., 2016).

2.2.4 Conspiracy theories and Misinformation

Research and public discourse regarding the spread of false content online (e.g., 'fake news') often reference both conspiracy theories and misinformation in the same context. In fact, at times research often mentions both in an interchangeable manner (De Connick et al., 2021; Pennycook et al., 2022). Yet, conspiracy theories and misinformation are distinct by definition from one another. By definition misinformation generally refers to false content (or

if deliberately fabricated content – disinformation), whereas conspiracy theories may be an inaccurate account of world events that must possess a set of parameters before they qualify as a conspiracy theory (van Prooijen, 2018) (e.g., must involve secrecy, coalition; see Section 1.1.1). The argument is that misinformation can lay the premises that support conspiracy theories. If people accept enough misinformation, this can be sufficient to develop a narrative or account that may run counter to accepted explanations of events. For example, although proven to be untrue, over 40% of Americans believed that 'voter fraud' occurred during the 2020 US election based on a number of misleading news outlets (Lyons et al., 2022; Pennycook et al., 2022).

2.2.5 Conspiracy Beliefs and Other Related Beliefs

There are also areas of research that focus on the specific style of belief arising from psychological disorders (Bortolotti et al., 2022; Drinkwater et al., 2012). For example, in studies concerning the consequences of irregular or delusional thinking, some conspiracy theory beliefs are believed to share fundamental characteristics with anomalistic beliefs (or at times referred to as supernatural or paranormal beliefs), such as: a contradiction to scientific understanding and a form of reality testing (Dagnall et al., 2016; French & Stone, 2017; Prike et al., 2018). Anomalistic beliefs are those that defy conventional understandings of reality and may include (but not limited to) belief in paranormal experiences (Brotherton et al., 2014; French & Stone, 2017). Although some anomalistic beliefs are considered widely conventional (e.g., people who believe in an afterlife), research has shown interest in how other more irregular anomalistic beliefs rely upon irrational premises, often associated with delusional thinking (Prike et al., 2018; Williams et al., 2022). Although this literature review does not concern the role of other belief systems outside of conspiracy theory beliefs, it is important to acknowledge that as, conspiracy theories can also be fanciful, unproven ideas, or even suggest rather supernatural concepts (e.g., the 'reptilian humanoids' conspiracy theory),

they may co-occur with other illogical beliefs. Indeed, there is research to suggest that these beliefs are usually shared or at least found to be associated with each other (Lobato et al., 2014; Prike et al., 2018).

2.3 Presence, Ubiquity and Public Perception

It would be difficult to estimate the true extent of how available or widespread conspiracy theories have become not just because of challenges in defining them, but because of difficulties in measurement. The public perception is that the volume of conspiracy theories are increasing in line with the growth of social media platforms (Enders et al., 2021; Uscinski et al., 2022). However, little evidence has been provided to demonstrate that beliefs in conspiracy theories have, in fact, increased over this time (van Prooijen, 2017; Romer et al., 2021). According to Uscinski et al., (2022), no matter how conspiracism is operationalized, there is no instance yet of observed systematic evidence to suggest CT beliefs have at all increased. Indeed, the lack of systematic evidence is owed to the fact conspiracy theories only became the subject of sustained research in the past decade, and, methods that claim to measure conspiracy theory beliefs are at times not always valid such as polls based on biased samples (Enders et al., 2022; Green et al., 2022).

Regardless of whether conspiracy theories have risen in recent times, it is important to understand their presence and impact in general. Much of this research has tended to focus on the spread of isolated conspiracy theories from the time when they become known (Bruns et al., 2021). This is observed, for example, in studies conducted during COVID-19 pandemic concerning the spread of specific emerging theories. According to a review of forty-three studies that measured COVID-19 related CT beliefs since the beginning of the pandemic, 40% of all participants at least endorsed the theory that ‘COVID-19 was intentionally spread for political reasons’ (Tsamakis et al., 2021). Strength in this belief increased in line with the growth of social media activity, whereas other initially popular theories declined in

prominence (e.g.., the Big Pharma theory, or the Bill Gates 5G theory; Fong et al., 2021; Erokhin et al., 2022). Online engagement in this theory could be predicted by the reported number of COVID-19 cases per day (Enders et al., 2021; Erokhin et al., 2022; Theocharis et al., 2021). In other words, the greater the attention was drawn toward the real-time consequences of the COVID-19 pandemic, the more attention was also drawn towards related conspiracy theories. Whilst this may not provide insight into the general spread of conspiracy content, this research does provide a means to study how conspiracy beliefs can increase and the use of conspiracy theories in real time to events.

Just as evaluating the availability and regularity of conspiracy theories is prone to difficulty and error, so too is evaluating the extent of belief in conspiracy theories. This difficulty centres on the distinction between endorsement of conspiracist ideas and the willingness of respondents to divulge beliefs in conspiracy theories to others, and, to researchers (Smallpage et al., 2022). Measurement of beliefs are always complicated, but, conspiracy beliefs are further complicated as they may address ideas or behaviours the respondent would rather conceal (Clifford & Jerit, 2015; Lopez & Hillygus, 2018; Schaffner & Luks, 2018). This is related to *social desirability bias*, a phenomenon found in psychology research whereby people may systematically alter their responses in spite of held beliefs, so they may conform to the social norms and avoid the negative judgment of others (Holbrook, Green & Krosnick, 2013; Gonzalez-Ocantos et al., 2012). In the context of conspiracy beliefs, it is argued that even across various political and cultural contexts, people are systematically underreporting their levels of conspiracy beliefs and in turn, are less inclined to share their beliefs on online platforms (Enders et al., 2020; Pytilk et al., 2020; Smallpage et al., 2022).

2.4 The Consequences of Conspiracy Theories

In addition to the growing research focussed on the spread and availability of conspiracy theories, interest has also been directed toward their consequences. Although these consequences have been open for debate, the following section provides a review of both the positive and negative outcomes of conspiracy theories.

2.4.1 Positive Consequences of Conspiracy Theories

Many of the positive consequences of conspiracy theories centre on their role in encouraging both social and political engagement. For example, it has been argued that conspiracy beliefs can lead to a sense of shared community with others who endorse the same theories (Franks, Bangerter Bauer, Hall and Noort, 2017). According to Wheeler et al. (2021), individuals who have intense feelings of ostracism and want to belong to a social group (e.g., those who experience feelings of threat or victimization), conspiracy beliefs can (a) provide a sense of common identity and belonging, (b) reinforce feelings of victimization by placing responsibility for shortcomings on other out-groups (i.e., the "us vs them" hypothesis; Fong et al., 2021; Pantazi et al., 2021), (c) present an opportunity for those with a sense of powerlessness to exert influence over their surroundings (Celia et al., 2021; Biddestone et al., 2020; Hofstadter, 2012), and (d) encourage collective action and social change attempts (Cichocka et al., 2016; Mari et al., 2022).

In addition to the provided feelings of empowerment, social and political engagement, there are benefits inherent to the structure of a conspiracy theory. By virtue of acting counter to information released by organisations who maintain a level of secrecy (e.g., government bodies), scholars suggest conspiracy theories have provided a method to reveal anomalies in mainstream explanations (e.g., Clarke, 2002; Swami and Coles, 2010). Indeed, some conspiracy theories have been proven true (e.g., the Watergate Scandal, Operation Northwoods), suggesting that conspiracy theories can question social hierarchies, and,

encourage a higher amount of transparency around government actions (see Swami and Coles, 2010; Douglas et al., 2019). Thus, conspiracy theories can provide people an opportunity to question the credibility of authorities and engage in political debate, which in in normal circumstances would likely be denied to them.

2.4.2 Negative Consequences of Conspiracy Theories

At present, the vast majority of research examining the consequences of conspiracy theories has focused on negative consequences (Mulukom et al., 2022). Whilst it was believed that conspiracy beliefs satisfy important psychological needs (i.e., feelings of power, belonging and social connection; Douglas et al., 2019), longitudinal research suggests conspiracy beliefs have been shown to worsen negative psychological states and are thought to be more 'appealing than satisfying' (Biddlestone et al., 2021; Douglas et al., 2017; Gligoric et al., 2021). Indeed, long term conspiracy beliefs are associated with feelings of social stigma, a more negative evaluation of the self (i.e., a stressful and often involuntary form of self-criticism), lower self-esteem and narcissistic personality traits (Green et al., 2023; Lantian et al., 2020).

Conspiracy theories have also been shown to interfere with intergroup relations (Biddlestone et al., 2020; Jolley et al., 2020). Several studies have shown that belief in conspiracy theories regarding specific ethnic groups (e.g., jewish conspiracy theories) are associated with extreme attitudes (e.g., anti-Semitic views; Imhoff & Bruder, 2014). Bilewicz, et al. (2013) found such prejudice views against specific groups (e.g., Jewish people), have predicted favouritism toward political movements that discriminate against those people (e.g., favouring policies that prevent Jewish people from buying Polish land; Bilewicz & Krzeminski, 2010). This was supported by findings from the recent US election, which proposed those who endorse prejudice conspiracy theories regarding Jewish or African-American people, were less likely to vote for a political candidate associated to either

ethnic group (Jolley et al., 2020; Jolley et al., 2022; Sutton et al., 2020). Furthermore, not only do specific conspiracy theories encourage prejudice towards targeted ethnic groups (e.g., Jewish conspiracy theories), there are instances where they have incited acts of violence towards a range of ethnic groups (Jolley et al., 2020; Sutton et al., 2020).

Conspiracy theory beliefs may also lead to several negative health consequences by how they may encourage science denialism – the systematic and unwarranted rejection of science (Rizeq, Flora & Toplak, 2021; Rutjen, 2022). 'Anti-science' conspiracy theories suggest scientists are colluding with each other and/or other interest groups (like governments or corporations) to distort or falsify their findings to fit a certain agenda (Rothmund et al., 2020). Accordingly, if conspiracy theorists were to see the entire scientific body itself as conspirators then, by extension, any recommendations made by scientific bodies on important issues (e.g., climate change, disease prevention; Bertin et al., 2021) are also seen as part of the same conspiracy. These views have been well highlighted in media by the 'do your own research (DYOR)' mantra of conspiracy movements, where conspiracist groups view the in-group as 'critical freethinkers' for not showing endorsement for widely accepted scientific knowledge, however, this is a bias view which neglects to acknowledge that scientific knowledge is widely accepted due to being based on reliable and valid empirical evidence (Vranic et al., 2022).

The influence of anti-science conspiracy theories on health outcomes is readily evident from the COVID-19 pandemic. Many conspiracy theories encouraged problematic actions against public health initiatives where these measures are dependent on public co-operation to be effective (e.g., social restrictions, vaccination programs; Ball & Maxmen, 2020; Constantinou et al., 2021). It is estimated that between 10-30% of voluntary non-vaccination cases were caused by conspiracy theories regarding the COVID-19 pandemic (Bruns et al., 2021). In the United States, such high rates of voluntary anti-vaccination cases

produced at least $1 billion of loss each day based on the cost of hospitalizations, the valuation of lives lost and the impact of long-term morbidity (Loobma et al., 2021; Mousoulidou et al., 2023; Bruns et al., 2021).

Specifically, anti-vaccination conspiracy beliefs have been an ongoing public health issue prior to the emergence of COVID-19. According to Oliver and Wood (2014), it was found that over half the U.S. population and a third of the United Kingdom endorsed at least one medical conspiracy theory, with the most popular suggesting a link between the Measles, Mumps and Rubella (MMR) vaccine and autism. It is believed that such conspiracy theories about the MMR vaccine caused the rate of measles to surge across several western countries, with it being declared endemic once again within the United Kingdom in 2015 (Jolley & Douglas, 2014b). Moreover, along with higher vaccine hesitancy, anti-vaccination conspiracy beliefs were also associated with a number of other atypical beliefs regarding medicine (Jolley & Douglas. 2014a: 2014b). Anti-vaccination conspiracy beliefs have been associated with negative attitudes towards contraceptive behaviours (Hoyt et al., 2012), the non-treatment of sexual transmitted diseases and HIV/AIDS (Rubincam, 2017) and, increased use of unfounded alternative medicines (Andrade, 2020; Soveri et al., 2021). Overall, by encouraging the rejection of accepted scientific practices and theory, conspiracy beliefs encourage people to reject the value of medical science, rendering them more vulnerable to poor health outcomes. Indeed, the world health organisation (WHO) previously ranked vaccine hesitancy as one of the ’10 threats to global health’ in 2018, prior to the outbreak of the COVID-19 pandemic (World Health Organisation, 2019).

Although there may be some positive consequences of holding conspiracy beliefs, and further research should explore how people’s psychological needs might be met by conspiracy beliefs, the literature to date paints a rather pessimistic picture. Specifically, a growing body of research has shown that conspiracy theories can negatively affect people in

a variety of areas, including their social life, medical choices and political engagement. It has, therefore, been highly important that researchers explore who is more likely to endorse conspiracy theory beliefs.

2.5 Psychological Explanations of Conspiracy Theory Beliefs

Although there has been increased research attention on the spread and implications of conspiracy theories, most attention has been directed toward how people develop conspiracy beliefs. Some factors are seen as arising from *macro* level factors (e.g., the COVID-19 pandemic; Douglas et al., 2021), whereas other have focused on factors affecting groupings of individuals, known as the *meso* approach (e.g., the 'anti-vaccination' movement; Usinscki et al., 2022). However, the most prevalent approach, the *micro* approach has focused on individual differences (De Connick et al., 2021; Mulukom et al., 2020; van Prooijen et al., 2018). What psychological differences make certain people more likely to adopt conspiracy beliefs than others?

Several individual difference approaches have been proposed regarding conspiracy theory beliefs, some of which are not included in the approach presented in this thesis. For example, some research has focused on the social motives behind conspiracy beliefs (Douglas, 2019). Specifically, social identity theory has been proposed as an explanation for how people create and define their place in society, which can result in the formation of conspiracy theory beliefs (e.g., 'critical free thinkers' movement; Robertson et al., 2022; Sternisko et al., 2020). However, individual difference approaches tend to advance two principal lines of argument. One view is that conspiracy theory beliefs arise from limited education or skills in the ability to understand and process complex information (e.g., scientific claims or the logic of arguments; Evans & Stanovich, 2013; Georgiou et al., 2019; Oliver & Wood, 2014a, 2014b; Swami et al., 2014: 2017; van Prooijen, 2014: 2017). In this thesis, this view will often be referred to as the *socio-cognitive* explanation of conspiracy beliefs. The

other principal view argues that conspiracy beliefs are influenced by various forms of neurodiversity or psychopathology, with particular attention being given to characteristics such as schizotypal personality traits and how they might give rise to unstructured, atypical thinking patterns (Brotherton et al., 2014; Georgiou et al., 2019: 2021b; Swami et al., 2016). This view is at times referred to as the clinical or *psychopathological* explanation of conspiracy beliefs. In the following, I will provide a review of both explanations, their points of merit, and, their limitations. Some studies have examined both sets of factors, but many have tended to study each in isolation and made little attempt to integrate them (Acar et al., 2022; Douglas et al., 2021).

2.6 The Socio-cognitive Explanation for Conspiracy Theory Beliefs

The socio-cognitive approach centres on the importance of cognitive acuity and draws attention towards how preferences in thinking style and prior education play a role in bias thinking and the formation of conspiracy theory beliefs (Lantian et al., 2020; Swami et al., 2014: 2017; van Prooijen, 2014: 2017). Early research within this area suggested high education levels predicted a decreased likelihood that people believe in conspiracy theories (Douglas et al., 2016; Van Prooijen, Krouwel, & Pollet, 2015). Such work built the argument that more educated people should have the necessary skills needed to debunk conspiracy theories (van Prooijen, 2016; Goreis & Voracek, 2019). However, as observed van Prooijen (2018), this view is rather simplistic, in that the relationship between education and conspiracy beliefs cannot usually be reduced to a single mechanism but is the often result of the complex interplay of multiple psychological factors that are associated with education. Indeed, subsequent research has since shown that the relationship between level of education and conspiracy beliefs is often negligible once other cognitive factors are also included in analysis (Georgiou et al., 2019; Cichocka, 2018).

Another line of research has examined which cognitive factors are likely to encourage people to reject conspiracy theories. The principal view was that people who have the tendency to engage in an analytical thinking style are less likely to accept conspiracy beliefs (Swami et al., 2014; van Prooijen, 2016; Goreis & Voracek, 2019). An analytical thinking style refers to the preference to systematically seek out information on a given topic rather than rely upon intuition when forming a conclusion. Thus, it is reasoned an analytical thinker is likely driven by curiosity to solve a problem and establish a reliable understanding of facts, and, on this basis, would not accept a conspiracy theory on face value (van Prooijen, 2016; Pytilk et al., 2020). On the other hand, people who then prefer a more intuitive approach are shown to be more easily convinced by the weak arguments behind conspiracy theories. This often referred to as the *gullible conspiracist hypothesis* (van Prooijen, 2016; van Prooijen et al., 2022).

A limitation of the focus on 'analytical thinking' is that it is assumed that this approach is free of bias. In fact, conspiracy theory beliefs are often associated with a plethora of heuristics and biases in decision making (e.g., the conjunction fallacy, illusory correlations; confirmation bias; Brotherton et al., 2014; van der Wal et al., 2018; van Prooijen, 2018; Wabnegger et al., 2021). According to this view, it is then assumed that individuals who takes a more deliberate and systematic approach to information searching also possesses good judgment when selecting information. This is a characteristic more descriptive of *critical thinking*. Critical thinking is considered a readiness and willingness to (re)consider, reason, (re)appraise and review ones interpretation of facts in order to facilitate good judgment, and, update beliefs in a reliable manner (Lai, 2011). Whilst critical thinking could be considered reliant upon a disposition toward analytical thinking, it has been argued the capacity to appraise information is a more significant process in the interpretation of conspiracy theories (Bangerter et al., 2020; Lantian et al., 2021; Oswald, 2016). If people

who do show a preference for analytical thinking then do not possess the adequate critical thinking skills, they may engage in biased information searching, only selecting sources that reinforce pre-existing beliefs (i.e., conspiracy beliefs; Gagliardi et al., 2022; van Elk et al., 2015).

In support of this view, some recent studies have shown a counterintuitive *negative* association between measures of critical thinking and conspiracy beliefs (Lantian et al., 2021; Yelbuz et al., 2022). However, there are potential reasons for this surprising finding. First, critical thinking as a concept is rather difficult to measure. Often, only aspects of critical thinking are captured in research – whether that be how people interpret facts, update their beliefs or form decisions in an online context (e.g., fake news; Marchete & Turpin, 2021). Such measures also do not provide reasoning for why some people are better able to apply these skills than others. For example, the Cognitive Reflection Test (CRT; Branas-Garza et al., 2019; Stecula & Pickup, 2021) and Ennis-Weir Critical thinking Essay Test are both popularised measures of critical thinking in a conspiracy theory context (Lantian et al., 2021; Gjoneska et al., 2021). Both, measures capture who is better able to interpret facts and update their beliefs (defined as constitutive of critical thought), yet, neither measure provide a tangible explanation for *why* this occurs. It then becomes difficult to infer how 'critical thinking skills' can be improved, or, how they may be fostered in a target population (e.g., conspiracy theorists).

To address this issue, some researchers consider *scientific reasoning* as a more refined concept and more amenable to a future intervention approach to conspiracy beliefs (Cavajova et al., 2022; Cichocka et al., 2018). Scientific reasoning is related to the evaluation of facts, updating of knowledge and problem-solving strategies (Zimmerman, 2000; Morris et al., 2012). Scientific reasoning also includes more advanced cognitive skills, such as induction, deduction, analogy and causal reasoning among other competencies (Dunbar & Fugelsang,

2005; Han, 2013; Diaz et al., 2023). In other words, if critical thinking is how people interpret information to form beliefs, scientific reasoning is how people first evaluate such information to form an interpretation. Indeed, Gjoneska (2021) proposed that analytical thinking, critical thinking and scientific reasoning are related and nested processes, with scientific reasoning being the most refined and highest in order, as shown in Figure 1.

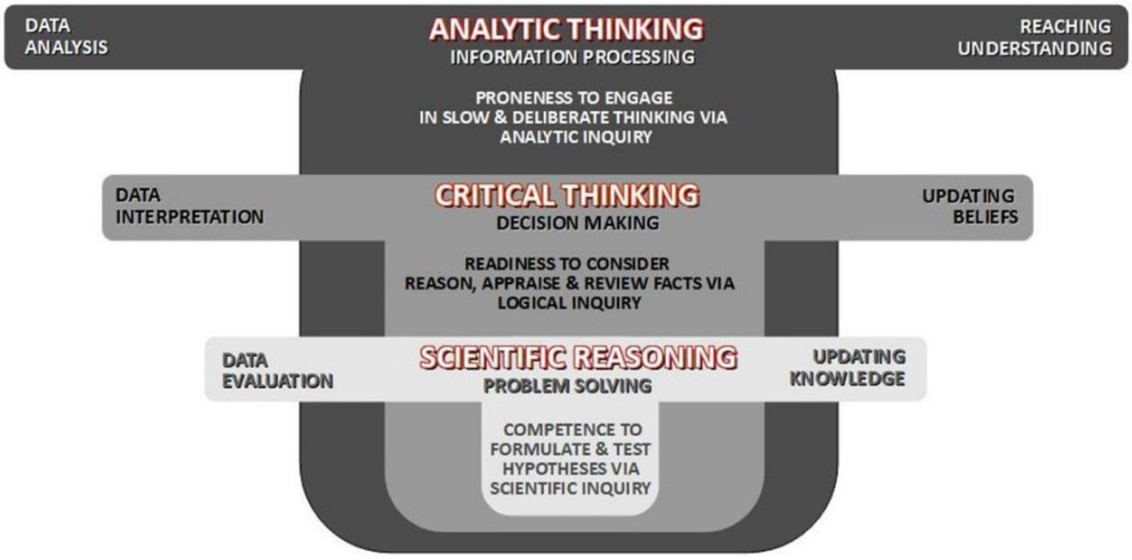

Figure 1 *The Hierarchical structure of cognitive styles related to Conspiracy Theory Beliefs.*

Note: Analytical thinking (the broadest and lowest in order), critical thinking, and scientific reasoning (the narrowest and highest in order) are conceptualized as related and nestled constructs[1].

2.6.1 Limitations of the Sociological Explanation

Similar to the results of other research concerning analytical and critical thinking, scientific reasoning has also shown to have a negative association to conspiracy theory beliefs (Cavajova et al., 2020; Cavajova et al., 2023; Hubl et al., 2021). However, studies have generally not examined each measure using a more integrated approach. For example,

[1] Adapted from "Conspiratorial Beliefs and Cognitive Styles: An Integrated Look on Analytic Thinking, Critical Thinking, and Scientific Reasoning in Relation to (Dis)trust in Conspiracy Theories", by Gjoneska, B., (2021). Retrieved from https://doi.org/110.3389/fpsyg.2021.736838

research is also yet to examine whether scientific reasoning is first, a more relevant skillset to the prevention of conspiracy theory beliefs than the other suggested 'lower-level processes', or, whether scientific reasoning skills can be amended into an intervention approach. For this reason, the research presented within this thesis aims to expand upon the limitations of this work.

2.7 The Clinical Explanation for Conspiracy Theory Beliefs

The clinical view of CT beliefs has focussed on psychopathology- the idea that underlying conditions may encourage differences in the way people process information and form beliefs (Barron et al., 2018; Georgiou et al., 2019; Swami et al., 2014). Indeed, the argument put forth from the socio-cognitive approach (e.g., the role of analytical/intuitive thinking) is often integrated into the clinical approach. Much of this work so far has focussed on the role of schizotypy. A robust number of studies have shown a moderate significant positive association between measures of schizotypy and conspiracy beliefs (Barron et al., 2014; Georgiou et al., 2019; van der Tempel & Alcock, 2015; Swami et al., 2016).

Schizotypy is a multidimensional psychological construct that possesses positive, negative and disorganized dimensions and resembles the factorial models of schizophrenia (Barron et al., 2014; Balzan et al., 2016; Bental, Claridge & Slade, 1989; Dagnall et al., 2016). Traits of schizotypy include anomalies in cognition (e.g., odd or magical thinking, hallucinations); socio-emotional functioning (e.g., narrowed affect); and, behaviour (e.g., odd behaviour and language) that often remain latent in development, but become more pronounced in adulthood (Balzan et al., 2015; Cohen et al., 2015; Ettinger et al., 2015). Schizotypy is often associated with a proneness to delusions, excessive focus on the details of events rather than the overall situation, and unfounded inferences (Balzan et al., 2015; Eisenacher et al., 2017; Moritz et al., 2013; Warman et al., 2007; Woodward et al., 2014). Thus, these traits are believed to make separating fictitious from credible information more

difficult and therefore could encourage the development of CT beliefs (Balzan et al., 2016; Barron et al., 2014; 2018; Georgiou et al., 2021b).

Research that has examined conspiracy beliefs and other related paranormal beliefs in non-clinical populations have taken a dimensional approach to schizotypy (Barron et al., 2014, Dagnall, 2015; Drinkwater et al., 2021b; 2022; Georgiou et al., 2021b). A "dimension" refers to a continuum where an individual can demonstrate various levels of a personality characteristic (e.g., a trait of schizotypy). This suggests that schizotypal traits exist across a spectrum of severity, rather than imply a concrete threshold between "normality" and a disorder (Gross et al., 2014). Based on this logic, the dimensional approach would suggest schizotypal traits may be more common than first supposed and that people who adopt conspiracy beliefs may possess schizotypal traits at a lower level of the spectrum (Barron et al., 2014; Denovan et al., 2020). As presented in Figure 2, the dimensional approach suggests that schizotypal traits can fluctuate from normal state of function, ranging from subclinical psychotic experiences and traits, toward its clinical manifestation in the form of certain psychotic-spectrum disorders (e.g., schizophrenia; Fonseca-Pedredo & Dubanne, 2021;). This led Barron et al. (2018) to conclude that the dimensional model acts as a coherent conceptual framework for investigating conspiracy beliefs in the general population.

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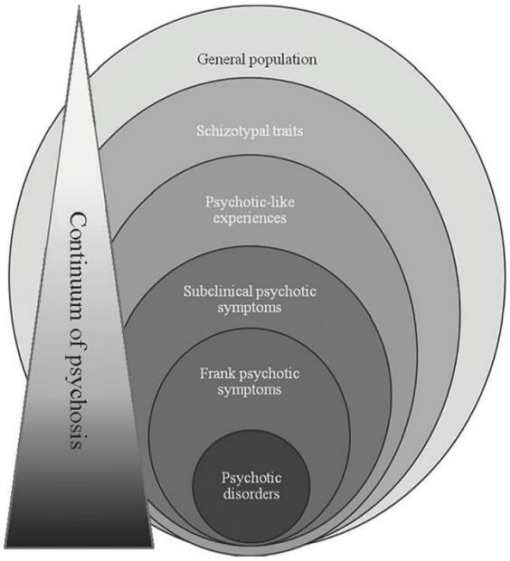

Figure 2 *The suggested architecture of the dimensional approach to psychosis.*

Note: On the left side, the 'continuum of psychosis' figure increases in severity from top to bottom. The more you move toward the base of the triangle (i.e.; from top to bottom, darker shaded side), the more present and severe symptoms become. On the right side, the smaller the circle becomes, the less common and more severe the cohort[2].

In addition to the direct association with conspiracy beliefs, there is also evidence of an indirect influence through socio-cognitive factors related to CTs (Barron et al., 2018; Georgiou et al., 2019; Lantian et al., 2021). Georgiou et al. (2019) found a negative association between schizotypy and analytical thinking and, in turn, a positive association with intuitive thinking and CT beliefs. In line with the sociological explanation detailed in Section 2.2., schizotypal people appear less likely to use a more systematic style of thinking that would help make clear the counterarguments to CT claims (Swami & Furnham, 2012; van Prooijen, 2015: 2017). Thus, research has since attempted to capture this difference in

[2] Adapted from "Schizotypal traits and psychotic-like experiences during adolescence: An update" by Fonseca-Pedrero E., Debanne F., (2017), Retrieved from: https://doi.org/10.7334/psicothema2016.209

information processing through the study of differences in performance on a range of problem-solving tasks (e.g., Bias Against Disconfirmatory Evidence Task; Balzan et al., 2016; Georgiou et al., 2021).

2.7.1 Limitations of the Clinical Explanation

Although research examining the relationship between schizotypy and CT beliefs appear to have merit, much of this work holds the assumption that schizotypal characteristics are the principal predisposing factor to conspiracist beliefs. However, schizotypal traits often co-exist with other traits or conditions that could also increase people's susceptibility to CT style thinking (e.g., delusion-proneness; Swami et al., 2016; Georgiou et al., 2019). For example, an important correlate that has received little attention in conspiracy theory literature are autistic traits or Autism Spectrum Disorder (ASD; Abu-Akel at al., 2017; Dinsdale et al., 2013; Ford et al., 2014: 2017; Zhou et al., 2019).

There are several reasons why it might be reasonable to examine the potential role of autistic traits in the context of conspiracy theory beliefs. Broader clinical research has shown that autistic and schizotypal traits have a co-occurrence rate of about 3%, with prevalence rates of autistic traits in psychosis populations much higher than the general population (Deste, Nenadic et al., 2021; Kincaid et al., 2017; Penn, Pinkham, Nibbio, & Harvey, 2020; Pinkham et al., 2019). In fact, ASD is often regarded as the principal condition (or primary diagnosis) in cases of co-morbidity with schizophrenia spectrum disorders (Hodges et al., 2020). Moreover, the co-occurrence of autistic and schizotypal traits appear to share some cognitive similarities (Wakabayashi, Baron-Cohen & Ashwin, 2012; Zhang et al., 2015). Both can involve altered or impaired social and communicative functioning (Calridge & McDonald, 2009; Dinsdale et al., 2013:2015; Ford & Crewther, 2014; Ford et al., 2017; Zhou et al., 2019). Similar to schizotypy, autistic traits can feature a rigid, inflexible thinking style which may involve an abnormal intensity or focus to specific details and points of interest

when interpreting information (e.g., real-world events), rather than engage in an adaptable thinking style which is open to disconfirmatory evidence (Baron-Cohen, 2006:2009, Luke et al., 2011; Mackenzie et al., 2018; Zhang et al., 2015).

Autistic traits may also lead to difficulties in conceptual reasoning (Williams et al., 2014). People with autistic traits can sometimes find events more ambiguous and discomforting to experience. Thus, to resolve this discomfort, it may be easier for people with autistic traits to use knowledge from previously formed conceptual schemas to eliminate ambiguity when making future decisions. This tendency is often referred to as a 'need for sameness' (Baron-Cohen, 2008; Pegado et al., 2020; Fujino et al., 2019; Williams et al., 2014). However, whilst schizotypal and autistic traits may share common socio-cognitive pathways, it is important to recognise the lack of specificity in currently available instruments that limit the ability to discern these differences (i.e., Autism Spectrum Quotient, Multidimensional Schizotypy Scale; Ferndandes et al. 2018; Trevisan et al., 2020)

2.7.2 The paradox of Schizotypy and Autistic traits

Unlike people with schizotypy, people who possess autistic traits are known to be more likely to use a more analytical thinking style of reasoning when they process new information (Gaeth et al., 2016). People with autistic traits are associated with a lower tendency to engage in intuitive reasoning. For this reason, individuals with autistic traits may have a tendency to overanalyse received information to the extent they engage in *extreme pattern imposition* – the tendency to engage in a systematic method of pairing and combining information in a way that may seem illogical at face value (Levin et al., 2015; Gaeth et al., 2016; Luke et al., 2014; Lewton et al., 2019; Wilkinson, 2018). In other words, whilst it is known that schizotypy and autism are often related conditions, both have the potential to encourage CT beliefs in different ways (Caldridge & MacDonald, 2009; Dinsdale et al., 2013; Ford and Crewther, 2014).

Overall, schizotypal traits appear to encourage intuitive or heuristic processing that leads to stronger CT beliefs, whereas, autistic traits may also include an additional element of systematic processing. Based on these findings thus far, it is fair to suggest these results are consistent with the original diametrical model of autism and psychosis (Abu-Akel & Bailey, 2000; Crespi and Badcock, 2008; Salice & Henriksen, 2021). This view suggests that ASD and schizotypy/schizophrenia may differ in some measures of cognition, including measures of preferences in thinking (e.g., analytical vs intuitive thinking). In effect, both conditions may increase susceptibility to CT beliefs but in different ways. Our conclusion was that both the considerable overlap between to the two clinical conditions as well as possible differences in cognitive processes between schizotypy and autism justify a more detailed investigation into the role of autistic traits in the context of conspiracy belief research.

2.7.3 Summary: Psychological Explanation of Conspiracy Theory Beliefs

Overall, both the sociological and clinical approaches to conspiracy theory beliefs have merit. The sociological approach is able to refine down to the important cognitive skills needed to debunk conspiracy theories, whereas the clinical approach has demonstrated the likely role of psychopathological traits in the formation of conspiracy beliefs (i.e., factors more peripheral to cognitive ability). However, given the links between clinical conditions and cognitive processes, there would appear to be a need for research that integrates the two approaches. In effect, cognitive mechanisms potentially related to CT formation need to be studied in a more clinical context.

Overall, the individual difference approach to conspiracy theory beliefs has mainly focussed on understanding why and how they developed from the two presented approaches, and, the research presented within this thesis also builds upon this focus of research. However, there has been less attention given to how this understanding can be used to develop ways to reduce or change these beliefs. Although identifying the reasons behind

conspiracy beliefs is an essential step, the ultimate aim of research should be to develop evidence-based strategies to counter them. Hence, considering their negative consequences as presented in Section 1.3.2., it is important that more research efforts shift towards identifying strategies that make use of the existing knowledge on conspiracy beliefs.

2.8 Current Interventions for Conspiracy Theory Beliefs

In the context of conspiracy theory beliefs, the literature thus far is yet to establish a reliable intervention approach. The lack of consensus on the underlying causes of conspiracy theory beliefs has led to a limitation in the conspiracy theory literature on interventions, as there is no clear and consistent framework on which to base interventions aimed at reducing or altering these beliefs (Goreis & Voracek, 2019; van Mulukom et al., 2022; Pilch et al., 2023). Moreover, although there are a considerable number of variables suggested as predictors of conspiracy beliefs, few may be transferable to intervention. However, particularly in the wake of the COVID-19 pandemic, research that more broadly aims to prevent the influence of misinformation-like content (e.g., fake news, falsely reported science) has provided insight on how to further the discussion around CT-based interventions.

Broadly speaking, most psychological interventions within the context of misinformation has taken either an accuracy-nudge approach or an inoculation approach. An accuracy nudge intervention refers to the use of *priming* to encourage people to focus on accuracy when processing information – the idea that exposure to one stimulus may influence a response to a subsequent stimulus (Maxfield, 1997; Roozenbeek et al., 2021). This approach is founded on the work of Pennycook et al. (2020), where a simple 'accuracy reminder' prior to participants beginning a study, nearly tripled their level of truth discernment in participants subsequent sharing intentions of online information. The appeal was a simple intervention reminding people of the importance of accuracy, may "nudge"

people to think about the accuracy of the information they see online and reduce the spread of misinformation. As this approach does not provide any new information, it allows people to help identify the importance of accuracy themselves in an economical manner (i.e., not requiring many cognitive resources; Rozenbeek et al., 2021). The accuracy-nudge intervention to misinformation has also been shown to be effective both prior to misinformation exposure ('prebunking') and afterwards ('debunking'), which demonstrates its adaptability (Ecker et al., 2021; Pennycook et al., 2021: 2022).

In contrast to an accuracy-nudge approach, an inoculation approach follows the ethos that an attitude or belief (in this case beliefs based on misinformation) can be prevented through prior-exposure to weakened versions of misinformation, analogous to the way the people can be protected against disease through built immunity (Compton et al., 2021). Given the difficulty of changing beliefs based on misinformation (e.g., conspiracy beliefs), the inoculation approach in theory would help people resist persuasion by misinformation in the first place. The aim would be to protect people against disinformation by teaching them to spot and refute a misleading claim. This allows a person to build up a resistance of what could be thought of as "mental antibodies" when encountering misinformation in the future (Traberg et al., 2022). An inoculation approach typically has two components that work in conjunction: *threat* and *refutational pre-emption*. The *threat* component involves individuals being made aware that they will be exposed to persuasive content (e.g., forewarning people that political actors may want to mislead audiences' attitudes on climate change; Bolsen & Druckman, 2015; van der Linden et al., 2017). The *refutational pre-emption* component refers to providing individuals with the tools or arguments to refute the persuasive content they will be exposed to, and, future persuasive attempts (i.e., misinformation they may confront outside the context of the intervention; Pfau et al., 2005; van der Linden et al., 2017).

Overall, whilst a more resource intensive approach compared to an accuracy-nudge, the inoculation approach provides tools or counterarguments that should then be readily available when individuals are exposed to misinformation in the future. Unlike the accuracy-nudge approach, the inoculation approach also does not hold the assumption that people are readily able to evaluate the accuracy of information when primed (Pennycook et al., 2020). Considering the pervasive and infallible nature of conspiracy theory beliefs (i.e., often based on disprovable premises), van der Linden et al. (2020) suggests the inoculation approach may provide a more fruitful method of identifying the structural components of a conspiracy theory. However, in regard to the prevention of conspiracy beliefs, the limitations of this approach can be deducted into two main questions for researchers: (a) what 'tools' are most relevant to prevent conspiracy beliefs that may be amenable to an inoculation approach, and, (b) what cognitive skills or individual differences may better allow these tools to be accepted, or, act as a barrier for these tools to be applied in future occurrences.

2.9 References

Abu-Akel, A. M., Apperly, I. A., Wood, S. J., & Hansen, P. C. (2017). Autism and psychosis expressions diametrically modulate the right temporoparietal junction. *Social neuroscience,* 12(5), 506–518, doi: 10.1080/17470919.2016.1190786

Abu-Akel, A., & Bailey, A. L. (2000). The possibility of different forms of theory of mind impairment in psychiatric and developmental disorders. *Psychological medicine*, *30*(3), 735–738. https://doi.org/10.1017/s0033291799002123

Acar, K., Horntvedt, O., Cabrera, A., Olsson, A., Ingvar, M., Lebedev, A. V., & Petrovic, P. (2022). COVID-19 conspiracy ideation is associated with the delusion proneness trait and resistance to update of beliefs. *Scientific Reports*, *12*(1), 10352.

Andrade G. (2020). Medical conspiracy theories: cognitive science and implications for ethics. *Medicine, health care, and philosophy*, *23*(3), 505–518. https://doi.org/10.1007/s11019-020-09951-6

Ball, P., & Maxmen, A. (2020). The epic battle against coronavirus misinformation and conspiracy theories. *Nature*, *581*(7809), 371-375.

Balzan, R. P., Mattiske, J. K., Delfabbro, P., Liu, D., & Galletly, C. (2019). Individualized metacognitive training (MCT+) reduces delusional symptoms in psychosis: A randomized clinical trial. *Schizophrenia Bulletin, 45*, 27-36, doi: 10.1093/schbul/sby152

Balzan, R., Woodward. S., Delfabbro, P., Moritz, S. (2016) Overconfidence across the psychosis continuum: a calibration approach, *Cognitive Neuropsychiatry*, 21(6), pp. 510-524, doi:10.1080/23311908.2015.1135855

Bangerter, A., Wagner-Egger, P., & Delouvée, S. (2020). How conspiracy theories spread. *In* M. Butter & P. Knight *(Eds.),* Routledge handbook of conspiracy theories (*pp.* 206–218). *Routledge.*

Baron-Cohen, S. (2008). Autism, Hypersystemizing, and Truth. Quarterly Journal of Experimental Psychology, 61(1), 64–75.

Barron, D., Furnham, A., Weis, L., Morgan, K. D., Towell, T., & Swami, V. (2018). The relationship between schizotypal facets and conspiracist beliefs via cognitive processes. *Psychiatry Research, 259*, 15-20. doi:10.1016/j.psychres.2017.10.001

Barron, D., Morgan, K., Towell, T., Altemeyer, B., & Swami, V. (2014). Associations between schizotypy and belief in conspiracist ideation. *Personality and Individual Differences, 70*, 156-159. doi:10.1016/j.paid.2014.06.040

Bentall, R. P., Claridge, G. S., & Slade, P. D. (1989). The multidimensional nature of schizotypal traits: A factor analytic study with normal subjects. *British Journal of Clinical Psychology, 28*(4), 363–375.

Bertin, P., Nera, K., & Delouvée, S. (2020). Conspiracy beliefs, rejection of vaccination, and support for hydroxychloroquine: A conceptual replication-extension in the COVID-19 pandemic context. *Frontiers in psychology*, 2471.

Biddlestone, M., Green, R., & Douglas, K. M. (2020). Cultural orientation, power, belief in conspiracy theories, and intentions to reduce the spread of COVID-19. *British Journal of Social Psychology*, *59*(3), 663-673.

Biddlestone, M., Green, R., Cichocka, A., Douglas, K., & Sutton, R. M. (2022). A systematic review and meta-analytic synthesis of the motives associated with conspiracy beliefs. https://doi.org/10.31234/osf.io/rxjqc

Bilewicz, M., & Krzeminski, I. (2010). Anti-Semitism in Poland and Ukraine: The belief in Jewish control as a mechanism of scapegoating. *International Journal of Conflict and Violence (IJCV)*, *4*(2), 234-243.

Bilewicz, M., Winiewski, M., Kofta, M., & Wójcik, A. (2013). Harmful Ideas, the Structure and Consequences of Anti-Semitic Beliefs in Poland. *Political Psychology*, *34*(6), 821-839.

Bolsen, T., & Druckman, J. N. (2015). Counteracting the politicization of science. *Journal of Communication*, *65*(5), 745-769.

Bortolotti, L. (2022). Are delusions pathological beliefs?. *Asian Journal of Philosophy*, *1*(1),31.

Brañas-Garza, P., Kujal, P., & Lenkei, B. (2019). Cognitive reflection test: Whom, how, when. *Journal of Behavioral and Experimental Economics*, *82*, 101455.

Brosnan, M., Lewton, M., & Ashwin, C. (2016). Reasoning on the Autism Spectrum: A Dual Process Theory Account. *Journal of autism and developmental disorders*, *46*(6), 2115–2125. https://doi.org/10.1007/s10803-016-2742-4

Brotherton, R., French, C. C., & Pickering, A. D. (2013). Measuring belief in conspiracy and Individual Differences, 122, 155-163. https://doi.org/10.1016/j.paid.2017.10.026

Bruns, A., Harrington, S., & Hurcombe, E. (2021). Coronavirus conspiracy theories: Tracing misinformation trajectories from the fringes to the mainstream. *Communicating COVID-19: interdisciplinary perspectives*, 229-249.

Čavojová, V., Šrol, J., & Ballová Mikušková, E. (2022). How scientific reasoning correlates with health-related beliefs and behaviors during the COVID-19 pandemic?. *Journal of health psychology*, *27*(3), 534-547.

Celia, G., Lausi, G., Girelli, L., Cavicchiolo, E., Limone, P., Giannini, A. M., & Cozzolino, M. (2022). COVID-19 related conspiracy beliefs and their relationship with defense strategies, emotions, powerlessness, attitudes, and time perspective. *Frontiers in Psychology*, *13*.

Cichocka, A., Marchlewska, M., & De Zavala, A. G. (2016). Does self-love or self-hate predict conspiracy beliefs? Narcissism, self-esteem, and the endorsement of conspiracy theories. *Social Psychological and Personality Science*, *7*(2), 157-166.

Cichocka, A., Marchlewska, M., Golec de Zavala, A., & Olechowski, M. (2016). 'They will not control us': Ingroup positivity and belief in intergroup conspiracies. *British journal of psychology*, 107(3): 556–576.

Cichocka, A., Marchlewska, M., Golec de Zavala, A., & Olechowski, M. (2016). 'They will not control us': Ingroup positivity and belief in intergroup conspiracies. *British journal of psychology*, *107*(3), 556-576.

Clarke, S. (2002). Conspiracy theories and conspiracy theorizing. *Philosophy of the social sciences*, *32*(2), 131-150.

Clifford, S., Jewell, R. M., & Waggoner, P. D. (2015). Are samples drawn from Mechanical Turk valid for research on political ideology?. *Research & Politics*, *2*(4), 2053168015622072.

Coady, D. (2003). Conspiracy theories and official stories. *International Journal of Applied Philosophy*, *17*(2), 197-209.

Cohen, A.S., Mohr, C., Ettinger, U., Chan, R.C. (2015) Schizotypy as an organizing framework for social and affective sciences, *Schizophrenia Bulletin,* 18(4), doi: 10.1093/schbul/sbu195

Compton, J., van der Linden, S., Cook, J., & Basol, M. (2021). Inoculation theory in the post-truth era: Extant findings and new frontiers for contested science, misinformation, and conspiracy theories. *Social and Personality Psychology Compass*, *15*(6), e12602.

Constantinou, M., Courtoy, A., Ebert, M. A., Engelhardt, M., Giani, T., Hobbs, T., ... & Zhang, R. (2021). Parton distributions and lattice-QCD calculations: Toward 3D structure. *Progress in Particle and Nuclear Physics*, *121*, 103908.

Crespi, B., & Badcock, C. (2008). Psychosis and autism as diametrical disorders of the social brain. *The Behavioral and brain sciences*, *31*(3), 241–320. https://doi.org/10.1017/S0140525X08004214

Dagnall, N., Denovan, A., Drinkwater, K., Parker, A., & Clough, P. (2016). Toward a Better Understanding of the Relationship between Belief in the Paranormal and Statistical Bias: The Potential Role of Schizotypy. *Frontiers in psychology*, *7*, 1045. https://doi.org/10.3389/fpsyg.2016.01045

Dagnall, N., Denovan, A., Drinkwater, K., Parker, A., & Clough, P. (2016). Toward a Better Understanding of the Relationship between Belief in the Paranormal and Statistical Bias: The Potential Role of Schizotypy. *Frontiers in psychology*, 7, 1045.

De Coninck, D., Frissen, T., Matthijs, K., d'Haenens, L., Lits, G., Champagne-Poirier, O., Carignan, M. E., David, M. D., Pignard-Cheynel, N., Salerno, S., & Généreux, M. (2021). Beliefs in Conspiracy Theories and Misinformation About COVID-19: Comparative Perspectives on the Role of Anxiety, Depression and Exposure to and Trust in Information Sources. *Frontiers in psychology*, *12*, 646394.

Denovan, A., Dagnall, N., Drinkwater, K., Parker, A., and Neave, N. (2020). Conspiracist beliefs, intuitive thinking, and schizotypal facets: a further evaluation, *Applied Cognitive Psychology*, 34, 1394–1405.

Deste, G., Vita, A., Penn, D. L., Pinkham, A. E., Nibbio, G., & Harvey, P. D. (2020). Autistic symptoms predict social cognitive performance in patients with schizophrenia. *Schizophrenia Research, 215*, 113-119

Díaz, C., Dorner, B., Hussmann, H., & Strijbos, J. W. (2023). Conceptual review on scientific reasoning and scientific thinking. *Current Psychology*, *42*(6), 4313-4325.

Dinsdale NL, Hurd PL, Wakabayashi A, Elliot M, Crespi BJ (2013) How Are Autism and Schizotypy Related? Evidence from a Non-Clinical Population. PLOS ONE 8(5): e63316, doi: 10.1371/journal.pone.0063316

Douglas, K. M. (2021). COVID-19 conspiracy theories. *Group Processes & Intergroup Relations*, *24*(2), 270-275.

Douglas, K. M., Uscinski, J. E., Sutton, R. M., Cichocka, A., Nefes, T., Ang, C. S., & Deravi, F. (2019). Understanding conspiracy theories. *Political psychology*, *40*, 3-35.

Drinkwater, K. G., Dagnall, N., Denovan, A., & Williams, C. (2021). Paranormal Belief, Thinking Style and Delusion Formation: A Latent Profile Analysis of Within-Individual Variations in Experience-Based Paranormal Facets. *Frontiers in psychology*, 12, 670959.

Drinkwater, K., Dagnall, N., & Parker, A. (2012). Reality testing, conspiracy theories, and paranormal beliefs. *Journal of Parapsychology*, *76*(1), 57-77.

Ecker, U. K., Lewandowsky, S., Cook, J., Schmid, P., Fazio, L. K., Brashier, N & Amazeen, M. A. (2022). The psychological drivers of misinformation belief and its resistance to correction. *Nature Reviews Psychology*, *1*(1), 13-29.

Eisenacher S., Rausch F., Ainser F., Mier D., Veckenstedt R., Schirmbeck F., et al. . (2015). Investigation of Metamemory functioning in the at-risk mental state for psychosis, *Psychology and Medicine*, 45, 3329–3340. Doi:10.1017/S0033291715001373

Enders, A. M., Uscinski, J. E., Klofstad, C., & Stoler, J. (2020). The different forms of COVID-19 misinformation and their consequences. *Harvard Kennedy School Misinformation Review*.

Enders, A. M., Uscinski, J. E., Seelig, M. I., Klofstad, C. A., Wuchty, S., Funchion, J. R., ... & Stoler, J. (2021). The relationship between social media use and beliefs in conspiracy theories and misinformation. *Political behavior*, 1-24.

Enders, A., Farhart, C., Miller, J., Uscinski, J., Saunders, K., & Drochon, H. (2022). Are republicans and conservatives more likely to believe conspiracy theories?. *Political behavior*, 1-24.

Erokhin, D., Yosipof, A., & Komendantova, N. (2022). COVID-19 Conspiracy theories discussion on Twitter. *Social Media+ Society*, *8*(4), 20563051221126051.

Ettinger, U., Mohr, C., Gooding, D. C., Cohen, A. S., Rapp, A., Haenschel, C., & Park, S. (2015). Cognition and Brain Function in Schizotypy: A Selective Review. *Schizophrenia Bulletin*, *41*, S417–S426, doi:10.1093/schbul/sbu190

Evans, B., Jonathan, K., & Stanovich, K., E. (2013). Dual-Process Theories of Higher Cognition Advancing the Debate. *Perspectives on Psychological Science* 8 (3):223-241. doi: 10.1177/1745691612460685

Fernandes, J. M., Cajão, R., Lopes, R., Jerónimo, R., & Barahona-Corrêa, J. B. (2018). Social Cognition in Schizophrenia and Autism Spectrum Disorders: A Systematic Review and Meta-Analysis of Direct Comparisons. *Frontiers in psychiatry*, *9*, 504. https://doi.org/10.3389/fpsyt.2018.00504

Fong, A., Roozenbeek, J., Goldwert, D., Rathje, S., & van der Linden, S. (2021). The language of conspiracy: A psychological analysis of speech used by conspiracy theorists and their followers on Twitter. *Group Processes & Intergroup Relations*, *24*(4), 606-623.

Fonseca Pedrero, E., & Debbané, M. (2017). Schizotypal traits and psychotic-like experiences during adolescence: An update. *Psicothema*, *29*(1), 5–17. https://doi.org/10.7334/psicothema2016.209

Fonseca-Pedrero, E., Debbané, M., Rodríguez-Testal, J. F., Cohen, A. S., Docherty, A. R., & Ortuño-Sierra, J. (2021). Schizotypy: The way ahead. *Psicothema, 33*(1), 16–27.

Ford, T. C., & Crewther, D. P. (2014). Factor analysis demonstrates a common schizoidal phenotype within autistic and schizotypal tendency: Implications for neuroscientific studies. Frontiers in Psychiatry, 5, Article 117.

Ford, T. C., Nibbs, R., & Crewther, D. P. (2017). Increased glutamate/GABA+ ratio in a shared autistic and schizotypal trait phenotype termed Social Disorganisation. *NeuroImage. Clinical*, 16, 125–131, doi: 10.1016/j.nicl.2017.07.009

Franks, B., Bangerter, A., Bauer, M. W., Hall, M., & Noort, M. C. (2017). Beyond "monologicality"? Exploring conspiracist worldviews. *Frontiers in psychology*, *8*, 861.

French, C. C., & Stone, A. (2017). *Anomalistic psychology: Exploring paranormal belief and experience*. Bloomsbury Publishing.

Fugelsang, J. A., & Dunbar, K. N. (2005). Brain-based mechanisms underlying complex causal thinking. *Neuropsychologia*, *43*(8), 1204-1213.

Gaeth, G. & Levin, Irwin & Jain, Gaurav & Burke, E.V... (2016). Toward understanding everyday decision making by adults across the autism spectrum. 11. 537-547.

Gagliardi, Lorenzo, The role of cognitive biases in conspiracy beliefs: A literature review (October 28, 2022). Available at SSRN: https://ssrn.com/abstract=4261122 or http://dx.doi.org/10.2139/ssrn.4261122

Georgiou, M., Delfabbro, P. H., & Balzan, R. (2019). Conspiracy beliefs in the general population: The importance of psychopathology, cognitive style and educational attainment, *Personality and Individual Differences*, 151

Georgiou, N., Delfabbro, P., & Balzan, R. (2021). Conspiracy-Beliefs and Receptivity to Disconfirmatory Information: A Study Using the BADE Task. *SAGE Open.*

Gjoneska B. (2021). Conspiratorial Beliefs and Cognitive Styles: An Integrated Look on Analytic Thinking, Critical Thinking, and Scientific Reasoning in Relation to (Dis)trust in Conspiracy Theories. *Frontiers in psychology*, *12*, 736838.

Gjoneska, B. (2021). Conspiratorial beliefs and cognitive styles: An integrated look on analytic thinking, critical thinking, and scientific reasoning in relation to (Dis) trust in conspiracy theories. *Frontiers in psychology*, *12*, 736838.

Gligorić, V., da Silva, M. M., Eker, S., van Hoek, N., Nieuwenhuijzen, E., Popova, U., & Zeighami, G. (2021). The usual suspects: How psychological motives and thinking styles predict the endorsement of well-known and COVID-19 conspiracy beliefs. *Applied Cognitive Psychology*, *35*(5), 1171-1181.

Gonzalez-Ocantos, E., De Jonge, C. K., Meléndez, C., Osorio, J., & Nickerson, D. W. (2012). Vote buying and social desirability bias: Experimental evidence from Nicaragua. *American Journal of Political Science*, *56*(1), 202-217.

Goreis, A., & Voracek, M. (2019). A systematic review and meta-analysis of psychological research on conspiracy beliefs: Field characteristics, measurement instruments, and associations with personality traits. *Frontiers in Psychology*, 10, 205.

Green, J., Hobbs, W., McCabe, S., & Lazer, D. (2022). Online engagement with 2020 election misinformation and turnout in the 2021 Georgia runoff election. *Proceedings of the National Academy of Sciences*, *119*(34), e2115900119.

Green, R., Toribio-Flórez, D., Douglas, K. M., Brunkow, J. W., & Sutton, R. M. (2023). Making an impression: The effects of sharing conspiracy theories. *Journal of Experimental Social Psychology*, *104*, 104398

Grimes D. R. (2021). Medical disinformation and the unviable nature of COVID-19 conspiracy theories. *PloS one*, *16*(3), e0245900.

Gross, G.M., Kwapil, T.R., Raulin, M.L., Silvia, P.J., & Barrantes-Vidal, N. (2018). The Multidimensional Schizotypy Scale-Brief: Scale development and psychometric properties. *Psychiatry Research*, 216, 7-13.

Ha, L., Graham, T., & Gray, J. E. (2022). Where conspiracy theories flourish: A study of YouTube comments and Bill Gates conspiracy theories. *Harvard Kennedy School (HKS) Misinformation Review*, *3*(5).

Han, J. (2013). *Scientific reasoning: Research, development, and assessment* (Doctoral dissertation, The Ohio State University).

Hodges, H., Fealko, C., & Soares, N. (2020). Autism spectrum disorder: definition, epidemiology, causes, and clinical evaluation. *Translational pediatrics*, *9*(Suppl 1), S55–S65.

Hofstadter, R. (2012). *The paranoid style in American politics*. Vintage.

Holbrook, A. L., & Krosnick, J. A. (2013). A new question sequence to measure voter turnout in telephone surveys: Results of an experiment in the 2006 ANES pilot study. *Public Opinion Quarterly*, *77*(S1), 106-123.

Hübl, P. (2020). How conspiracy theorists get the scientific method wrong.

Imhoff, R., & Bruder, M. (2014). Speaking (un–) truth to power: Conspiracy mentality as a generalised political attitude. *European Journal of Personality*, *28*(1), 25-43.

Jack, A., & Panchal, R. (2021). Soaring seas, forest fires and deadly drought: climate change conspiracies and mental health. *BJPsych bulletin*, *45*(4), 210–215. https://doi.org/10.1192/bjb.2021.7

Jolley, D., & Douglas, K. M. (2017). Prevention is better than cure: Addressing anti-vaccine conspiracy theories. *Journal of applied social psychology*, *47*(8), 459-469.

Jolley, D., & Paterson, J. L. (2020). Pylons ablaze: Examining the role of 5G COVID-19 conspiracy beliefs and support for violence. *British journal of social psychology*, *59*(3), 628-640.

Jolley, D., Douglas, K. M., Marchlewska, M., Cichocka, A., & Sutton, R. M. (2022). Examining the links between conspiracy beliefs and the EU "Brexit" referendum vote in the UK: Evidence from a two-wave survey. *Journal of Applied Social Psychology*, *52*(1), 30-36.

Jolley, D., Mari, S., & Douglas, K. M. (2020). *Consequences of conspiracy theories* (pp. 231-241). Routledge.

Jolley, D., Meleady, R., & Douglas, K. M. (2020). Exposure to intergroup conspiracy theories promotes prejudice which spreads across groups. *British Journal of Psychology*, *111*(1), 17-35.

Kincaid, D. L., Doris, M., Shannon, C., & Mulholland, C. (2017). What is the prevalence of autism spectrum disorder and ASD traits in psychosis? A systematic review. *Psychiatry research*, *250*, 99–105. https://doi.org/10.1016/j.psychres.2017.01.017

Lai, E. R. (2011). Critical thinking: A literature review. *Pearson's Research Reports*, *6*(1), 40-41.

Lantian, A., Bagneux, V., Delouvée, S., & Gauvrit, N. (2020). Maybe a Free Thinker but not a Critical One: High Conspiracy Belief is Associated With low Critical Thinking Ability. Preprint available: doi.org/10.31234/osf.io/8qhx4

Leman, M., Moelants, D., Varewyck, M., Styns, F., van Noorden, L., & Martens, J. P. (2013). Activating and relaxing music entrains the speed of beat synchronized walking. *PloS one*, *8*(7), e67932. https://doi.org/10.1371/journal.pone.0067932

Leonard, M. J., & Philippe, F. L. (2021). Conspiracy Theories: A Public Health Concern and How to Address It. *Frontiers in psychology*, *12*, 682931. https://doi.org/10.3389/fpsyg.2021.682931

Leveaux S., Nera K., Fagnoni P., Klein P. P. P. L. (2022). Defining and explaining conspiracy theories: Comparing the lay representations of conspiracy believers and non-believers. *Journal of Social and Political Psychology*, 10(1), Article 1.

Lobato, E., Mendoza, J., Sims, V., & Chin, M. (2014). Examining the relationship between conspiracy theories, paranormal beliefs, and pseudoscience acceptance among a university population. *Applied Cognitive Psychology*, *28*(5), 617-625

Loomba, S., de Figueiredo, A., Piatek, S. J., de Graaf, K., & Larson, H. J. (2021). Measuring the impact of COVID-19 vaccine misinformation on vaccination intent in the UK and USA. *Nature human behaviour*, *5*(3), 337-348.

Lopez, J., & Hillygus, D. S. (2018). Why so serious?: Survey trolls and misinformation. *Why So Serious*.

Luke, L., Clare, I. C. H., Ring, H., Redley, M., Watson, P. (2012). Decision-making difficulties experienced by adults with autism spectrum conditions, *Autism*, 16(6), 612–621.

Lyons, B. A., & Workman, K. S. (2022). Explicit voter fraud conspiracy cues increase belief among co-partisans but have broader spillover effects on confidence in elections. *Harvard Kennedy School (HKS) Misinformation Review*, *3*(3).

Machete, P., & Turpin, M. (2020). The Use of Critical Thinking to Identify Fake News: A Systematic Literature Review. *Responsible Design, Implementation and Use of Information and Communication Technology*, 12067, 235 - 246.

Mari, S., Gil de Zuniga, H., Suerdem, A., Hanke, K., Brown, G., Vilar, R., ... & Bilewicz, M. (2022). Conspiracy theories and institutional trust: examining the role of uncertainty avoidance and active social media use. *Political Psychology*, *43*(2), 277-296.

Maxfield L. (1997). Attention and semantic priming: a review of prime task effects. *Consciousness and cognition*, *6*(2-3), 204–218. https://doi.org/10.1006/ccog.1997.0311

McCauley, C., & Jacques, S. (1979). The popularity of conspiracy theories of presidential assassination: A Bayesian analysis. *Journal of Personality and Social Psychology, 37*(5), 637–644.

McKenzie, K., Murray, A. L., Wilkinson, A., Murray, G. C., Metcalfe, D., O'Donnell, M., & McCarty, K. (2018). The relations between processing style, autistic-like traits, and emotion recognition in individuals with and without Autism Spectrum Disorder. *Personality and Individual Differences*, *120*, 1-6.

Moritz, S., Favrod, J., Andreou, C., Morrison, A. P., Bohn, F., Veckenstedt, R, Karow, A. (2013). Beyond the Usual Suspects: Positive Attitudes Towards Positive Symptoms Is Associated With Medication Noncompliance in Psychosis. Schizophrenia Bulletin, 39(4), 917–922. Doi:10.1093/schbul/sbs005

Morris, B. J., Croker, S., Masnick, A. M., & Zimmerman, C. (2012). The emergence of scientific reasoning. In *Current topics in children's learning and cognition*. IntechOpen.

Mousoulidou, M., Christodoulou, A., Siakalli, M., & Argyrides, M. (2023). The Role of Conspiracy Theories, Perceived Risk, and Trust in Science on COVID-19 Vaccination Decisiveness: Evidence from Cyprus. *International journal of environmental research and public health*, *20*(4), 2898. https://doi.org/10.3390/ijerph20042898

Napolitano, M. G., & Reuter, K. (2021). What is a conspiracy theory?. *Erkenntnis*, 1-28.

Nera, K., & Schöpfer, C. (2022, April 18). What Is So Special About Conspiracy Theories? Conceptually Distinguishing Beliefs in Conspiracy Theories from Conspiracy Beliefs in Psychological Research.

Oleksy, T., Wnuk, A., Maison, D., & Łyś, A. (2021). Content matters. Different predictors and social consequences of general and government-related conspiracy theories on COVID-19. *Personality and individual differences*, *168*, 110289.

Oliver, J. E., & Wood, T. J. (2014a). Conspiracy theories and the paranoid style(s) of mass opinion*, American Journal of Political Science*, doi:10.1111/ajps.12084.

Oliver, J. E., & Wood, T. J. (2014b). Medical conspiracy theories and health behaviours in the United States. *JAMA Internal Medicine*. Doi: 10.1001/jamainternmed.2014.190

Oswald, S. (2016). Conspiracy and bias: Argumentative features and persuasiveness of conspiracy theories.

Pantazi, M., Papaioannou, K., & van Prooijen, J. W. (2022). Power to the people: the hidden link between support for direct democracy and belief in conspiracy theories. *Political Psychology*, *43*(3), 529-548.

Pegado, F., Hendriks, M., Amelynck, S., Daniels, N., Steyaert, J., Boets, B., & Op de Beeck, H. (2020). Adults with high functioning autism display idiosyncratic behavioral patterns, neural representations and connectivity of the 'Voice Area' while judging the

appropriateness of emotional vocal reactions. *Cortex; a journal devoted to the study of the nervous system and behavior*, *125*, 90–108.

Pennycook, G., & Rand, D. G. (2022). Nudging Social Media toward Accuracy. *The Annals of the American Academy of Political and Social Science*, *700*(1), 152–164. https://doi.org/10.1177/00027162221092342

Pennycook, G., Cheyne, J. A., Koehler, D. J., & Fugelsang, J. A. (2019). On the belief that beliefs should change according to evidence: Implications for conspiratorial, moral, paranormal, political, religious, and science beliefs, doi: 10.31234/osf.io/a7k96

Pennycook, G., Fugelsang, J. A., & Koehler, D. J. (2015). Everyday Consequences of Analytic Thinking. *Current Directions in Psychological Science*, 24(6), 425–432.

Pennycook, G., Rand, D. G. (2019a). Fighting misinformation on social media using crowdsourced judgments of news source quality. Proceedings of the National Academy of Sciences, USA, 116, 2521–2526. doi:10.1073/pnas.1806781116

Pennycook, G., Rand, D. G. (2019b). Lazy, not biased: Susceptibility to partisan fake news is better explained by lack of reasoning than by motivated reasoning. *Cognition*, 188, 39–50. doi:10.1016/j.cognition.2018.06.011

Pfau, M., Ivanov, B., Houston, B., Haigh, M., Sims, J., Gilchrist, E., & Richert, N. (2005). Inoculation and mental processing: The instrumental role of associative networks in the process of resistance to counterattitudinal influence. *Communication monographs*, *72*(4), 414-441.

Pilch, I., Turska-Kawa, A., Wardawy, P., Olszanecka-Marmola, A., & Smołkowska-Jędo, W. (2023). Contemporary trends in psychological research on conspiracy beliefs. A systematic review. *Frontiers in psychology*, *14*, 1075779. https://doi.org/10.3389/fpsyg.2023.1075779

Pinkham, A., & Sasson, N. (2020). The benefit of directly comparing autism and schizophrenia, revisited. *Psychological Medicine, 50*(3), 526-528.

Prike, T., Arnold, M. M., & Williamson, P. (2018). The relationship between anomalistic belief and biases of evidence integration and jumping to conclusions. *Acta psychologica*, *190*, 217-227.

Pytlik, N., Soll, D., & Mehl, S. (2020). Thinking preferences and conspiracy belief: Intuitive thinking and the jumping to conclusions-bias as a basis for the belief in conspiracy theories. *Frontiers in psychiatry*, *11*, 568942.

Räikkä, J., & Räikkä, J. (2014). On the epistemic acceptability of conspiracy theories. *Social Justice in Practice: Questions in Ethics and Political Philosophy*, 61-75.

Rizeq, J., Flora, D. B., & Toplak, M. E. (2021). An examination of the underlying dimensional structure of three domains of contaminated mindware: paranormal beliefs, conspiracy beliefs, and anti-science attitudes. *Thinking & Reasoning*, *27*(2), 187-211.

Robertson, C. E., Pretus, C., Rathje, S., Harris, E., & Van Bavel, J. J. (2022). How social identity shapes conspiratorial belief. *Current Opinion in Psychology*, 101423.

Romer, D., & Jamieson, K. H. (2021). Conspiratorial thinking, selective exposure to conservative media, and response to COVID-19 in the US. *Social Science & Medicine*, *291*, 114480.

Roozenbeek, J., Schneider, C. R., Dryhurst, S., Kerr, J., Freeman, A. L., Recchia, G., ... & Van Der Linden, S. (2020). Susceptibility to misinformation about COVID-19 around the world. *Royal Society open science*, *7*(10), 201199

Rothmund, T., Farkhari, F., Azevedo, F., & Ziemer, C. T. (2020). Scientific trust, risk assessment, and conspiracy beliefs about COVID-19-four patterns of consensus and disagreement between scientific experts and the German public.

Rubincam, C. (2017). “It’s natural to look for a source”: A qualitative examination of alternative beliefs about HIV and AIDS in Cape Town, South Africa. *Public Understanding of Science*, *26*(3), 369-384.

Salice, A., Henriksen, M.G. (2021) Distrubances of Shared Intentionality in Schizophrenia and Autism, *Frontiers in Psychiatry*, doi.org/10.3389/fpsyt.2020.570597.

Schaffner, B. F., & Luks, S. (2018). Misinformation or expressive responding? What an inauguration crowd can tell us about the source of political misinformation in surveys. *Public Opinion Quarterly*, *82*(1), 135-147.

Soveri, A., Karlsson, L. C., Antfolk, J., Lindfelt, M., & Lewandowsky, S. (2021). Unwillingness to engage in behaviors that protect against COVID-19: the role of conspiracy beliefs, trust, and endorsement of complementary and alternative medicine. *BMC public health*, *21*, 1-12.

Šrol, J., Čavojová, V., & Ballová Mikušková, E. (2022). Finding Someone to Blame: The Link Between COVID-19 Conspiracy Beliefs, Prejudice, Support for Violence, and Other Negative Social Outcomes. *Frontiers in psychology*, *12*, 726076. https://doi.org/10.3389/fpsyg.2021.726076

Stecula, D. A., & Pickup, M. (2021). How populism and conservative media fuel conspiracy beliefs about COVID-19 and what it means for COVID-19 behaviors. *Research & Politics*, *8*(1).

Thalmann, K. (2019). *The stigmatization of conspiracy theory since the 1950s:" a plot to make us look foolish"*. Routledge.

Stecula, D. A., & Pickup, M. (2021). How populism and conservative media fuel conspiracy beliefs about COVID-19 and what it means for COVID-19 behaviors. *Research & Politics*, *8*(1), 2053168021993979.

Sternisko, A., Cichocka, A., & Van Bavel, J. J. (2020). The dark side of social movements: Social identity, non-conformity, and the lure of conspiracy theories. *Current opinion in psychology*, *35*, 1-6.

Sutton, R. M., & Douglas, K. M. (2022). Agreeing to disagree: reports of the popularity of Covid-19 conspiracy theories are greatly exaggerated. *Psychological medicine*, *52*(4), 791-793.

Swami V., Furnham A., Smyth N., Weis L., Lay A., Clow (2016) A. Putting the stress on conspiracy theories: Examining associations between psychological stress, anxiety, and belief in conspiracy theories. *Personality and Individual Differences.*

Swami V., Furnham A., Smyth N., Weis L., Lay A., Clow (2016) A. Putting the stress on conspiracy theories: Examining associations between psychological stress, anxiety, and belief in conspiracy theories. *Personality and Individual Differences*, 99:72–76. doi: 10.1016/j.paid.2016.04.084

Swami V., Furnham A., Smyth N., Weis L., Lay A., Clow (2016) A. Putting the stress on conspiracy theories: Examining associations between psychological stress, anxiety, and belief in conspiracy theories. *Personality and Individual Differences*, 99:72–76. doi: 10.1016/j.paid.2016.04.084

Swami, V. (2012). Social psychological origins of conspiracy theories: The case of the Jewish conspiracy theory in Malaysia, *Frontiers in Psychology*, 3, 280, doi: 10.3389/fpsyg.2012.00280.

Swami, V. (2014b). Political paranoia and conspiracy theories. *Power, politics, and paranoia: Why people are suspicious of their leaders* (pp. 218-236) doi:10.1017/CBO9781139565417.016

Swami, V., & Coles, R. (2010). The truth is out there: Belief in conspiracy theories. *The Psychologist*, 23, 560–563.

Swami, V., Barron, D., Weis, L., Voracek, M., Stieger, S., & Furnham, A. (2017). An examination of the factorial and convergent validity of four measures of conspiracist ideation, with recommendations for researchers. *PLOS ONE*, 12, e0172617. doi:10.1371/journal.pone.0172617

Swami, V., Chamorro-Premuzic, T., & Furnham, A. (2010). Unanswered questions: A preliminary investigation of personality and individual difference predictors of 9/11 conspiracist beliefs, *Applied Cognitive Psychology,* 24, 749–761, doi:10.1002/acp.1583.

Swami, V., Coles, R., Stieger, S., Pietschnig, J., Furnham, A., Rehim, S., et al. (2011). Conspiracist ideation in Britain and Austria: Evidence of a monological belief system and associations between individual psychological differences and real-world and fictitious conspiracy theories. *British Journal of Psychology*, 102, 443–463, .doi: 10.1111/j.2044-8295.2010.02004.x.

Swami, V., Voracek, M., Stieger, S., Tran, U. S., & Furnham, A. (2014a). Analytic thinking reduces belief in conspiracy theories. *Cognition, 133*(3), 572-585. doi:10.1016/j.cognition.2014.08.006

Tei, S., Fujino, J., Itahashi, T., Aoki, Y., Ohta, H., Kubota, M., ... & Takahashi, H. (2019). Egocentric biases and atypical generosity in autistic individuals. *Autism Research*, *12*(11), 1598-1608.

Theocharis, Y., Cardenal, A., Jin, S., Aalberg, T., Hopmann, D. N., Strömbäck, J., ... & Štětka, V. (2021). Does the platform matter? Social media and COVID-19 conspiracy theory beliefs in 17 countries. *new media & society*, 14614448211045666.

Traberg, C. S., Roozenbeek, J., & van der Linden, S. (2022). Psychological inoculation against misinformation: Current evidence and future directions. *The ANNALS of the American Academy of Political and Social Science*, *700*(1), 136-151.

Trevisan, D., Foss-Feig, J.H., Naples, A.,, Srihari, B., Anticevic, A., McPartland, J., (2020) Autism Spectrum Disorder and Schizophrenia Are Better Differentiated by Positive Symptoms Than Negative Symptoms, *Frontiers in Psychiatry*, doi.org/10.3389/fpsyt.2020.00548

Tsamakis, K., Tsiptsios, D., Ouranidis, A., Mueller, C., Schizas, D., Terniotis, C., ... & Rizos, E. (2021). COVID-19 and its consequences on mental health. *Experimental and therapeutic medicine*, *21*(3), 1-1.

Uscinski, J. E., Smallpage, S. M., Enders, A. M., & Drochon, H. (2022). The impact of social desirability bias on conspiracy belief measurement across cultures. *Political Science Research and Methods*.

Uscinski, J., Enders, A., Klofstad, C., Seelig, M., Drochon, H., Premaratne, K., & Murthi, M. (2022). Have beliefs in conspiracy theories increased over time?. *PloS one*, *17*(7), e0270429. https://doi.org/10.1371/journal.pone.0270429

Van der Linden, S., Leiserowitz, A., Rosenthal, S., & Maibach, E. (2017). Inoculating the public against misinformation about climate change. *Global challenges*, *1*(2), 1600008.

van der Tempel, Jan & Alcock, James. (2015). Relationships between conspiracy mentality, hyperactive agency detection, and schizotypy: Supernatural forces at work?. *Personality and Individual Differences.* 82. Doi:10.1016/j.paid.2015.03.010.

Van Der Wal, R. C., Sutton, R. M., Lange, J., & Braga, J. P. (2018). Suspicious binds: Conspiracy thinking and tenuous perceptions of causal connections between co-occurring and spuriously correlated events. *European Journal of Social Psychology*, *48*(7), 970-989.

van Elk M. (2015). Perceptual Biases in Relation to Paranormal and Conspiracy Beliefs. *PloS one*, *10*(6), e0130422. https://doi.org/10.1371/journal.pone.0130422

van Mulukom, V., Pummerer, L. J., Alper, S., Bai, H., Čavojová, V., Farias, J., & Žeželj, I. (2022). Antecedents and consequences of COVID-19 conspiracy beliefs: A systematic review. *Social Science & Medicine*, 114912.

van Mulukom, V., Pummerer, L. J., Alper, S., Bai, H., Čavojová, V., Farias, J., Kay, C. S., Lazarevic, L. B., Lobato, E., Marinthe, G., Pavela Banai, I., Šrol, J., & Žeželj, I. (2022).

Van Prooijen J.W. -. (2014). Power, politics, and paranoia: Why people are suspicious of their leaders. Cambridge: Cambridge University Press.

van Prooijen, J. W. (2017). Why education predicts decreased belief in conspiracy theories.

Van Prooijen, J. W. (2018). *The psychology of conspiracy theories*. Routledge.

van Prooijen, J. W., & Douglas, K. M. (2018). Belief in conspiracy theories: Basic principles

Van Prooijen, J. W., Krouwel, A. P., & Pollet, T. V. (2015). Political extremism predicts belief in conspiracy theories. *Social Psychological and Personality Science*, *6*(5), 570-578.

van Prooijen, J.W. -. (2017). Why education predicts decreased belief in conspiracy theories. *Applied Cognitive Psychology, 31*(1), 50-58. doi:10.1002/acp.3301

van Prooijen, J.W. -., & Douglas, K. M. (2018). Belief in conspiracy theories: Basic principles of an emerging research domain. *European Journal of Social Psychology,* doi:10.1002/ejsp.2530

Vranic, A., Hromatko, I., & Tonković, M. (2022). "I Did My Own Research": Overconfidence,(Dis) trust in Science, and Endorsement of Conspiracy Theories. *Frontiers in Psychology*, *13*.

Wabnegger, A., Gremsl, A., & Schienle, A. (2021). The association between the belief in coronavirus conspiracy theories, miracles, and the susceptibility to conjunction fallacy. *Applied cognitive psychology*, *35*(5), 1344-1348.

Wakabayashi, A., Baron-Cohen, S., & Ashwin, C. (2012). Do the traits of autism-spectrum overlap with those of schizophrenia or obsessive-compulsive disorder in the general population? Research in Autism Spectrum Disorders, 6(2), 717-725. https://doi.org/10.1016/j.rasd.2011.09.008

Warman, D.M., Lysaker, P.H., Martin, J.M., (2007) Cognitive insight and psychotic disorder: The impact of active delusions, *Schizophrenia research,* doi:10.1016/j.schres.2006.09.011

Wheeler, E. A. (2021). How belief in conspiracy theories addresses some basic human needs. *The Psychology of Political Behavior in a Time of Change*, 263-276.

Williams, C., Denovan, A., Drinkwater, K., & Dagnall, N. (2022). Thinking style and paranormal belief: the role of cognitive biases. *Imagination, Cognition and Personality*, *41*(3), 274-298.

Williams, D. L., Mazefsky, C. A., Walker, J. D., Minshew, N. J., & Goldstein, G. (2014). Associations between conceptual reasoning, problem solving, and adaptive ability in high-functioning autism. *Journal of autism and developmental disorders*, 44(11), 2908–2920, doi: 10.1007/s10803-014-2190-y

Woodward, N. D., Duffy, B., & Karbasforoushan, H. (2014). Response selection impairment in schizophrenia transcends sensory and motor modalities. *Schizophrenia Research*, *152*(0), 446–449, doi: 10.1016/j.schres.2013.11.038

Yelbuz, B., Madan, E., & Alper, S. (2022). Reflective thinking predicts lower conspiracy beliefs: A meta-analysis. *Judgment and Decision Making, 17*(4), 720-744. doi:10.1017/S1930297500008913

Zhang, L., Tang, J., Dong, Y., Ji, Y., Tao, R., Liang, Z., Chen, J., Wu, Y., & Wang, K. (2015). Similarities and Differences in Decision-Making Impairments between Autism Spectrum Disorder and Schizophrenia. Frontiers in behavioral neuroscience, 9, 259, doi: 10.3389/fnbeh.2015.00259

Zhou, H. Y., Yang, H. X., Gong, J. B., Cheung, E., Gooding, D. C., Park, S., & Chan, R. (2019). Revisiting the overlap between autistic and schizotypal traits in the non-clinical population using meta-analysis and network analysis. Schizophrenia research, 212, 6–14. Doi: 10.1016/j.schres.2019.07.050

Zimmerman, C. (2000). The development of scientific reasoning skills. *Developmental review*, *20*(1), 99-149.

Chapter 3: Study One

3.1 Preface to Study One

The principal aim of this thesis project was to explore the relationship between individual differences, how people evaluate conspiracy information and held conspiracy theory beliefs and, in turn, what implications this might have for challenging these belief systems. Previous studies which have investigated the antecedents to conspiracy theory beliefs have focussed on certain individual differences and, in a clinical context, the role of schizotypy and cognitive processing style. Both characteristics have been associated to a susceptibility to conspiracy beliefs. However, the fact that schizotypy often co-occurs with autism spectrum disorder raises the question as to the relative and potentially confounding role of autistic traits in the vulnerability to conspiracy theory beliefs.

Study one introduces the potential role of autistic traits as a correlate of CT beliefs, with measures of schizotypal traits, preferences for styles of thinking, open-mindedness, need for cognitive closure in uncertainty, and their relationship to biases in belief formation (e.g., Bias Against disconfirmatory Evidence), as well as measures of conspiracy theory beliefs included. This study represents one of the first investigations as to whether autistic traits are associated with conspiracy beliefs and if there would appear to be any differences between schizotypy and ASD in the cognitive mechanisms that account for any observed susceptibility to CT beliefs.

3.2 Statement of Authorship

Title of Paper	Autistic traits as a potential confounding factor in the relationship between schizotypy and conspiracy beliefs.
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Principal Author

Name of Principal Author (Candidate)	Neophytos Georgiou		
Contribution to the Paper	Study concept and design, data collection, statistical analyses, writing manuscript.		
Overall percentage (%)	80		
Certification:	This paper reports on original research I conducted during the period of my Higher Degree by Research candidature and is not subject to any obligations or contractual agreements with a third party that would constrain its inclusion in this thesis. I am the primary author of this paper.		
Signature		Date	28/02/2023

Co-Author Contributions

By signing the Statement of Authorship, each author certifies that:

i. the candidate's stated contribution to the publication is accurate (as detailed above).
ii. permission is granted for the candidate in include the publication in the thesis; and
iii. the sum of all co-author contributions is equal to 100% less the candidate's stated contribution.

Name of Co-Author	Professor Paul Delfabbro		
Contribution to the Paper	Principal Supervision, advice about study concept and design, manuscript proof-reading.		
Signature		Date	28/02/2023
Name of Co-Author	Dr. Ryan Balzan		
Contribution to Paper	Secondary Supervision, advice about study concept and design, manuscript proof-reading.		
Signature		Date	28/02/2023

Autistic traits as a potential confounding factor in the relationship between schizotypy and conspiracy beliefs

by

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Key Words: Conspiracy Theory, Autism Spectrum Disorder, Schizotypy, Analytical Thinking, Education, Misinformation effect

3.3 Abstract

Background: Conspiracy Theories (CT) are complex belief systems that view the world as being manipulated by multiple actors collaborating in the pursuit of malevolent goals. Although culture, education and sociological factors have been implicated in their development, psychological factors are recognized as important. Certain individual differences, including schizotypy and cognitive processing style, have been shown to make some individuals susceptible to CTs. However, the finding that schizotypy often co-occurs with autism spectrum disorder raises a question as to the relative and potentially confounding role of autistic traits in increasing vulnerability to CT beliefs.

Method: A total of 508 adults were recruited from an international online panel. The study included measures of conspiracy beliefs, schizotypy and autistic traits as well as measures of information searching and cognitive style.

*Result*s: The results confirmed that both autistic and schizotypy traits were positively associated with CT beliefs, but that schizotypy traits were the strongest predictor. Exploratory analyses of cognitive style measures indicated potential avenues for further investigation in relation in differences in cognitive processes that might underlie the development of CTs for in people with autistic traits as opposed to schizotypal traits.

Limitations: The study was based on a self-report methodology and did not utilise a clinical sample.

Conclusion: Both schizotypal and autistic traits are reliable predictors of conspiracy beliefs, but schizotypy appears to be the stronger predictor and that autistic traits are not a strong confounding factor in this relationship. However, autistic traits may pose an additional risk factor for CT beliefs.

3.4 Introduction

Conspiracy theories (CTs) are complex belief systems that involve the view that the world or an event is manipulated by multiple actors collaborating in the pursuit of malevolent goals (Douglas & Sutton, 2017; Swami & Furnham, 2014). Conspiracy theories can appear in many different forms. Some focus on specific events (e.g. global events or crises), whereas others can involve grandiose worldviews that span multiple countries and time-periods (Swami & Coles, 2010; van Prooijen, 2018). Although CTs are often imaginative and not always false, they can inspire behaviours (e.g., anti-vaccination protests) that give rise to negative civic, social and health outcomes (Douglas et al., 2015; Jolley & Douglas, 2017). For example, the COVID-19 crises of 2020 have demonstrated how conspiracy beliefs that have circulated via social media can affect public health initiatives, particularly in relation to the rejection of medical advice and social distancing laws (Depoux et al., 2020; Georgiou et al., 2020; van Prooijen & Douglas, 2018).

Although CT beliefs could arise from a range of factors, the dominant view within research suggests that underlying psychopathological traits, specifically schizotypal personality characteristics, make a person more likely to develop these erroneous beliefs (Barron et al., 2018; Georgiou et al., 2019; Swami et al., 2014). Schizotypal traits include anomalies in cognition (e.g. odd or magical thinking, hallucinations); socio-emotional functioning (e.g. narrowed affect); and, behaviour (e.g. odd behaviour and language) that often remain latent in development, but which become more pronounced in adulthood (Balzan et al., 2015; Cohen et al., 2015; Ettinger et al., 2015). Schizotypy is often associated with a proneness to delusions, excessive focus on the details of events rather than the overall situation, and unfounded inferences (Balzan et al., 2015; Eisenacher et al., 2017; Moritz et al., 2013; Warman et al., 2007; Woodward et al., 2014). These traits are believed to make

separating fictitious from credible information more difficult and therefore foster the development of CT beliefs (Balzan et al., 2016; Barron et al., 2014; 2018).

Schizotypy has been associated with a number of socio-cognitive processes which are related to CT beliefs, with most studies examining the potential role of differences in cognitive style. In particular, research in this area has examined the distinction drawn between two distinct cognitive approaches: (i) the intuitive reasoning (Type 1) which is based more on heuristics or cognitive short-cuts; and (ii), the analytic (or rational) cognitive style that relies on systematic information processing, evidence, and logic (Type 2) (Epstein et al., 1996; Evans and Stanovich, 2013; Ross et al., 2016). Reduced use of analytical (Type 2) thinking is thought to be a risk factor for CT beliefs (Oliver & Wood, 2014a, 2014b; Swami et al., 2014; 2017; van Prooijen, 2014, 2017). In support of these arguments, research has consistently reported significant negative associations between CT beliefs and a reduced reliance on analytical thinking (Swami et al., 2016; van Prooijen, 2018). Georgiou et al. (2019) found a negative association between schizotypy and analytical thinking and, in turn, a positive association with intuitive thinking and CT beliefs. In other words, schizotypal people appear less likely to use systematic analytical processes that would elucidate counterarguments and rebuttals to false CT claims (Swami & Furnham, 2012; van Prooijen, 2015: 2017).

Another socio-cognitive process that has been associated with schizotypy is a higher need for cognitive closure (NFCC; Swami et al., 2014; Marchlewksa et al., 2018). NFCC involves two basic tendencies. First, it involves a desire to obtain a quick solution or closure to an ambiguous situation; a process referred to as “seizing”. Second, it involves a tendency to preserve this solution or to maintain closure, or “freezing”. The higher an individual’s

NFCC, the more likely they are to find discomfort with ambiguous events and prefer to end further information seeking, even if that answer is not correct or the best answer (Swami et al., 2014; Marchlewska et al.,2018; Umam et al., 2018). The implication is that schizotypal people who have a high NFCC are likely to jump to conclusions and adopt CT beliefs due to their generalizable, and unfalsifiable conclusions. Such tendencies make the world more predictable, even if the supporting beliefs are incorrect (Balzan et al., 2015; Irwin, Drinkwater & Dagnall, 2017; Georgiou et al., 2019; Moritz et al., 2017). More schizotypal individuals may also further endorse other related CT's in order to uphold these beliefs as closure, rather than evaluate information and be open to multiple explanations (Goreis & Voracek, 2019; March & Springer, 2019).

It has been well established in research that schizotypy can be both directly associated with conspiracist beliefs, and indirectly through mediative relationships with either socio-cognitive processes (e.g. analytical thinking styles), or sociological factors (i.e. level and area of education) which foster higher-cognitive abilities (van Prooijen, 2015: 2017). Such research is built on the assumption that schizotypal characteristics are the principal predisposing psychopathological factor to conspiracist beliefs. However, schizotypal traits often co-exist with other traits or conditions that could also increase people's susceptibility to CT style thinking (e.g., delusion-proneness; Swami et al., 2016; Georgiou et al., 2019). Another important correlate that has received little attention in the CT literature are autistic traits or Autism Spectrum Disorder (ASD) (Abu-Akel at al., 2017; Calridge & McDonald, 2009; Dinsdale et al., 2013; Ford et al., 2017; Zhou et al., 2019).

There are several reasons why it might be reasonable to examine the potential role of autistic traits in CT formation. Broader clinical research has shown that autistic and

schizotypal traits have a co-occurrence rate of about 3%, with prevalence rates of autistic traits in psychosis populations much higher than the general population (Deste, Nenadic et al., 2021; Kincaid et al., 2017; Vita, Penn, Pinkham, Nibbio, & Harvey, 2020; Pinkham et al., 2019). The co-occurrence of autistic and schizotypal traits appear to share some cognitive similarities (Wakabayashi, Baron-Cohen & Ashwin, 2012; Zhang et al., 2015). Both can involve altered or impaired social and communicative functioning (Calridge & McDonald, 2009; Dinsdale et al., 2013:2015; Ford & Crewther, 2014; Ford et al., 2017; Zhou et al., 2019). Similar to schizotypy, autistic traits can feature a rigid, inflexible thinking style which may involve an abnormal intensity or focus to specific details and points of interest when interpreting information (e.g. real-world events), rather than engage in an adaptable thinking style which is open to disconfirmatory evidence (Baron-Cohen, 2006:2009, Luke et al., 2011; Wilkinson, 2018; Zhang et al., 2015). Similar to the association between a high NFCC and schizotypy, people with autistic traits may experience difficulties in conceptual reasoning (Williams et al., 2014). People with autistic traits can sometimes find events more ambiguous and discomforting to experience. Thus, to resolve this discomfort, it may be easier for people with autistic traits to use knowledge from previously formed conceptual schemas to eliminate ambiguity when making future decisions. This tendency is often referred to as a 'need for sameness' (Baron-Cohen, 2008; Pegado et al., 2020; Williams et al., 2014). However, whilst schizotypal and autistic traits may share common socio-cognitive pathways, it is important to recognise the lack of specificity in currently available instruments (i.e. Autism Spectrum Quotient, Multidimensional Schizotypy Scale; Ferndandes et al. 2018; Trevisan et al., 2020) that limit the ability to discern differences.

An important difference, however, is that unlike people with schizotypy, people with autistic traits are known to be more likely to use a more analytical thinking style (Gaeth et al.,

2016) of reasoning when they process new information. People with autistic traits are associated with a lower tendency to engage in intuitive reasoning and this may encourage an individual with autistic traits to overanalyse received information to the extent they engage in extreme pattern imposition (Baron-Cohen et al., 2008, 2009; Lewton et al., 2019). This is the tendency to engage in a systematic method of pairing and combining information in a way that may seem illogical at face value (Levin et al., 2015; Gaeth et al., 2016; Luke et al., 2014; Lewton et al., 2019; Wilkinson, 2018). In other words, whilst it is known that schizotypy and autism are often related conditions, both have the potential to encourage CT beliefs (Caldridge & MacDonald, 2009; Dinsdale et al., 2013; Ford and Crewther, 2014), but in different ways. Schizotypal traits appear to encourage intuitive or heuristic processing that leads to stronger CT beliefs, whereas, whereas autistic traits may also include an additional element of systematic processing. These findings are consistent with the original diametrical Model of autism and psychosis (Abu-Akel & Bailey, 2000; Crespi and Badcock, 2008; Salice & Henriksen, 2021), which first postulated that autistic and schizotypal traits are diametrically associated with measured of analytical thinking (i.e. REIm – R), and intuitive thinking (REIm – E/I). In our views, these known differences as well as the documented direct association between autism and schizotypy warrant further investigation.

3.4.1 The Present Study

The aim of the present study was to build upon the existing literature relating to conspiracist beliefs and schizotypy by examining the potential role of autistic traits as a potential correlate of CT beliefs. With particular focus drawn to socio-cognitive factors previously discussed (i.e. preference of thinking style, need for cognitive closure), would the relationship between schizotypy and CT beliefs remain after controlling for autistic traits? It was hypothesised that: (a) Both schizotypy and autistic traits would be positively related to

CT beliefs: (b) Higher levels of rational thought, as indicative of the Analytical (Type 2) cognitive style, would be positively related to autistic traits, but negatively associated with CT belief scores, and (c), Higher scores on the Intuitive/Emotional (Type 1) style thinking branch, will be positively associated with both Schizotypal personality traits and CT belief scores. We also examined whether greater CT endorsement would be related to an individuals' need for cognitive closure, which we hypothesised to be positively associated with the psychopathological factors previously discussed. The study also controlled for educational differences based on the finding that education level appears to be a protective factor against CT belief formation (see Van Prooijen, Krouwel, & Pollet, 2015; Darwin, Neave, & Holmes, 2011).

3.5 Method

3.5.1 Participants

As shown in Table 1, the study involved a total of 508 participants (278 men, 230 women) aged between 18 and 80 years (M = 26.51, SD = 12.87) from a range of countries: 66% from the US, UK, Canada and Australia and the remainder principally from continental Europe. A total of 277 (55%) reported having completed a university or college degree; 112 (22.2%) had started higher education; 97 (19.2%) had completed high school; and, 18 (3.6%) had not completed high school. *Gpower* analysis indicated that at least 200 cases would be sufficient to achieve power of 0.80 for a multiple regression with 12 predictors and anticipated R-squared value of 0.30.

3.5.2 Sampling Procedure

The study used an international panel sample obtained using the participant website Prolific and was promoted as an investigation looking at individual differences in how individuals explain world events. Participants were recruited over a period of one month. All participants received a small monetary compensation (around $US5) for their time and effort (around 20-25 minutes).

3.5.3 Study Design

The study was conducted entirely online which took approximately 25 minutes to complete. Participants completed several demographic questions and a range of psychological measures. The study was approved by the Human Research Ethics Subcommittee in the University of Adelaide's School of Psychology as a low risk application.

3.5.4 Measures

3.5.4.1 Demographic background and situation

Participants were asked to provide demographic information, including: gender, age, country of residence, highest education level and employment status.

3.5.4.2 Multidimensional Schizotypy Scale – Brief (MSS-B)

The MSS-B is a 38-item assessment developed by Gross et al. (2018) as an abbreviated form of the 77-item original scale formed by Kwapil et al. (2017) which measures positive, negative and disorganized traits of schizotypy. All items were rated on 1 (Completely Disagree) to 5 (Completely Agree). The MSS-B has been found to have very good psychometric properties in diverse populations and construct validity (Kemp et al., 2019). The Cronbach's Alpha for the present study was very good: 0.91. This includes the subscales measuring, positive ($\alpha = .87$), negative, ($\alpha = .93$), and disorganized schizotypy ($\alpha = .93$),

3.5.4.3 The Autism-Spectrum Quotient (AQ)

The AQ was designed by Baron-Cohen (2001) as a 50-item, self-administered instrument for measuring the degree to which an adult with normal intelligence has the traits associated with the autistic spectrum. The assessment contains 5 subscales which capture; social skill, attention switching, attention to detail, communication and imagination. Each item allows the participant to indicate "definitely agree", "slightly agree", "slightly disagree" or "definitely disagree". Unlike the binary scoring method suggested by Baron-Cohen (2001, 2004), Likert scoring the above options from 1-4 was used based on the recommendations of Stevenson and Hart (2017). These authors suggested that Likert scoring yielded higher internal consistency and test-retest reliability when administered to populations which were predominately neurotypical (i.e. College Students). The Cronbach's Alpha was very good: 0.87. All 5 subscales had very good Cronbach's Alpha levels (a = 0.85 – .091)

3.5.4.4 Rational/Experiential Multimodal Inventory – Short form (REIm – 13R / REIm – 13EI)

The REIm -13 is a 13-item self-report measure developed by McGuiness et al. (2019), which is a short form of the 42-item edition developed by Epstein and Norris (2011). It contains a 4-item subscale that measures tendencies to engage in analytical thinking (REIM-13-R), and a 9-item subscale that measures tendencies towards the use of experiential, emotional and intuitive thinking (REIm – 13 E/I). All items are rated on a 5-point scale from 1 (Strongly disagree) to 5 Strongly Agree). Epstein and Norris (2011), as well as Swami et al. (2017) and Georgiou et al. (2019), have shown that these measures have good psychometric properties. The Cronbach's Alpha for the present study was 0.82.

3.5.4.5 Need for Cognitive Closure Scale (NFCC – M / NFCC – A)

The NFCC is a 42-item self-report measure designed by Webster and Kruglanksi (1994) which assesses an individuals' desire for an answer in order to end further information processing and judgement, even if that answer is not correct or the best answer. The scale has 5 subscales, but only two were utilised in this project. These were Discomfort with Ambiguity, (e.g. "I'd rather know bad news than stay in a state of uncertainty"), and Closed-Mindedness, which measures how closed or open minded an individual is (e.g. "I do not usually consult many different opinions before forming my own view"). The 17 selected items were rated on a 6-point scale ranging from 1 (strongly disagree) to 6 (strongly agree). The NFCC has strong psychometric properties and has been shown to have good predictive validity in studies relating to conspiracy beliefs (Marchlewska et al., 2018). The Cronbach's Alpha for the present study was very good: 0.88.

3.5.4.6 The Beliefs in Conspiracy Theory Inventory (BCTI)

This measure is a 15-item self-report measure developed by Swami et al. (2010, 2011). It captures a range of well-known CTs (i.e. 'A powerful and secretive group, known as the New World Order, are planning to eventually rule the world'). All items are rated from 1 (Completely false) to 9 (Completely True), and an overall score is computed as the total of all items. Higher CT beliefs are indicated by higher scores. The Cronbach's Alpha was very good in this sample: 0.91.

3.5.4.7 The Generalised Conspiracy Beliefs Scale (GCBS)

This measure, developed by Brotherton (2013), captures whether people tend to perceive the world form a conspiratorial perspective and focuses less on specific beliefs (Brotherton et al., 2013; Swami et al., 2018). Items are scored from 1 (Definitely not true) to 5 (Definitely true) to yield an overall score between 15 and 75 (higher scores reflect greater conspiracy ideation). The Cronbach's Alpha for the present study was good in this sample: 0.93.

3.5.5 Analytical Approach

Analyses included the presentation of descriptive statistics for both psychometric variables of socio-cognitive factors (i.e. REim-13, NFCC) and psychopathological factors (i.e. MSS-B, AQ) in relation to CT measures (i.e. BCTI, GCBS). Pearson correlations were used to examine the relationships between the principal metric measures. ANOVA was used to compare CT beliefs across levels of education. Hierarchical Linear Regression Analysis was conducted to examine the relationship between the AQ scores and CT beliefs after controlling for other psychopathological factors (i.e. Schizotypy; Swami et al., 2017; Georgiou et al., 2019) and socio-cognitive factors (i.e. REIm – 13, NFCC). Finally, mediation analysis was used to assess whether the influence of autistic and schizotypal traits on CT beliefs, are mediated by a person's preference in thinking style (i.e. REIm – 13R, REIm – 13 E/I). Further, consistent with the diametrical approach to autism and psychosis, mediation analysis could also suggest whether there are differences in socio-cognitive pathways to CT beliefs based on ASD and schizotypy as the primary conditions under consideration.

Table 1
Demographic Characteristics of sample in Study One (n = 504)

	N (%)
Gender	
Male	278 (55.0)
Female	226 (45.0)
Age	
18-24	191 (37.8)
25-34	275 (34.7)
35-44	83 (16.4)
45-54	36 (7.1)
55-64	16 (3.2)
65+	3 (0.6)
Country	
Oceania	19 (3.8)
United Kingdom	199 (39.4)
United States of America	74 (14.7)
Canada	46 (9.1)
Other continental Europe	104 (20.6)
Rest of the World (Nations with, N < 5)	62 (12.4)
Education	
University Degree	277 (55.0)
Some College	112 (22.2)
High School Only	97 (19.2)
Less than high school	18 (3.6)
Employment Status	
Working (as employee)	248 (49.1)
Self- Employed	45 (8.9)
Temporarily off work	35 (6.9)
Looking for work	70 (13.9)
Other	106 (21.0)

3.6 Results

3.6.1 Statistical analysis: Data Screening

Prior to commencing analysis, the data were screened to determine suitability for parametric testing. Four scores on the MSS-B and AQ were found to be outliers through examination of box plots and were excluded because of their potential influence on exaggerating effect sizes (i.e. 2.5 above the Standard deviation). Despite some slight deviation from normality, the data distributions were found to be suitable for parametric testing. Analyses were conducted IBM SPSS v.27.

3.6.2 Descriptive statistics: psychometric and demographic measures

One-way ANOVA indicated no demographic differences in CT beliefs that might need to be controlled in subsequent (e.g., age or gender differences). Table 2 summarises the descriptive results for the different measures. As indicated, a considerable number of Autism-Spectrum Quotient scores (AQ) were above the clinical-cut off score (68; 13.4%). Multidimensional Schizotypy scores (MSS-B) generally fell in the middle range of the scale, with scores indicated negative schizotypal trails were above the midpoint of the scale, with positive and disorganized both below the midpoint. In terms of cognitive thinking style, the sample reported a relatively high level of preference for rational thought processing (type 2), and imaginative thinking, and less so for intuitive thinking (type 1). The sample also tended towards open minded thinking and a relatively high level of discomfort with ambiguity as indicated by Need for Cognitive Closure (NFCC) scores. Endorsement of conspiracy beliefs fell below the midpoint of the scale for both measures (i.e. BCTI, GCBS). In other words, the sample as a whole showed modest scores on the psychopathological traits investigated and was not strongly in support of conspiratorial beliefs.

Table 2
Descriptive statistics for measures in Study One

	N (%)	Range of Participant Scores (Range)
REIm Total	44.03 (4.05)	33-57 (13-65)
REIm_Intuitive Scale	9.97 (1.56)	4-15 (3-15)
REIm Rational Scale	12.40 (1.81)	7-19 (4-20)
REIm Imagination Scale	11.68 (2.17)	3-15 (3-15)
REIm Emotion Scale	9.97 (1.70)	4-15 (3-15)
NFCC Total	58.57 (5.40)	43-83 (17-85)
NFCC Ambiguity	32.93 (4.19)	20-45 (9-45)
NFCC Mindedness	25.64 (2.76)	18-38 (8-40)
MDSS Total	85.77 (23.19)	44-166 (38-190)
MDSS Positive	25.46 (10.47)	13-58 (13-65)
MDSS Negative	33.69 (6.18)	17-58 (13-65)
MDSS Disorganized	26.61 (10.29)	12-60 (12-60)
ASQ Total	128.36 (10.63)	94-171 (50-200)
ASQ Social Skills	25.99 (3.01)	17.34 (10-40)
ASQ Attention Switching	27.47 (2.84)	20-36 (10-40)
ASQ Attention to Detail	25.53 (3.31)	15-34 (10-40)
ASQ Communication	23.92 (3.34)	15-37 (10-40)
ASQ Imagination	25.45 (3.47)	14-38 (10-40)
GCBS	37.36 (14.90)	15-75 (15-75)
BCTI	52.20 (26.66)	15-135 (15-135)

3.6.3 Correlation Analysis

Pearson Correlations are presented in Table 3. Consistent with our hypothesis, there were moderate positive correlations between schizotypy, autism and CT beliefs. Higher AQ and MSS-B scores were positively correlated with CT beliefs as measured by both GCBS and BCTI. Higher scores on intuitive and experiential thinking styles (Type 1) were positively correlated with both CT measures, whereas rational thinking (Type 2) was uncorrelated with conspiracy beliefs. Furthermore, higher scores on schizotypy traits were positively associated with experiential thinking styles (Type 1), and negatively associated to rational thinking (Type 2). How open minded an individual is as scored on the NFCC – M, and how much discomfort an individual experiences with ambiguity as scored on the NFCC – A, were weak to moderately and positively correlated with both CT measures. In other words, those who are more open minded to differing views, but are more impulsive and unstructured in their decision making, were found to report stronger support for conspiracy beliefs.

3.6.3.1 Conspiracy Beliefs, Psychopathological factors and differences in thinking styles

Whilst both psychopathological factors – autistic and schizotypal personality traits (MSS-B) were moderately and positive correlated with each other and both measures of CT beliefs, the pattern of correlations involving these measures showed differences. In particular, higher scores on all subscale measures of autistic traits (AQ) were moderately and negatively correlated with Closed-Mindedness (NFCC – M), and more intuitive thinking styles (REI – 13-E/I), whereas there were weak to moderate correlations between autistic traits and analytical thinking styles and measures of CT beliefs (i.e. GCBS, BCTI). In other words, those with autistic traits scored higher on analytical approaches to decision making, but reported being more closed minded to differing information or personal views.

On the other hand, higher scores on all subscale measures for schizotypy (MSS – B), were weakly and negatively correlated with analytical thinking styles (REI – 13R). There were small to moderate positive correlations with Closed-Mindedness (NFCC – M), intuitive thinking styles (REI – 13R) and measures of CT beliefs (i.e. GCBS, BCTI). In summary, the results indicated that those with schizotypal traits scored higher on measures of openness to information and personal views, but scored higher on impulsivity and measures of less systematic decision making.

Table 3
Pearson's Correlation analysis between all psychometric measures in Study One

	1	2	*3*	*4*	5	6	7	8	9	10	11
1.NFCC–M											
2.NFCC–A	.168**										
3.REIm 13R	.183**	.067									
4.REIm 13E/I	.288**	.169**	-.126**								
5.AQ Total	-.339*	.203**	.166**	-.271**							
6..MSS – B Total	.312**	.172**	-.140**	.233**	.341**						
7..MSS_P	.349**	.139**	-.161**	.278**	.418**	.884**					
8.MSS_N	.251**	.143**	-.089**	.134**	.224**	.780**	.563**				
9..MSS_D	.198**	.161**	-.100**	.163**	.210**	.887**	.657**	.586**			
10.GCBS	.253**	.080	.010	.243**	.263**	.436**	.514**	.268**	.300**		
11. BCTI	.246**	.021	-.002	.240**	.255**	.396**	.488**	.236**	.254**	.849**	

Note: *p <.05(two-tailed), **p <.01(two-tailed), NFCC – M = Need For Cognitive Closure – Mindedness, NFCC – A = Need For Cognitive Closure Ambiguity, REIm – 13R = Rational Multimodal Inventory Subscale, REIm – 13 E/I = = Experiential and Intuitive Multimodal Inventory Subscale, AQ Total = Total of all subscales of the Autism Spectrum Quotient, MSS – B Total = Multidimensional Schizotypy Scale Total, MSS – P = Positive Schizotypy Subscale, MSS – N = Negative Schizotypy Subscale, MSS – D = Disorganised Schizotypy Subscale, GCBS = Generalised Conspiracy Belief Scale, BCTI = Belief in Conspiracy Theory Inventory.

3.6.3.2 Conspiracy beliefs and level of education

A one-way ANOVA was conducted to examine whether CT belief scores differed according to the level of education an individual has completed. For both GCBS and BCTI scores, there were non-significant differences across levels of education for both GCBS scores $F(3,501) < 1$, and BCTI scores $F(3,501) < 1$.

3.6.4 Multiple Regression

3.6.4.1 Predictors of CT beliefs

It was important to examine how well schizotypy and autistic traits predicted CT beliefs after controlling for other potential correlates of CT beliefs. As shown in Table 4 and 5, a three-stage hierarchical multiple regression was conducted with GCBS and BCTI scores as the dependent variable respectively. Given that our focus was on the incremental contribution of schizotypy and autistic traits to the model, we controlled for demographic (Step 1) and broader cognitive style variables (Step 2) first. This approach allowed us to examine the contribution of different sets of variables in separate models.

The results showed that the best predictor of CT beliefs across both GCBS and BCTI scores was schizotypy (MSS-B). The combination of measures explained 45% of variation in BCTI scores and 49% in GCBS scores. Factors such as level of education were not significantly related to CT beliefs. Schizotypy and Autistic traits explained 42.9% of BCTI scores and 47% GBCS scores respectively. Adding socio-cognitive factors explained an additional 9% of BCTI scores and 3% of GCBS scores, although some predictors (omitted from the final model) approached significance (NFCC – M; $\beta = .085$, $p = .053$). Neither models predicting GCBS scores, or BCTI scores, contained a significant interaction term that included schizotypy and autistic traits ($p > .05$). This suggests the two are indeed independent predictors of conspiracy beliefs.

Table 4
Summary of Hierarchical Analysis for Variables Predicting Conspiracy Ideation via BCTI scores (N = 504)

	Model 1			Model 2			Model 3		
	B	*SE B*	B	*B*	*SE B*	B	*B*	*SE B*	B
Age	-.011	.987	.01	-.011	.987	.01	-.011	.987	.01
Gender	.004	.512	.01	.004	.512	.01	.004	.512	.01
Level of Education	.522	.270	.01	.522	.270	.01	.522	.270	.01
REIm – 13R				-1.412	.605	-.096*	-1.412	.605	-.096*
REIm – 13 E/I				2.282	.738	.134*	2.112	.738	.122*
NFCC – M				.907	.434	.094*	.907	.434	.094*
NFCC – A				-.251	.264	-.039	-.251	.264	-.039
AQ _Total							2.015	.115	.097*
MSS – B Total							.244	.115	.341**
R^2		.05			.10*			.492**	
F for Changes in R^2		.317			4.25*			18.53**	

Note. All psychometric variables were centred at their means, *p <.05, **p<.01.

Table 5

Summary of Hierarchical Analysis for Variables Predicting Conspiracy Ideation via GCBS scores (N = 504)

	Model 1			Model 2			Model 3		
	B	*SE B*	B	*B*	*SE B*	B	*B*	*SE B*	B
Age	-.45	.732	.01	-.45	.732	.01	-.45	.732	.01
Gender	-.12	.689	.01	-.12	.689	.01	-.12	.689	.01
Level of Education	.874	.270	.08	.721	.266	.07	.721	.266	.07
REIm – 13R				-.682	.309	-.089*	-.682	.309	-.089*
REIm – 13 E/I				1.169	.377	.132**	1.169	.377	.132**
NFCC – M				.430	.22	.085	.430	.22	.085
NFCC – A				-.097	.135	-.029	-.097	.135	-.029
AQ _Total							.114	.059	.086*
MSS – B Total							.230	.027	.384**
R^2	.02			.11*			.259**		
F for Changes in R^2	.244			3.87*			22.347**		

Note. All psychometric variables were centred at their means, *p <.05, **p<.01

3.6.5 Mediation Analysis

In addition to examining how well schizotypy and autistic traits predicted CT beliefs after controlling for other correlates of CT beliefs, it was important to examine whether the relationship between psychopathological factors and CT beliefs (via GCBS and BCTI scores) were mediated by a person's cognitive style (REIm – 13 R, REIm – 13 E/I), as hypothesized. Significance of indirect effects were tested using bootstrapping procedures suggested by Hayes (2013; n = 5000), with confidence intervals set at 95%.

3.6.5.1 Autistic traits, preference in thinking style, and, CT beliefs

As shown in Figure 3, autistic traits showed a direct effect on GCBS scores (R^2 = .22, CI^{95}, .109 – .398, p <.01). However, a statistically significant, indirect effect through analytical thinking (REIm – 13R scores; R^2 = .12, CI^{95}, .027 – .344, p <.01), suggests the relationship between autistic traits and GCBS scores was partially mediated by a preference for analytical thought (R^2 = .34, CI^{95}, .139 – .510, p <.01). However, there was no evidence of a mediation effect between autistic traits, analytical thinking, and BCTI scores. There was also no evidence of mediation between autistic traits, intuitive/experiential thinking (REIm – 13E/I scores), and either measures of CT Beliefs.

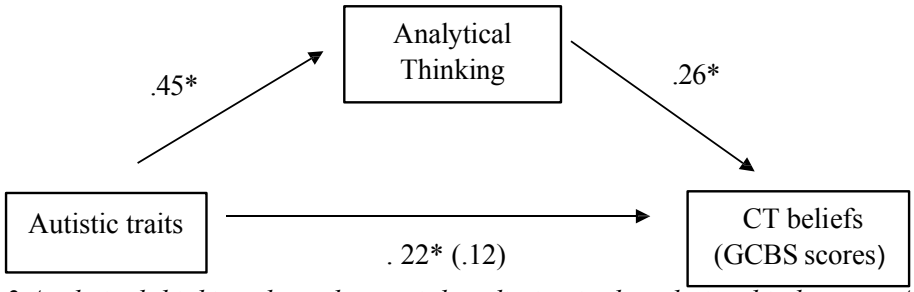

Figure 3 *Analytical thinking showed a partial mediation in the relationship between Autistic traits and Conspiracy beliefs via GCBS scores.*

Note: *p* <.05*

3.6.5.2 Schizotypal traits, preference in thinking style, and, CT beliefs

Whilst schizotypal traits showed a direct effect on GCBS scores (R^2 = .410, CI^{95}, .101 – .520, p <.01), and BCTI scores (R^2 = .390, CI^{95}, .156 – .522, p <.01), there was no evidence of mediation through analytical thinking. However, as shown in Figure 4, a statistically significant, indirect effect found through intuitive thinking (REIm – 13E/I scores; R^2 = .10, CI^{95}, .027 – .344, p <.01), suggests the relationship between schizotypy and GCBS scores was partially mediated by a preference for intuitive thought (R^2 = .488, CI^{95}, .142 – 630, p <.01).

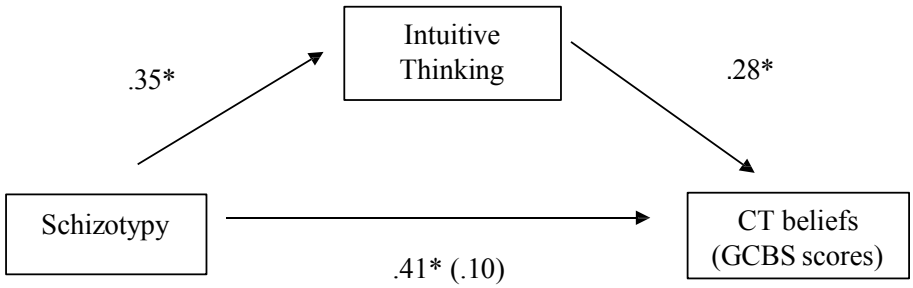

Figure 4 *Intuitive Thinking mediates the relationship between Schizotypy and Conspiracy Beliefs via GCBS scores.*

Note: *p* <.05.*

Likewise, as shown in Figure 5, a statistically significant, but weak indirect effect was also found through intuitive thinking (R^2 = .071, CI^{95}, .045 – .103, p <.01), which means, the relationship between schizotypy and BCTI scores was also partially mediated by a preference for intuitive thinking (R^2 = .460, CI^{95}, .211 – 590, p <.01)

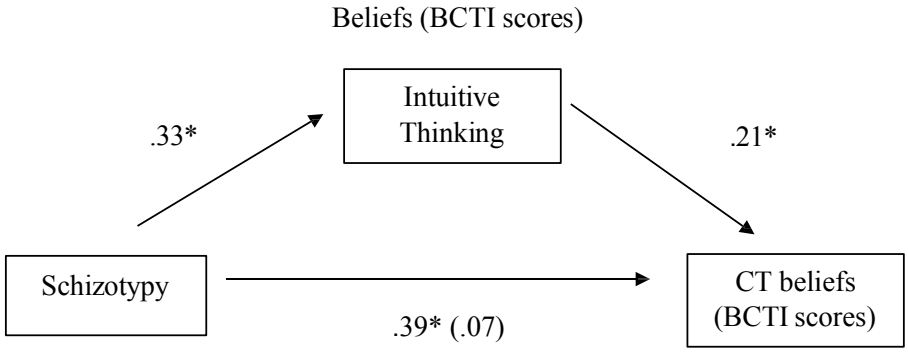

Figure 5 *Intuitive Thinking mediates the relationship between Schizotypy and Conspiracy via BCTI scores.*

Note: *p* <.05*

3.7 Discussion

The project examined several hypotheses which broadly converged on three principal lines of investigation: whether the susceptibility to CT beliefs is related to (i) traits of schizotypy and Autism Spectrum Disorder; (ii) differences in analytical styles of thinking or a person's need for cognitive closure; and, (iii) differences in educational attainment. Overall, the results in this study confirmed the hypothesis that measures of Schizotypy (MSS-B) and autistic traits would be positively associated with CT beliefs. It was also found that higher levels of analytical thinking (REIm – 13R), was negatively associated with schizotypy and was noted related to CT beliefs. On the other hand, higher levels of intuitive and emotionally (Type 1) style thinking (REIm – 13 E/I), was positively associated to schizotypy and CT beliefs. There was also support for the notion that an individual's need for cognitive closure is associated with traits of schizotypy, autism, and CT beliefs. Socio-cultural factors such as differences in education were not related to CT beliefs in this sample.

The results relating both schizotypy and autistic traits to CT beliefs are consistent with the view that underlying neurologically atypical conditions may make individuals more prone to adopting conspiracy beliefs (Barron et al., 2014:2018; Ettinger et al., 2015; Georgiou et al., 2019; Swami et al., 2014). These predictors remained significant after controlling for socio-demographic and decision-style variables. These findings are consistent with those of Barron et al. (2018), but are also consistent the view articulated by Georgiou et al. (2019) who emphasised the importance of controlling for other related mental health/ co-morbid conditions that often co-exist with schizotypy which, in turn, may also increase people's vulnerability to conspiratorial style reasoning. In support of this view, our study also showed that autistic and schizotypy traits were related and this was consistent with several other studies (Abu-Akel at al., 2017; Calridge & McDonald, 2009; Dinsdale et al., 2013).

However, although both autistic and schizotypy traits were related to conspiracy beliefs, consistent with the diametrical model of autism and psychosis (Abu-Akel & Bailey, 2000; Crespi and Badcock, 2008; Salice & Henriksen, 2021), the results suggested that the mechanisms explaining this association may differ. Those scoring higher on schizotypy were less likely to engage in analytical (Type 2) thinking and reported a more intuitive approach (Type 1) which, in turn, was also associated with a higher discomfort with ambiguity (Swami et al., 2016; Marchlewska et al., 2018; van Prooijen 2016; Umam et al., 2018). By contrast, those scoring higher on the autism measure reported being more likely to engage in analytical thinking and less likely to engage in an intuitive thinking, even though autistic traits were also associated with a higher discomfort with ambiguity. Further, it was found that the positive relationship between autistic traits and conspiracy beliefs, was partially mediated by analytical thinking, and, by contrast, the positive relationship between schizotypal traits and conspiracy beliefs, was partially mediated by intuitive thinking.

These findings have potential implications for the arguments previously advanced by Swami et al. (2016), van Prooijen (2017) and van Prooijen (2018) in CT research where it has often been assumed that systematic or more critical thought should be a protective factor against CT belief formation. This logic appears justified for people who display schizotypal traits, but our findings show that those with autistic traits who scored higher on CT beliefs engaged in greater analytical thinking. These findings suggest that reducing susceptibility to CTs in people with autistic traits requires an examination of broader meta-cognitive factors. This could include, for example, how to appraise or reflect upon large volumes of information in a way that highlights contradictions, or the relative weight of different pieces of information.

3.7.1 Limitations

It is important to acknowledge that several factors need to be considered when interpreting the results in this study. The findings are based upon a convenience sample and can only be generalised to people who undertake online panel surveys. The use of self-report methodology also means that one cannot rule out response biases. Another limitation to consider is that both the Autism-Spectrum Quotient, and Multidimensional Schizotypy Scale, were used to capture a person's tendency to engage in thoughts or behaviour associated with both psychopathological states, and do not specifically capture the behaviour of individuals who may have previously received a clinical diagnosis. Hence, the influence of other clinical conditions (e.g., schizophrenia), or numerous other co-morbid conditions cannot be discounted. It is also important to acknowledge that the REIm – 13 is purely based on a person's self-evaluation of their own thinking style and is not always associated with behavioural measures of analytical thinking (e.g. Cognitive Reflection Tests; Sleboda & Sokolowska, 2017). The measures of CT belief may also have not been inclusive of all relevant CT beliefs known to the participants, including those which have recently surfaced in response to the COVID-19 pandemic. However, considering the nature of the sampling method, power of the study to detect significant effects, and the use of validated measures, there is reason to consider the study to have good ecological validity given that CTs thrive in online communities.

3.7.2 Summary

In conclusion, the study showed that both schizotypal and autistic traits are independent predictors of CT beliefs, but that schizotypy remains the stronger predictor of CT beliefs. The study contributes to the broader debates about whether other unexamined co-morbid clinical conditions (apart from schizotypy) might contribute to stronger CT beliefs. Here we show that an effect for autism is present, but that it is not strong enough (as a confounding factor) to discount the findings of others studies that have shown strong associations between schizotypy and CT beliefs. If future research were to assess whether autistic traits are a risk factor for CT beliefs, such findings may hold a role in future Metacognitive Training or psychoeducation programs (Jolley & Douglas, 2017; Balzan et al., 2019), which attempt to challenge conspiratorial thinking, as it may also be beneficial to people with autistic traits.

3.8 References

Abu-Akel, A., & Bailey, A. L. (2000). The possibility of different forms of theory of mind impairment in psychiatric and developmental disorders. *Psychological medicine*, *30*(3), 735–738. https://doi.org/10.1017/s0033291799002123

Abu-Akel, A. M., Apperly, I. A., Wood, S. J., & Hansen, P. C. (2017). Autism and psychosis expressions diametrically modulate the right temporoparietal junction. *Social neuroscience,* 12(5), 506–518, doi: 10.1080/17470919.2016.1190786

Balzan, R., Woodward. S., Delfabbro, P., Moritz, S. (2016) Overconfidence across the psychosis continuum: a calibration approach, *Cognitive Neuropsychiatry*, 21(6), pp. 510-524, doi:10.1080/23311908.2015.1135855

Balzan, R. P., Mattiske, J. K., Delfabbro, P., Liu, D., & Galletly, C. (2019). Individualized metacognitive training (MCT+) reduces delusional symptoms in psychosis: A randomized clinical trial. *Schizophrenia Bulletin, 45*, 27-36, doi: 10.1093/schbul/sby152

Baron-Cohen, S. (2008). Autism, Hypersystemizing, and Truth. Quarterly Journal of Experimental Psychology, 61(1), 64–75. https://doi.org/10.1080/17470210701508749

Barron, D., Morgan, K., Towell, T., Altemeyer, B., & Swami, V. (2014). Associations between schizotypy and belief in conspiracist ideation. *Personality and Individual Differences, 70*, 156-159. doi:10.1016/j.paid.2014.06.040

Barron, D., Furnham, A., Weis, L., Morgan, K. D., Towell, T., & Swami, V. (2018). The relationship between schizotypal facets and conspiracist beliefs via cognitive processes. *Psychiatry Research, 259*, 15-20. doi:10.1016/j.psychres.2017.10.001

Brotherton, R., French, C. C., & Pickering, A. D. (2013). Measuring belief in conspiracy theories: The Generic Conspiracist Beliefs Scale. *Frontiers in Psychology, 4*, 279. Doi:10.3389/fpsyg.2013.00279.

Carter, R. M., Jung, H., Reaven, J., Blakeley-Smith, A., & Dichter, G. S. (2020). A Nexus Model of Restricted Interests in Autism Spectrum Disorder. Frontiers in human neuroscience, 14, 212. https://doi.org/10.3389/fnhum.2020.00212

Claridge, G., & McDonald, A. (2009). An investigation into the relationships between convergent and divergent thinking, schizotypy, and autistic traits. Personality and Individual Differences, 46(8), 794–799, doi: 10.1016/j.paid.2009.01.018

Cohen, A.S., Mohr, C., Ettinger, U., Chan, R.C. (2015) Schizotypy as an organizing framework for social and affective sciences, *Schizophrenia Bulletin,* 18(4), doi: 10.1093/schbul/sbu195

Crespi, B., & Badcock, C. (2008). Psychosis and autism as diametrical disorders of the social brain. *The Behavioral and brain sciences*, *31*(3), 241–320. https://doi.org/10.1017/S0140525X08004214

Dagnall, N., Denovan, A., Drinkwater, K., Parker, A., & Clough, P. (2016). Toward a Better Understanding of the Relationship between Belief in the Paranormal and Statistical Bias: The Potential Role of Schizotypy. *Frontiers in Psychology*, *7*, 1045, doi:10.3389/fpsyg.2016.01045

Dagnall, N., Denovan, A., Drinkwater, K., Parker, A., & Clough, P. (2017). Statistical Bias and endorsement of conspiracy theories. Applied Cognitive Psychology, 31, doi:10.1002/acp.3331.

Depoux, A., Martin, S., Karafillakis, E., Preet, R., Wilder-Smith, A., & Larson, H. (2020). The pandemic of social media panic travels faster than the COVID-19 outbreak. *Journal of travel medicine*, *27*(3), doi: 10.1093/jtm/taaa031

Deste, G., Vita, A., Penn, D. L., Pinkham, A. E., Nibbio, G., & Harvey, P. D. (2020). Autistic symptoms predict social cognitive performance in patients with schizophrenia. *Schizophrenia Research, 215*, 113-119.

Dinsdale NL, Hurd PL, Wakabayashi A, Elliot M, Crespi BJ (2013) How Are Autism and Schizotypy Related? Evidence from a Non-Clinical Population. PLOS ONE 8(5): e63316, doi: 10.1371/journal.pone.0063316

Douglas, K. M., Sutton, R. M. (2011). Does it take one to know one? Endorsement of conspiracy theories is influenced by personal willingness to conspire. British Journal of Social Psychology, 50, 542–552, doi: 10.1111/j.2044-8309.2010.02018.x.

Douglas, K. M., Sutton, R. M., & Cichocka, A. (2017). The psychology of conspiracy theories. *Current Directions in Psychological Science, 26*(6), 538-542, doi: 10.1177/0963721417718261

Eichner, C., & Berna, F. (2016). Acceptance and efficacy of Metacognitive Training (MCT) on positive symptoms and delusions in patients with schizophrenia: A meta-analysis taking into account important moderators. Schizophrenia Bulletin, 42, 952-962, doi: org/10.1093/schbul/sbv225

Eisenacher S., Rausch F., Ainser F., Mier D., Veckenstedt R., Schirmbeck F., et al. . (2015). Investigation of Metamemory functioning in the at-risk mental state for psychosis, *Psychology and Medicine*, 45, 3329–3340. Doi:10.1017/S0033291715001373

Eisenacher S., Rausch, F., Mier, D., Frenske, S., Veckenstedt, R., Englisch, S (2016). Bias against disconfirmatory evidence in the at-risk mental state and during psychosis. Psychiatry Res. 238, 242–250, doi:10.1016/j.psychres.2016.02.028

Epstein, S., Pacini, R., Denes-Raj, V., & Heier, H. (1996). Individual differences in intuitive-experiential and analytical-rational thinking styles. *Journal of Personality and Social Psychology*, 71, 390–405, Doi:10.1037/0022-3514.71.2.390.

Epstein, S., Norris, P. (2011) An Experiential Thinking Style: Its Facets and Relations With Objective and Subjective Criterion Measures, *Journal of Personality,*34(4), doi:10.1111/j.1467-6494.2011.00718.x

Ettinger, U., Mohr, C., Gooding, D. C., Cohen, A. S., Rapp, A., Haenschel, C., & Park, S. (2015). Cognition and brain function in schizotypy: a selective review. *Schizophrenia bulletin*, *41 Suppl 2*(Suppl 2), S417–S426, doi: 10.1093/schbul/sbu190

Evans, B.T., Jonathan, K. (2003) In two minds: dual-process accounts of reasoning, *Trends in Cognitive Sciences*, 7(10), doi:10.1016/j.tics.2003.08.012

Evans, B., Jonathan, K., & Stanovich, K., E. (2013). Dual-Process Theories of Higher Cognition Advancing the Debate. *Perspectives on Psychological Science* 8 (3):223-241. doi: 10.1177/1745691612460685

Ettinger, U., Mohr, C., Gooding, D. C., Cohen, A. S., Rapp, A., Haenschel, C., & Park, S. (2015). Cognition and Brain Function in Schizotypy: A Selective Review. *Schizophrenia Bulletin*, *41*, S417–S426, doi:10.1093/schbul/sbu190

Fernandes, J. M., Cajão, R., Lopes, R., Jerónimo, R., & Barahona-Corrêa, J. B. (2018). Social Cognition in Schizophrenia and Autism Spectrum Disorders: A Systematic Review and Meta-Analysis of Direct Comparisons. *Frontiers in psychiatry*, *9*, 504. https://doi.org/10.3389/fpsyt.2018.00504

Ford, T. C., & Crewther, D. P. (2014). Factor analysis demonstrates a common schizoidal phenotype within autistic and schizotypal tendency: Implications for neuroscientific studies. Frontiers in Psychiatry, 5, Article 117.

Ford, T. C., Nibbs, R., & Crewther, D. P. (2017). Increased glutamate/GABA+ ratio in a shared autistic and schizotypal trait phenotype termed Social Disorganisation. *NeuroImage. Clinical*, 16, 125–131, doi: 10.1016/j.nicl.2017.07.009

Gaeth, G. & Levin, Irwin & Jain, Gaurav & Burke, E.V... (2016). Toward understanding everyday decision making by adults across the autism spectrum. 11. 537-547.

Georgiou, M., Delfabbro, P. H., & Balzan, R. (2019). Conspiracy beliefs in the general population: The importance of psychopathology, cognitive style and educational attainment, *Personality and Individual Differences*, 151.

Georgiou, M., Delfabbro, P. H., & Balzan, R (2020) COVID-19-related conspiracy beliefs and their relationship with perceived stress and pre-existing conspiracy beliefs, *Personality and Individual Differences*, 166:110201, DOI: 10.1016/j.paid.2020.110201

Goreis, A., & Voracek, M. (2019). A systematic review and meta-analysis of psychological research on conspiracy beliefs: Field characteristics, measurement instruments, and associations with personality traits. Frontiers in Psychology, 10 (FEB), art. no. 205. doi:10.3389%2ffpsyg.2019.00205.

Hayes, A. F. (2013). *Methodology in the social sciences.Introduction to mediation, moderation, and conditional process analysis: A regression-based approach. Guilford Press.*

Irwin, H. J., Dagnall, N., & Drinkwater, K. (2017). Tweedledum and Tweedledee: Are paranormal disbelievers a mirror image of believers? Journal of the Society for Psychical Research, 81(3), 161–179.

Jolley, D., & Douglas, K. M. (2014b). The social consequences of conspiracism: Exposure to conspiracy theories decreases intentions to engage in politics and to reduce one's carbon footprint. *British, Journal of Psychology*, 105, 35–56. doi:10.1111/bjop.12018

Jolley, D., & Douglas K.M. (2017) Prevention is better than cure: Addressing anti-vaccine conspiracy theories, *Journal of Applied Social Psychology,* p. 459-469.

Kincaid, D. L., Doris, M., Shannon, C., & Mulholland, C. (2017). What is the prevalence of autism spectrum disorder and ASD traits in psychosis? A systematic review. *Psychiatry research*, *250*, 99–105. https://doi.org/10.1016/j.psychres.2017.01.017

Lewton, M., Ashwin, C., & Brosnan, M. (2019). Syllogistic reasoning reveals reduced bias in people with higher autistic-like traits from the general population. *Autism*, *23*(5), 1311–1321.

Luke, L., Clare, I. C. H., Ring, H., Redley, M., Watson, P. (2012). Decision-making difficulties experienced by adults with autism spectrum conditions, *Autism*, 16(6), 612–621.

March E, Springer J (2019) Belief in conspiracy theories: The predictive role of schizotypy, Machiavellianism, and primary psychopathy. PLOS ONE 14(12): e0225964, doi: 10.1371/journal.pone.0225964

Marchlewska, M., Cichocka, A., and Kossowska, M. (2018) Addicted to answers: Need for cognitive closure and the endorsement of conspiracy beliefs. European Journal of Social Psychol., 48: 109– 117, doi: 10.1002/ejsp.2308.

Moritz, S., Favrod, J., Andreou, C., Morrison, A. P., Bohn, F., Veckenstedt, R, Karow, A. (2013). Beyond the Usual Suspects: Positive Attitudes Towards Positive Symptoms Is Associated With Medication Noncompliance in Psychosis. Schizophrenia Bulletin, 39(4), 917–922. Doi:10.1093/schbul/sbs005

Nenadic, I., Meller, T., Evermann, U., Schmitt, S., Julia – Katharina, Pfarr, Abu-Akel, A., Grezzellschak, S. (2021) Subclinical schizotypal vs. autistic traits show overlapping and diametrically opposed facets in a non-clinical population, *Schizophrenia Research*, 231, 32-41.

Oliver, J. E., & Wood, T. J. (2014a). Conspiracy theories and the paranoid style(s) of mass opinion*, American Journal of Political Science*, doi:10.1111/ajps.12084.

Oliver, J. E., & Wood, T. J. (2014b). Medical conspiracy theories and health behaviours in the United States. *JAMA Internal Medicine*. Doi: 10.1001/jamainternmed.2014.190

Pinkham, A. E., Morrison, K. E., Penn, D. L., Harvey, P. D., Kelsven, S., Ludwig, K., & Sasson, N. J. (2019). Comprehensive comparison of social cognitive performance in autism spectrum disorder and schizophrenia. *Psychological medicine*, 1-9

Ross, R.M., Bjoern, H., McKay, R., (2017) Analytic cognitive style predicts paranormal explanations of anomalous experiences but not the experiences themselves: Implications for cognitive theories of delusions. *Journal of Behaviour Therapy and Experimental Psychiatry* 56, pages 90-96. DOI:10.1016/j.jbtep.2016.08.018

Salice, A., Henriksen, M.G. (2021) Distrubances of Shared Intentionality in Schizophrenia and Autism, *Frontiers in Psychiatry*, doi.org/10.3389/fpsyt.2020.570597.

Sasson, N. J., Pinkham, A. E., Carpenter, K. L. H., & Belger, A. (2011). The benefit of directly comparing autism and schizophrenia for revealing mechanisms of social cognitive impairment. *Journal of Neurodevelopmental Disorders, 3*, 87–10.

Sleboda, P., & Sokolowska, J. (2017). Measurements of Rationality: Individual Differences in Information Processing, the Transitivity of Preferences and Decision Strategies. Frontiers in psychology, 8, 1844. https://doi.org/10.3389/fpsyg.2017.01844

Sommer, M., Döhnel, K., Jarvers, I., Blaas, L., Singer, M., Nöth, V., Schuwerk, T., & Rupprecht, R. (2018). False Belief Reasoning in Adults with and without Autistic Spectrum Disorder: Similarities and Differences. *Frontiers in psychology,* 9, 183. https://doi.org/10.3389/fpsyg.2018.00183

Swami, V. (2012). Social psychological origins of conspiracy theories: The case of the Jewish conspiracy theory in Malaysia, *Frontiers in Psychology*, 3, 280, doi: 10.3389/fpsyg.2012.00280.

Swami, V. (2014b). Political paranoia and conspiracy theories. *Power, politics, and paranoia: Why people are suspicious of their leaders* (pp. 218-236) doi:10.1017/CBO9781139565417.016

Swami, V., Barron, D., Weis, L., Voracek, M., Stieger, S., & Furnham, A. (2017). An examination of the factorial and convergent validity of four measures of conspiracist ideation, with recommendations for researchers. *PLOS ONE*, 12, e0172617. doi:10.1371/journal.pone.0172617

Swami, V., Chamorro-Premuzic, T., & Furnham, A. (2010). Unanswered questions: A preliminary investigation of personality and individual difference predictors of 9/11 conspiracist beliefs, *Applied Cognitive Psychology,* 24, 749–761, doi:10.1002/acp.1583.

Swami, V., & Coles, R. (2010). The truth is out there: Belief in conspiracy theories. *The Psychologist*, 23, 560–563.

Swami, V., Coles, R., Stieger, S., Pietschnig, J., Furnham, A., Rehim, S., et al. (2011). Conspiracist ideation in Britain and Austria: Evidence of a monological belief system and associations between individual psychological differences and real-world and fictitious conspiracy theories. *British Journal of Psychology*, 102, 443–463, .doi: 10.1111/j.2044-8295.2010.02004.x.

Swami, V., Voracek, M., Stieger, S., Tran, U. S., & Furnham, A. (2014a). Analytic thinking reduces belief in conspiracy theories. *Cognition, 133*(3), 572-585. doi:10.1016/j.cognition.2014.08.006

Trevisan, D., Foss-Feig, J.H., Naples, A.,, Srihari, B., Anticevic, A., McPartland, J., (2020) Autism Spectrum Disorder and Schizophrenia Are Better Differentiated by Positive Symptoms Than Negative Symptoms, *Frontiers in Psychiatry*, doi.org/10.3389/fpsyt.2020.00548

Umam, A. N., Muluk, H., & Milla, M. N. (2018). The need for cognitive closure and belief in conspiracy theories: An exploration of the role of religious fundamentalism in cognition, DOI: 10.1201/9781315225302-79

Van Prooijen J.W. -. (2014). Power, politics, and paranoia: Why people are suspicious of their leaders. Cambridge: Cambridge University Press.

van Prooijen, J.W. -. (2017). Why education predicts decreased belief in conspiracy theories. *Applied Cognitive Psychology, 31*(1), 50-58. doi:10.1002/acp.3301

van Prooijen, J.W. -., & Douglas, K. M. (2018). Belief in conspiracy theories: Basic principles of an emerging research domain. *European Journal of Social Psychology,* doi:10.1002/ejsp.2530

van Prooijen, J. W. (2017). Why education predicts decreased belief in conspiracy theories. Applied Cognitive Psychology, 31, 50–58, doi: 10.1002/acp.3301.

van Prooijen, J. W., & Douglas, K. M. (2018). Belief in conspiracy theories: Basic principles of an emerging research domain. European Journal of Social Psychology, 48, 3.

Wakabayashi, A., Baron-Cohen, S., & Ashwin, C. (2012). Do the traits of autism-spectrum overlap with those of schizophrenia or obsessive-compulsive disorder in the general population? Research in Autism Spectrum Disorders, 6(2), 717-725. https://doi.org/10.1016/j.rasd.2011.09.008

Warman, D.M., Lysaker, P.H., Martin, J.M., (2007) Cognitive insight and psychotic disorder: The impact of active delusions, *Schizophrenia research,* doi:10.1016/j.schres.2006.09.011

Woodward, N. D., Duffy, B., & Karbasforoushan, H. (2014). Response selection impairment in schizophrenia transcends sensory and motor modalities. *Schizophrenia Research*, *152*(0), 446–449, doi: 10.1016/j.schres.2013.11.038

Williams, D. L., Mazefsky, C. A., Walker, J. D., Minshew, N. J., & Goldstein, G. (2014). Associations between conceptual reasoning, problem solving, and adaptive ability in high-functioning autism. *Journal of autism and developmental disorders*, 44(11), 2908–2920, doi: 10.1007/s10803-014-2190-y

Zhang, L., Tang, J., Dong, Y., Ji, Y., Tao, R., Liang, Z., Chen, J., Wu, Y., & Wang, K. (2015). Similarities and Differences in Decision-Making Impairments between Autism Spectrum Disorder and Schizophrenia. Frontiers in behavioral neuroscience, 9, 259, doi: 10.3389/fnbeh.2015.00259

Zhou, H. Y., Yang, H. X., Gong, J. B., Cheung, E., Gooding, D. C., Park, S., & Chan, R. (2019). Revisiting the overlap between autistic and schizotypal traits in the non-clinical population using meta-analysis and network analysis. Schizophrenia research, 212, 6–14. Doi: 10.1016/j.schres.2019.07.050

Chapter 4: Study Two

4.1 Preface for Study Two

Study one found that both schizotypal and autistic traits were reliable predictors of conspiracy theory beliefs, even when controlling for other socio-cognitive factors (i.e. thinking style). However, the results suggested that the mechanisms explaining this association may differ. Those scoring higher on autistic traits reported being more likely to engage in analytical thinking. This challenges the assumption of previous research that a preference for a more systematic or analytical thinking style should be a protective factor against conspiracy theory beliefs. Accordingly, these findings necessitate a further examination into the role of broader meta-cognitive factors in the relationship between autistic traits and conspiracy beliefs (e.g., how people appraise or reflect upon online information).

Study two built upon our previous research, through the examination of whether patterns of information searching played a role in conspiracy beliefs, and, if this relationship is particularly strong in people who have shown higher autistic traits. If individuals with higher autistic traits are more likely to engage in analytical thinking and still adopt conspiracy beliefs, it may be possible that they prefer a more systematic thinking approach but may still engage in information searching in a bias manner. In this study participants completed both the measures captured in Study One, but with the addition of measures which gauge the consistency and intensity of how people search for information online, as well as their intensity and focus on specific topics of interest. Analysis included an assessment of participants who specifically scored above the clinical cut-off on the Autism Spectrum Quotient, and, planned group comparisons between those above and below (i.e. general population) the clinical cut-off on all measures within this study.

4.2 Statement of Authorship

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Principal Author

Name of Principal Author (Candidate)	Neophytos Georgiou		
Contribution to the Paper	Study concept and design, data collection, statistical analyses, writing manuscript.		
Overall percentage (%)	80		
Certification:	This paper reports on original research I conducted during the period of my Higher Degree by Research candidature and is not subject to any obligations or contractual agreements with a third party that would constrain its inclusion in this thesis. I am the primary author of this paper.		
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Co-Author Contributions

By signing the Statement of Authorship, each author certifies that:

iv. the candidate's stated contribution to the publication is accurate (as detailed above).

v. permission is granted for the candidate in include the publication in the thesis; and

vi. the sum of all co-author contributions is equal to 100% less the candidate's stated contribution.

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Contribution to Paper	Secondary Supervision, advice about study concept and design, manuscript proof-reading.		
Signature		Date	28/02/2023

Could autistic traits be a risk factor for conspiracy beliefs? An analysis of cognitive style and information-seeking behaviour

by

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4.3 Abstract

Background: Conspiracy theories (CTs) have proliferated in recent years due to the ease with which information can now be disseminated via social-media. Research indicates that a much focused attention on specific topics or information can increase risk of conspiracy reasoning. Given that individuals with Autism Spectrum Disorder (ASD) traits are known to display these tendencies, this paper examined whether the pattern of information-searching, and socio-cognitive factors associated with CT beliefs, differ for people with people scoring lower and higher on ASD traits.

Method: From a sample of 508 adults recruited from an international online panel. The study included measures of conspiracy beliefs, ASD traits, as well as measures of information searching and cognitive style as seen in Georgiou et al., (2020c, in press).

Results: People with stronger ASD traits were found to endorse CT beliefs more strongly. The results suggest differences between ASD and non-ASD cases in relation to socio-cognitive factors such as; a person's comfort with ambiguity, their mindedness, and their tendency to engage in analytical or intuitive thinking which could account for this difference in beliefs.

Limitations: The study did not use a clinical sample, and relied upon a self-report methodology.

Conclusion: The findings raise the possibility that ASD traits may be a potential risk factor for the development of CT beliefs with specific cognitive factors identified as mechanisms to explain this effect.

4.4 Introduction

Conspiracy theories (CTs) are novel and thought provoking narratives which suggest that there are secret actors conspiring together to influence world events often for their own personal gain, or for other malevolent purposes (Douglas & Sutton, 2017; Furnham, 2013; Georgiou et al., 2019; Swami et al., 2011; van Prooijen, Krouwel & Pollet, 2015). Not all CTs are incorrect (e.g., MK Ultra, Pentagon Papers, Watergate), but many are considered maladaptive because they are often maintained by faulty reasoning and can lead to a range of negative consequences (Douglas & Sutton, 2011; Keeley, 1999; Introne et al., 2020). For example, CT beliefs have been used to justify attacks on public officials, the rejection of medical advice, and the disregard for public health measures (Jolley & Douglas, 2014; Georgiou et al., 2020a; Nisa et al., 2020).

Although CT beliefs have existed throughout the centuries (e.g., fears about the influence of Freemasonry on religion in the 19th Century), CT beliefs have proliferated in recent years due to the ease with which information can now be disseminated via social-media (Douglas & Sutton, 2011; Douglas et al., 2019). Information is now more readily available, can be easily shared, targeted to particular individuals or online communities and spread rapidly via various online news media (Franks et al., 2017; Kou et al., 2017). Thus, while the Internet has often facilitated the spread of superficial information, it has also allowed individuals to compile meticulous, detailed, but still invalid theories about the world (Spohr, 2017; Del Vicario et al., 2016).

Given the potential importance of the proliferation of online information and its potential role in CT formation, there is interest in whether certain individuals are more likely to be vulnerable to the influence of this material than others. One view within CT research is that there are individuals who gain comfort or reassurance from these belief systems because they are often unambiguous and are accepted by others (March & Springer, 2019;

Marchlewska et al., 2018; Swami et al., 2016; van Prooijen, 2018). Psychological research shows that such beliefs are found to be more common in people with an underlying conditions such as schizotypy (Barron, 2014; 2018; Georgiou, Delfabbro & Balzan, 2019; Swami et al., 2016; van der Tempel, 2015). Other important risk factors identified in the literature include exposure to significant, or stressful circumstances or events, or strongly held (often extreme) political views (see van Proojen, 2018). Central to much of this discussion has been the notion that CTs arise when people take 'cognitive short-cuts' or apply heuristics and biases when they process information. Important examples of these include confirmation or hindsight bias whereby people seek out information in a superficial and selective way so as to support one-sided views of events (Douglas et al., 2016; Pytlik et al., 2020; van Elk, 2015; van Prooijen & Van Djik. 2014).

In line with this view, previous research by Swami et al. (2016), van Prooijen (2017) and van Prooijen (2018) has suggested that analytical or more systematic thinking is usually a protective factor for CT beliefs (van Prooijen, 2016: 2018; Swami et al., 2016; Marchewlska et al., 2018; Umam et al., 2018). However, one of the difficulties with this view is that this does not rule out the possibility of confirmation bias. In fact, consistent with the common mantra often visible in CT rallies ('Do your research'), it may be that many CT believers engage in quite active and systematic searching for information that is consistent with a particular world view (e.g., that COVID – 19 is a hoax; Georgiou, Delfabbro & Balzan, 2020). This observation has led us to examine whether there may be specific individual differences that might make certain individuals more likely to engage in what we term 'rabbit-hole' thinking, or the tendency to focus on a narrow range of detailed information searching that may serve to encourage and maintain CT beliefs. In other words, while a reliance on analytical processing might protect some people from CT beliefs, the protective effect may be context-bound if this analytical thought is applied to the wrong information.

In other words, it may not be the lack of engagement with a systematic approach that promotes CT beliefs (as demonstrated by ASD; Georgiou et al., 2020c, in press), but rather some people may only seek out information that confirms their conspiracy beliefs, regardless of their tendency to engage in analytical or systematic thinking (Narayan & Prejlevic, 2018; Stahl & Van Prooijen, 2018; Wilson, 2018). Whilst this tendency could be argued to exist in anyone with a passionate belief, and represent a form of confirmation bias (Spohr, 2017; Knoblock-Westerwick, Mothes & Polavin, 2020), we hypothesise that such a tendency might be more likely to occur in people who are more prone to highly concentrated analytical thought. A particular condition where this is known to occur more commonly is in Autism Spectrum Disorder (ASD) or in people with ASD traits. Accordingly, it is of relevance to assess whether there might be some differences in the patterns of association between information searching and analytical thought in people classified high or low on ASD traits.

4.4.1 The Present Study

This paper builds on our previous research Georgiou et al. (2020c, in press) in order to gain clearer insights into the association between ASD and conspiracy beliefs. Previous studies (e.g., Luke et al., 2011; Wilkinson, 2018) show that ASD traits are associated with the development of fixed or rigid beliefs that can often be maintained by very focused and detailed information searches. In this paper, we examine whether this pattern of information searching plays a role in CT formation and if this relationship is particularly strong in people who score above the clinical cut-off score on ASD traits. It was hypothesised that: (1) People scoring above the AQ cut-off score will engage in a higher level of information searching behaviour and will report more focused information searching than those scoring below the cut-off, (2) Higher levels of reported information searching behaviour will be more positively associated with stronger CT belief scores in those classified as having stronger ASD traits, bit negatively in those below the cut-off score (low ASD traits) and (3) there will be a stronger

association between the use of analytical thought and CT beliefs in those individuals scoring above the cut-off scores (i.e., with higher autistic traits). We also examined whether the relationship between AQ scores and CT beliefs after controlling for other known predictors of CT beliefs as conducted within Georgiou et al., (2020c, in press), differs when the analysis is completed for people scoring above the AQ cut-off as compared with those who score below the cut-off score.

4.5 Method

4.5.1 Participants

The study involved 508 participants (M = 278, F = 230). Most participants (almost two-thirds) were aged 18-34 years. The majority lived in the UK (39%), Continental Europe (21%) or the US (15%). The majority (around 80%) were well-educated and had either a degree or some degree post-secondary education. Full details are presented in Georgiou, Balzan & Delfabbro (2020c, in press).

4.5.2 Sampling Procedure

The online research participation website *Prolific.Inc* was used to recruit participants and the study was advertised as being about people's individual differences in interpreting real-world events. There was a small monetary fee (around 3 UK pounds).

4.5.3 Study Design

Demographic information and other measures, (including the measurement of Autism Spectrum Disorder), were completed online. The study was approved by the Human Research Ethics Subcommittee in the University of Adelaide's School of Psychology.

4.5.4 Measures

4.5.4.1 Demographic background

Demographic measures included gender, age, country of residence, and education level.

4.5.4.2 Specific information-seeking

Participants were asked how often they gather information online about specific topics of their interest and what sources they use to do so. This was in order to gauge the consistency and intensity of their information searching in relation to specific topics. Sources included: TV News Programming, Social Media (E.g. Facebook, Twitter), Scientific-Based News Websites, Internet Forums (E.g. Reddit, Quora), Internet News Sites (E.g. The

Guardian), and other Internet Information Websites. The frequency of use was captured on a scale of 1 (Never) to 7 (Almost Continuously throughout the day). Participants were classified as high users if they scored 6 or 7 across all information sources.

4.5.4.3 Information Seeking Behaviour

Participants were also asked questions to gather the context of their information seeking behaviour and, in particular, its frequency, intensity and focus. Four questions were asked: 'Do you ever find yourself researching multiple topics because they are somehow connected', 'Do you ever find yourself trying to find as much evidence as possible to back up your beliefs on a specific topic', 'Do you ever research a specific topic as much as possible because you feel that the mainstream view on the topic is wrong?', 'Do you ever find yourself researching a specific topic for an extended period of time?'. Each question was measured on a scale from 1 (Never) to 5 (Always), with those users who scored 4 or 5 across all items considered to have a highly focused interest in a topic.

4.5.4.4 The Autism-Spectrum Quotient (AQ)

The AQ was designed by Baron-Cohen (2001) as a 50-item, self-administered instrument for measuring the degree to which an adult with normal intelligence has the traits associated with ASD. The assessment contains 5 subscales which capture; social skill, attention switching, attention to detail, communication and imagination. Each item allows the participant to indicate "definitely agree", "slightly agree", "slightly disagree" or "definitely disagree". Consistent with the binary scoring method suggested by Baron-Cohen (2001, 2004) and Williams (2018), "definitely agree", or "slightly agree" responses were scored as 1 point per item. Consistent with Ashwood et al. (2016), those scoring above the clinical cut-off score of 32 out of 50 were considered likely to be diagnosable for ASD. The Cronbach's Alpha was very good: 0.87.

4.5.4.5 Multidimensional Schizotypy Scale – Brief (MSS-B)

Developed by Gross et al. (2018), the MSS-B is an abbreviated 38-item which measures positive, negative and disorganized traits of Schizotypy. All items were rated on 1 (Completely Disagree) to 5 (Completely Agree). The MSS-B has very good psychometric properties in diverse populations and good construct validity (Kemp et al., 2019). The Cronbach's Alpha for the present study was very good: 0.91.

4.5.4.6 Rational/Experiential Multimodal Inventory – Short form (REIm – 13R / REIm – 13E/I)

Developed by McGuiness et al. (2019), the REIm -13 is a 13-item short form of the 42-item edition developed by Epstein and Norris (2011). It contains a 4-item subscale that measures tendencies to engage in analytical thinking (REIM-13-R), and a 9-item subscale that measures a tendency to use experiential, emotional and intuitive thinking (REIm – 13 E/I). All items are rated on a 5-point scale from 1 (Strongly disagree) to 5 Strongly Agree). The Cronbach's Alpha for the present study was 0.82.

4.5.4.7 Need for Cognitive Closure Scale (NFCC – M / NFCC – A)

The NFCC assesses individuals' desire for an answer in order to end further information processing and judgement, even if that answer is not the correct answer (Webster & Kruglanksi, 1994). Two subscales were used in this project. These subscales are *Discomfort with Ambiguity*, (e.g. "I'd rather know bad news than stay in a state of uncertainty"), and *Closed-Mindedness* which measures how closed or open minded an individual is (e.g. "I do not usually consult many different opinions before forming my own view"). The 17 selected items were rated on a 6-point scale ranging from 1 (strongly disagree) to 6 (strongly agree). The Cronbach's Alpha for the present study was very good: 0.88.

4.5.4.8 The Beliefs in Conspiracy Theory Inventory (BCTI)

This measure is a 15-item self-report measure developed by Swami et al. (2010, 2011). It captures a range of well-known CTs (i.e. 'The Apollo Moon landings never happened and were staged in a Hollywood studio'). All items are rated from 1 (Completely false) to 9 (Completely True), and an overall score is based on the total of all items. The Cronbach's Alpha was very good in this sample: 0.91.

4.5.4.9 The Generalised Conspiracy Beliefs Scale (GCBS)

This measure is a 15-item self-report measure developed by Brotherton (2013) that captures whether people tend to perceive the world from a conspiratorial perspective and focuses less on specific CT beliefs (Brotherton et al., 2013; Swami et al., 2018). Items are scored from 1 (Definitely not true) to 5 (Definitely true) to yield an overall score between 15 and 75. The Cronbach's Alpha was very good in this sample: 0.93.

4.5.5 Analytical Approach

Independent samples t-tests were used to compare CT beliefs (i.e. BCTI, GCBS), Schizotypy (i.e. MSS – B), styles of thinking (i.e. REIm – 13R, REIm – 13 E/I) and need for cognitive closure (i.e. NFCC – M, NFCC – A), between those scoring higher on ASD traits and those scoring lower (i,e., below the cut-off score score on the AQ). Pearson correlation analysis was used to examine the relationship between psychological measures. A hierarchical Linear Regression Analysis was conducted to examine the relationship between AQ scores and CT beliefs after controlling for the other factors discussed above. This analysis was completed separately for people scoring above the AQ cut-off and those who scored below to examine similarities and differences in the factors associated with strong CT belief endorsement.

4.6 Results

Table 1 and Table 2 of Georgiou et al., (2020c, in press) summarises the descriptive statistics for the measures used in this study. As indicated, 60 participants (13.4%) scored above the AQ clinical cut-off for ASD, with multi-dimensional schizotypy scores (MSS-B) generally falling in the middle range of the scale.

4.6.1 Correlation Analysis

Table 6 summarises the Spearman correlations between the frequency with which respondents reported specific information searching, information seeking behaviour, and the previously established predisposing factors to conspiracy beliefs (i.e. ASD traits, Schizotypy; Georgiou et al., 2020), as well as conspiracy beliefs scores (i.e. BCTI, GCBS) in both ASD and non-ASD cases. Pearson's correlations between all established psychometric measures are also presented for reference from Georgiou et al., (2020c, in press).

4.6.1.1 Correlational Analysis in individuals below AQ cut-off

As anticipated, socio-cognitive factors previously established to be negatively associated to conspiracy beliefs such as a person's tendency to engage in analytical thinking (REIM – 13R), and positively associated to conspiracy beliefs (as measured by GCBS and BCTI scores), such as a person's tendency to prefer a more intuitive/experiential thinking style (REIm – 13 E/I) were found in individuals below the ASD cut-off scores. Only a weak and positive correlation could be found between level of information seeking and generalised conspiracy beliefs (I.e. GCBS), with the information searching behaviour a person reported not related to CT beliefs. It also appeared that the more open minded a person was (i.e. NFCC – A), the more likely they were to engage in intuitive/experiential styles of thinking, and conspiracy beliefs and to engage in information seeking behaviour.

4.6.1.2 Correlational Analysis in individuals above the AQ cut-off

On the other hand, in those who scored above the AQ cut-off, a moderate and positive correlation was found between level of information seeking and both measures of conspiracy beliefs (i.e. GCBS, BCTI). In contrast to the other group (below cut-off), there were moderate and positive associations between the tendency to engage in analytical thinking, the level of information searching, information searching behaviour, and both measures of conspiracy beliefs. There was also a strong and positive correlation between the level of information a person seeks, and their level of interest in a particular topic.

Table 6

Correlation of Information Seeking Behaviour, Motivations of Information Seeking Behaviour, Conspiracy beliefs, and Predictors of Conspiracy Beliefs in non-ASD (top) and ASD (below) cases

Note: REIm – 13R Rational Subscale of the Rational and Experiential Multimodal Inventory Short form, REIm – 13 E/I = Experiential/Intuitive Subscale of the Rational and Experiential Multimodal Inventory Short form, AQ = Autism Spectrum Quotient Total Score, MSS – B = Multidimensional Schizotypy

	1.	2.	3.	4.	5.	6.	7.	8.
1. NFCC – M								
2. NFCC – A	.152**							
3. REIm – 13 R	.101**	.067						
4. REIm – 13 E/I	.283**	.149*	-.116**					
5. BCTI	.242**	.021	-.002	.207**				
6. GCBS	.250**	.080	.010	.220**	.888**			
7. Focussed Info	.106*	.050	.208*	.100*	.020	.182**		
8. Level of Info	-.106*	.100*	.210*	-.080*	.088	.104**	.399**	

	1.	2.	3.	4.	5.	6.	7.	8.
1. NFCC – M								
2. NFCC – A	.101*							
3. REIm – 13 R	.088*	-.032*						
4. REIm – 13 E/I	-.120*	.190*	-.144**					
5. BCTI	.142*	.080*	.210*	.277**				
6. GCBS	.133**	.111*	.240*	.190**	.701**			
7. Focussed Info	-.180*	.108*	.338*	-.071*	.240*	.202*		
8. Level of Info	-.211*	.089*	.300*	-.145*	.337**	.355*	.580**	

Scale Total Score, GCBS = Generalised Conspiracy Belief Scale, BCTI = Belief in Conspiracy Theories Inventory, Info _ Total = The sum off scores for each Information Seeking Questions, Fixated Interest _ Total – The sum off scores for all 4 questions regarding motivations behind information seeking behaviour.

4.6.2 Group Comparisons according to ASD cut-off scores

4.6.2.1 Differences in level of Conspiracy Beliefs

It was found that those above the AQ cut-off score for ASD were more likely to adopt both specific conspiracy beliefs as measured by the BCTI (M = 66.57, SD = 27.545) than non-ASD cases (M = 49.88, SD = 25.801) with a large difference observed between the two groups $t(502) = 4.97$, $p < .001$, $d = .625$). There was also a significant difference between the two groups for more generalised conspiracy beliefs as measured by the GCBS (M = 44.93, SD = 12.678 for AQ scores above the cut-off), compared to cases below the cut-off score (M = 36.13, SD = 13.714), $t(502) = 5.03$, $p < .001$, $d = .663$).

4.6.2.2 Differences in Schizotypal traits

Those above the AQ cut-off were found to score much higher on measures of schizotypy (M = 101.11, SD = 28.765) compared to those below the AQ cut-off (M = 83.29, SD = 21.185), with significant moderate differences found across negative traits, $t(502) = 5.16$, $p < .001$, $d = .584$), and disorganized traits $t(502) = 3.328$, $p = .001$, $d = .406$), and significant strong difference found for positive traits $t(502) = 7.48$, $p < .001$, $d = .883$).

4.6.2.3 Differences in Socio-Cognitive Factors

In terms of a person's need for cognitive closure, those who scored below the AQ cut-off reported less discomfort with ambiguous events (M = 32.73, SD = 4.209) than the higher AQ group (M = 42.21, SD = 3.841), $t(502) = 2.77$, $p = .001$, $d = .23$). Those below the cut-off were found to be more open-minded (M = 27.76, SD = 2.956) than those scoring above (M = 25.30, SD = 2.569), with a large effect size, $t(502) = -7.28$, $p < .001$, $d = .883$).

Those in the higher AQ group were more likely to engage in analytical thought (M = 12.97, SD = 1.761) compared to cases below the cut-off (M = 12.30, SD = 1.803), $t(502) =$

2.88, $p = .04$, $d = .375$). There were no significant differences for intuitive/experiential thought.

4.6.2.4 Differences in Information Seeking Behaviour

Consistent with our hypotheses, those above the AQ cut-off were more likely to engage in large volumes of information searching, $t(502) = 5.03$ $p < .001$, $d = .639$).

4.6.3 Multiple Regression

It was important to examine how well traits of autism spectrum disorder predicted CT beliefs specifically in individuals above the clinical cut-off in order to determine whether the influence of ASD traits is greater in predicting CT beliefs than previously anticipated, and, in turn, may be diluted when observed in samples from the general population.

4.6.3.1 Predicting GCBS scores in cases above and below the AQ cut-off

As shown in Table 7, a two-stage hierarchical multiple regression was conducted with GCBS scores as the dependent variable for people scoring above the AQ-cut off and those scoring below. First, sociological and demographic factors such as level of education, level of information seeking, and level of fixated interest were entered first, then, socio-cognitive factors previously discussed were entered second.

When examining solely those cases below the cut-off, the level of information seeking and focused information searching were both significant predictors at stage-one of the hierarchical model, explaining 19.7% of the variance. However, they were not significant predictors at stage-two of the model. The level a person engages in intuitive/experiential thinking was the strongest predictor ($\beta = .363$), as the model including socio-cognitive factors explaining 23.8% of the variance.

Table 7

Summary of Hierarchical Analysis for predicting conspiracy ideation via GCBS scores in below AQ cut-off (top) and above AQ cut-off (bottom) cases

	Model 1			Model 2		
	B	SE	*β*	B	SE	*β*
Level of Education	-.110	.371	.001	.522	.270	.001
Level of Information Seeking	.177	.473	.121	.129	.470	.032
Level of Focussed Searching	.190	.465	.040	.190	.465	.001
REIm – 13R				-.458	.358	-.060
REIm – 13 E/I				1.465	.426	.165**
NFCC – M				.027	.154	.008
NFCC – A				.746	.259	.140*
R^2		.036			.120	
F for Changes in R^2		1.102			5.764	
	Model 1			Model 2		
	B	SE	*β*	B	SE	*β*
Level of Education	-.177	.366	.01	.522	.270	.01
Level of Information Seeking	.610	.245	.275*	.301	.273	.139
Level of Focussed Searching	.408	.288	.109*	.277	.365	.040
REIm – 13R				-1.082	.642	-.150*
REIm – 13 E/I				3.056	1.188	.363*
NFCC – M				-.347	.216	.080*
NFCC – A				.562	.383	.121*
R^2		.197			.238	
F for Changes in R^2		2.765			3.821	

Note. All psychometric variables were centred at their means, *p <.05, **p<.01.

In cases below the cut-off, the results showed that the best predictor of CT beliefs was again respondent scores on intuitive/experiential thinking (β = .165). Both level of information seeking and fixated interests were not significant predictors. When a person's discomfort with ambiguity was included (NFCC – A, β = .140), both independent variables accounted for 12% of the models variance.

4.6.4 Predicting BCTI scores in cases below and above the AQ cut-off

As shown in Table 8, a two-stage hierarchical multiple regression was conducted to assess how scores on the BCTI may differ for people scoring above the AQ cut off and below. Once again, all factors were entered in order from all sociological and demographic factors, to socio-cognitive factors.

As was the case for GCBS scores, the level of information seeking and information seeking behaviour, were weak predictors of BCTI scores in those scoring above the AQ cut-off in stage-one of the model, but were not significant when socio-cognitive factors were included. The best predictor of specific conspiracy beliefs in this group was a person's tendency to engage in Experiential/Intuitive (β = .436). Including measures of Experiential/Intuitive and Rational thinking, and a person's level of discomfort with ambiguity, the model predicted 25.5% of variance in ASD cases scores on the BCTI.

Once again, similar to GCBS scores, level of information seeking and information seeking behaviour were not significant predictors of BCTI scores for those scoring below the AQ cut-off for any stage of the model. The best predictors were both a person's tendency to engage in Experiential/Intuitive (β = .254), and how open minded an individual is (β = .253), which together explained 26% of the variance.

Table 8

Summary of Hierarchical Analysis for predicting conspiracy ideation via BCTI scores in below AQ cut-off (top) and above AQ cut-off (bottom) cases

	Model 1			**Model 2**		
	B	SE	β	B	SE	β
Level of Education	-.288	.500	.001	-.312	.270	.001
Level of Information Seeking	.372	.250	.081	.364	.245	.080
Level of Focussed Searching	.193	.458	.023	.069	.454	.008
REIm – 13R				-1.032	.677	-.072
REIm – 13 E/I				2.572	.804	.254**
NFCC – M				1.533	.490	.253*
NFCC – A				.147	.291	.024
R^2		.095			.260	
F for Changes in R^2		1.877			5.177	
	Model 1			**Model 2**		
	β	SE	B	β	SE	B
Level of Education	-.201	.500	.001	-.312	.270	.001
Level of Information Seeking	1.118	.420	.237**	.759	.579	.090*
Level of Focussed Searching	.450	.878	.114*	.735	.1.100	.040
REIm – 13R				-2.172	1.002	-.139*
REIm – 13 E/I				7.975	2.516	.436*
NFCC – M				.592	1.255	.064
NFCC – A				-2.099	.881	-.293**
R^2		.151			.255	
F for Changes in R^2		2.854			3.426	

Note. All psychometric variables were centred at their means, *p <.05, **p<.01.

4.7 Discussion

This project has built on our previous work (Georgiou et al., 2020c, in press) and investigated several hypotheses. On the whole, the findings were consistent with the hypotheses. Consistent with Hypothesis 1 and 2, it was found that those scoring above the AQ cut off score were found to report greater engagement in information searching behaviour, more focused information searching, a more pronounced tendency to engage in analytical thought, and, ultimately, a higher level of CT beliefs (as measured by BCTI and GCBS scores). In addition, and consistent with Hypothesis 3, we observed that engagement in greater analytical thought was negatively associated to CT beliefs in those scoring below the AQ cut-off, but that a positive relationship existed in those scoring above the cut-off score.

The results relating information searching behaviour and analytical thinking in those higher in ASD traits is consistent with the view that analytical thinking may be a context-dependent protective factor against CT beliefs. Whilst the encouragement of a more systematic approach can reduce these erroneous beliefs as previous research discussed (Swami et al., 2014; van Prooijen, 2017:2018), this may not be true for people with higher ASD traits. As cases above the AQ cut-off were more likely to find discomfort with ambiguous events, and, were likely to be less open-minded (as measured by the NFCC – A and NFCC – M), they may only focus on a narrow range of detail information searching (e.g. only CT content), and, in turn, be less likely to find the necessary disconfirmatory information.

These results are broadly consistent with literature which has consistently shown an association between ASD and the preference for an avoidant decision-making style (Baron-Cohen, 2007; South et al., 2014; Vella et al., 2018; Wilkinson, 2008). It could be suggested that ASD cases may conduct this narrow-ranged information searching, or, what we have

termed ‘rabbit-hole’ thinking, and, in turn, are more likely to hold a confirmation bias towards only information that reassures CT beliefs, in order to avoid the need and/or stress of future decision-making (Swami et al., 2011: 2016; Georgiou, Delfabbro & Balzan, 2019; Goreis & Voracek, 2019). However, this observation would need to be validated in other samples using ASD cases confirmed using clinical interviews. We would note that these results should also not be seen as sitting in opposition to existing literature (e.g., Swami et al., 2014; van Prooijen, 2017:2018) because the best predictor of conspiracy beliefs in both ASD and non-ASD cases remained the tendency to engage in an intuitive and/or experiential thinking style. In other words, engaging in less intuitive thinking may be a protective factor against CT beliefs, but some of this benefit many lost by those who score higher on ASD traits because they may have a tendency to search more narrowly for information and be less likely to encounter information that counters the CT beliefs.

4.7.1 Limitations and Future Research

As with Georgiou, Delfabbro and Balzan (2020c, in press), there are important limitations that need to be acknowledged when interpreting the results. These include the shortcomings of using a convenience sample; the potential for response bias in self-report methodology; the use of only a single self-report measure (the AQ) to assess ASD traits; and, the influence of other clinical conditions or other co-morbid conditions that might not have been assessed. The results are also not based on a clinical diagnosis of ASD. Thus, future research could address this issue by specifically drawing a sample of people with a clinical diagnosis of ASD. In addition, as suggested by Georgiou, Delfabbro and Balzan (2019), whilst the results of this study suggest a contradictory positive association between analytical thinking and CT belief in ASD cases may be due to the existence of confirmation bias towards CT information, future research could seek to re-examine these results using

standardized tests of cognitive bias that could detect variations in decision-making in CT prone individuals, or, in this instance, people with ASD.

4.7.2 Conclusions

The results of this study suggest there are differences in the psychological factors that may be associated with CT formation in people scoring higher and low on ASD trait. The findings that CT beliefs might be related to a condition that has a developmental history raises the possibility that CT prone individuals can be identified earlier in life and that there are opportunities for early assessment and intervention. For example, young people identified as being on the Autism spectrum might be encouraged to engage in broader evidence searching, to question single lines of evidence and to read more widely. Metacognitive Training or Cognitive Bias Correction psychoeducation programmes (Balzan et al., 2019; Moritz et al., 2015), which encourage participants to challenge intuitive, experiential and biased thinking styles, may also be beneficial to people with ASD traits.

4.8 References

Abu-Akel, A. M., Apperly, I. A., Wood, S. J., & Hansen, P. C. (2017). Autism and psychosis expressions diametrically modulate the right temporoparietal junction. *Social neuroscience,* 12(5), 506–518, doi: 10.1080/17470919.2016.1190786

Balzan, R., Woodward. S., Delfabbro, P., Moritz, S. (2016) Overconfidence across the psychosis continuum: a calibration approach, *Cognitive Neuropsychiatry*, 21(6), pp. 510-524, doi:10.1080/23311908.2015.1135855

Balzan, R. P., Moritz, S., & Schneider, B. C. (2019). Metacognitive training: Targeting cognitive biases. In C. Cupitt (Ed.), CBT for Psychosis: Process-Oriented Therapies and the Third Wave (pp. 47-63). Routledge

Baron-Cohen, S. (2008). Autism, Hypersystemizing, and Truth. Quarterly Journal of Experimental Psychology, 61(1), 64–75. https://doi.org/10.1080/17470210701508749

Barron, D., Morgan, K., Towell, T., Altemeyer, B., & Swami, V. (2014). Associations between schizotypy and belief in conspiracist ideation. *Personality and Individual Differences, 70*, 156-159. doi:10.1016/j.paid.2014.06.040

Barron, D., Furnham, A., Weis, L., Morgan, K. D., Towell, T., & Swami, V. (2018). The relationship between schizotypal facets and conspiracist beliefs via cognitive processes. *Psychiatry Research, 259*, 15-20. doi:10.1016/j.psychres.2017.10.001

Brotherton, R., French, C. C., & Pickering, A. D. (2013). Measuring belief in conspiracy theories: The Generic Conspiracist Beliefs Scale. *Frontiers in Psychology, 4*, 279. Doi:10.3389/fpsyg.2013.00279.

Carter, R. M., Jung, H., Reaven, J., Blakeley-Smith, A., & Dichter, G. S. (2020). A Nexus Model of Restricted Interests in Autism Spectrum Disorder. Frontiers in human neuroscience, 14, 212. https://doi.org/10.3389/fnhum.2020.00212

Claridge, G., & McDonald, A. (2009). An investigation into the relationships between convergent and divergent thinking, schizotypy, and autistic traits. Personality and Individual Differences, 46(8), 794–799, doi: 10.1016/j.paid.2009.01.018

Cohen, A.S., Mohr, C., Ettinger, U., Chan, R.C. (2015) Schizotypy as an organizing framework for social and affective sciences, *Schizophrenia Bulletin,* 18(4), doi: 10.1093/schbul/sbu195

Dagnall, N., Denovan, A., Drinkwater, K., Parker, A., & Clough, P. (2016). Toward a Better Understanding of the Relationship between Belief in the Paranormal and Statistical Bias: The Potential Role of Schizotypy. *Frontiers in Psychology*, *7*, 1045, doi:10.3389/fpsyg.2016.01045

Dagnall, N., Denovan, A., Drinkwater, K., Parker, A., & Clough, P. (2017). Statistical Bias and endorsement of conspiracy theories. Applied Cognitive Psychology, 31, doi:10.1002/acp.3331.

Del Vicario, M., Bessi, A., Zollo, F., Petroni, F., Scala, A., Caldarelli, G., Stanley, H. E., & Quattrociocchi, W. (2016). The spreading of misinformation online. *Proceedings of the National Academy of Sciences of the United States of America*, 113(3), 554–559, doi: 10.1073/pnas.1517441113

Depoux, A., Martin, S., Karafillakis, E., Preet, R., Wilder-Smith, A., & Larson, H. (2020). The pandemic of social media panic travels faster than the COVID-19 outbreak. *Journal of travel medicine*, *27*(3), doi: 10.1093/jtm/taaa031

Dinsdale NL, Hurd PL, Wakabayashi A, Elliot M, Crespi BJ (2013) How Are Autism and Schizotypy Related? Evidence from a Non-Clinical Population. PLOS ONE 8(5): e63316, doi: 10.1371/journal.pone.0063316

Douglas, K. M., Sutton, R. M. (2011). Does it take one to know one? Endorsement of conspiracy theories is influenced by personal willingness to conspire. British Journal of Social Psychology, 50, 542–552, doi: 10.1111/j.2044-8309.2010.02018.x.

Douglas, K. M., Sutton, R. M., Callan, M. J., Dawtry, R. J., & Harvey, A. J. (2016). Someone is pulling the strings: Hypersensitive agency detection and belief in conspiracy theories. *Thinking and Reasoning*, 22(1), 57-77. doi:10.1080/13546783.2015.1051586

Douglas, K. M., Sutton, R. M., & Cichocka, A. (2017). The psychology of conspiracy theories. *Current Directions in Psychological Science, 26*(6), 538-542, doi: 10.1177/0963721417718261

Eisenacher S., Rausch F., Ainser F., Mier D., Veckenstedt R., Schirmbeck F., et al. . (2015). Investigation of Metamemory functioning in the at-risk mental state for psychosis, *Psychology and Medicine*, 45, 3329–3340. Doi:10.1017/S0033291715001373

Eisenacher S., Rausch, F., Mier, D., Frenske, S., Veckenstedt, R., Englisch, S (2016). Bias against disconfirmatory evidence in the at-risk mental state and during psychosis. Psychiatry Res. 238, 242–250, doi:10.1016/j.psychres.2016.02.028

Epstein, S., Pacini, R., Denes-Raj, V., & Heier, H. (1996). Individual differences in intuitive-experiential and analytical-rational thinking styles. *Journal of Personality and Social Psychology*, 71, 390–405, Doi:10.1037/0022-3514.71.2.390.

Epstein, S., Norris, P. (2011) An Experiential Thinking Style: Its Facets and Relations With Objective and Subjective Criterion Measures, *Journal of Personality,*34(4), doi:10.1111/j.1467-6494.2011.00718.x

Ettinger, U., Mohr, C., Gooding, D. C., Cohen, A. S., Rapp, A., Haenschel, C., & Park, S. (2015). Cognition and brain function in schizotypy: a selective review. *Schizophrenia bulletin*, *41 Suppl 2*(Suppl 2), S417–S426, doi: 10.1093/schbul/sbu190

Evans, B.T., Jonathan, K. (2003) In two minds: dual-process accounts of reasoning, *Trends in Cognitive Sciences*, 7(10), doi:10.1016/j.tics.2003.08.012

Evans, B., Jonathan, K., & Stanovich, K., E. (2013). Dual-Process Theories of Higher Cognition Advancing the Debate. *Perspectives on Psychological Science* 8 (3):223-241. doi: 10.1177/1745691612460685

Ettinger, U., Mohr, C., Gooding, D. C., Cohen, A. S., Rapp, A., Haenschel, C., & Park, S. (2015). Cognition and Brain Function in Schizotypy: A Selective Review. *Schizophrenia Bulletin*, *41*, S417–S426, doi:10.1093/schbul/sbu190

Ford, T. C., & Crewther, D. P. (2014). Factor analysis demonstrates a common schizoidal phenotype within autistic and schizotypal tendency: Implications for neuroscientific studies. Frontiers in Psychiatry, 5, Article 117.

Ford, T. C., Nibbs, R., & Crewther, D. P. (2017). Increased glutamate/GABA+ ratio in a shared autistic and schizotypal trait phenotype termed Social Disorganisation. *NeuroImage. Clinical*, 16, 125–131, doi: 10.1016/j.nicl.2017.07.009

Franks, B., Bangerter, A., Bauer, M. W., Hall, M., & Noort, M. C. (2017). Beyond "Monologicality"? Exploring Conspiracist Worldviews. Frontiers in psychology, 8, 861. https://doi.org/10.3389/fpsyg.2017.00861

Furnham A. (2013). Commercial conspiracy theories: a pilot study. *Frontiers in psychology,* 4, 379. https://doi.org/10.3389/fpsyg.2013.00379

Gaeth, G. & Levin, Irwin & Jain, Gaurav & Burke, E.V... (2016). Toward understanding everyday decision making by adults across the autism spectrum. 11. 537-547.

Georgiou, M., Delfabbro, P. H., & Balzan, R. (2019). Conspiracy beliefs in the general population: The importance of psychopathology, cognitive style and educational attainment, *Personality and Individual Differences*, 151.

Georgiou, M., Delfabbro, P. H., & Balzan, R (2020a) COVID-19-related conspiracy beliefs and their relationship with perceived stress and pre-existing conspiracy beliefs, *Personality and Individual Differences*, 166:110201, DOI: 10.1016/j.paid.2020.110201

Georgiou, M., Delfabbro, P. H., & Balzan, R (2020c, in press) The relationship between Autism Spectrum Disorder, Schizotypy and Conspiracy beliefs, *Cognitive Neuropsychiatry*, manuscript submitted for publication.

Goreis, A., & Voracek, M. (2019). A systematic review and meta-analysis of psychological research on conspiracy beliefs: Field characteristics, measurement instruments, and associations with personality traits. Frontiers in Psychology*,* 10 (FEB), art. no. 205. doi:10.3389%2ffpsyg.2019.00205.

Introne, J., Korsunska, A., Krsova, L., & Zhang, Z. (2020). Mapping the Narrative Ecosystem of Conspiracy Theories in Online Anti-vaccination Discussions. In A. Gruzd, P. Mai, R. Recuero, A. Hernandez-Garcia, C. Sian Lee, J. Cook, J. Hodson, B. McEwan, & J. Hopke (Eds.), *11th International Conference on Social Media and Society: Diverse Voices - Promises and Perils of Social Media for Diversity, SMSociety 2020*, pp. 184-192, doi:10.1145/3400806.3400828

Irwin, H. J., Dagnall, N., & Drinkwater, K. (2017). Tweedledum and Tweedledee: Are paranormal disbelievers a mirror image of believers? Journal of the Society for Psychical Research, 81(3), 161–179.

Jolley, D., & Douglas, K. M. (2014b). The social consequences of conspiracism: Exposure to conspiracy theories decreases intentions to engage in politics and to reduce one's carbon footprint. *British, Journal of Psychology*, 105, 35–56. doi:10.1111/bjop.12018

Keeley, B. L. (1999). Of conspiracy theories. *Journal of Philosophy*, 96, 109–126., doi:10.2139/ssrn.1084585

Knobloch-Westerwick, S., Mothes, C., & Polavin, N. (2020). Confirmation Bias, Ingroup Bias, and Negativity Bias in Selective Exposure to Political Information. Communication Research, 47(1), 104–124, doi.org/10.1177/0093650217719596

Kou, Y., Gui, X., Chen, Y., & Pine, K. (2017). Conspiracy talk on social media: Collective sensemaking during a public health crisis. *Proceedings of the ACM on Human-Computer Interaction*, 1(CSCW), doi:10.1145/3134696

Luke, L., Clare, I. C. H., Ring, H., Redley, M., Watson, P. (2012). Decision-making difficulties experienced by adults with autism spectrum conditions, *Autism*, 16(6), 612–621.

March E, Springer J (2019) Belief in conspiracy theories: The predictive role of schizotypy, Machiavellianism, and primary psychopathy. PLOS ONE 14(12): e0225964, doi: 10.1371/journal.pone.0225964

Marchlewska, M., Cichocka, A., and Kossowska, M. (2018) Addicted to answers: Need for cognitive closure and the endorsement of conspiracy beliefs. European Journal of Social Psychol., 48: 109– 117, doi: 10.1002/ejsp.2308.

Moritz, S., Endlich, L., Mayer, H., Andreou, C., Ramdani, N., Petermann, F., & Balzan, R. P. (2015). The benefits of doubt: cognitive bias correction training reduces hasty decision-making in schizophrenia. Cognitive Therapy and Research, 39, 627-635

Moritz, S., Favrod, J., Andreou, C., Morrison, A. P., Bohn, F., Veckenstedt, R, Karow, A. (2013). Beyond the Usual Suspects: Positive Attitudes Towards Positive Symptoms Is Associated With Medication Noncompliance in Psychosis. Schizophrenia Bulletin, 39(4), 917–922. Doi:10.1093/schbul/sbs005

Narayan, B & Preljevic, M (2017). An information behaviour approach to conspiracy theories: listening in on voices from within the vaccination debate. *Information Research*, 22(1), CoLIS paper 1616. Retrieved from http://InformationR.net/ir/22-1/colis/colis1616.html

Nisa, C.F., Bélanger, J.J., Schumpe, B.M., Faller, D.G. (2019). Meta-analysis of randomised controlled trials testing behavioural interventions to promote household action on climate change, *Nature Communications*, 10, doi.org/10.1038/s41467-019-12457-2

Oliver, J. E., & Wood, T. J. (2014a). Conspiracy theories and the paranoid style(s) of mass opinion*, American Journal of Political Science*, doi:10.1111/ajps.12084.

Oliver, J. E., & Wood, T. J. (2014b). Medical conspiracy theories and health behaviours in the United States. *JAMA Internal Medicine*. Doi: 10.1001/jamainternmed.2014.190

Pytlik, N., Soll, D., & Mehl, S. (2020). Thinking preferences and conspiracy belief: Intuitive thinking and the jumping to conclusions-bias as a basis for the belief in conspiracy theories. *Frontiers in Psychiatry*, 11 doi:10.3389/fpsyt.2020.568942

Ross, R.M., Bjoern, H., McKay, R., (2017) Analytic cognitive style predicts paranormal explanations of anomalous experiences but not the experiences themselves:

Implications for cognitive theories of delusions. *Journal of Behaviour Therapy and Experimental Psychiatry* 56, pages 90-96. DOI:10.1016/j.jbtep.2016.08.018

Sommer, M., Döhnel, K., Jarvers, I., Blaas, L., Singer, M., Nöth, V., Schuwerk, T., & Rupprecht, R. (2018). False Belief Reasoning in Adults with and without Autistic Spectrum Disorder: Similarities and Differences. *Frontiers in psychology,* 9, 183, doi: 10.3389/fpsyg.2018.00183

Spohr, D. (2017). Fake news and ideological polarization: Filter bubbles and selective exposure on social media. Business Information Review, 34(3), 150–160, doi: 10.1177/0266382117722446

Ståhl, T., & van Prooijen, J. W. (2018). Epistemic rationality: Skepticism toward unfounded beliefs requires sufficient cognitive ability and motivation to be rational. Personality and Individual Differences, 122, 155-163. https://doi.org/10.1016/j.paid.2017.10.026

Swami, V. (2012). Social psychological origins of conspiracy theories: The case of the Jewish conspiracy theory in Malaysia, *Frontiers in Psychology*, 3, 280, doi: 10.3389/fpsyg.2012.00280.

Swami, V. (2014b). Political paranoia and conspiracy theories. *Power, politics, and paranoia: Why people are suspicious of their leaders* (pp. 218-236) doi:10.1017/CBO9781139565417.016

Swami, V., Barron, D., Weis, L., Voracek, M., Stieger, S., & Furnham, A. (2017). An examination of the factorial and convergent validity of four measures of conspiracist ideation, with recommendations for researchers. *PLOS ONE*, 12, e0172617. doi:10.1371/journal.pone.0172617

Swami, V., Chamorro-Premuzic, T., & Furnham, A. (2010). Unanswered questions: A preliminary investigation of personality and individual difference predictors of 9/11 conspiracist beliefs, *Applied Cognitive Psychology,* 24, 749–761, doi:10.1002/acp.1583.

Swami, V., & Coles, R. (2010). The truth is out there: Belief in conspiracy theories. *The Psychologist*, 23, 560–563.

Swami, V., Coles, R., Stieger, S., Pietschnig, J., Furnham, A., Rehim, S., et al. (2011). Conspiracist ideation in Britain and Austria: Evidence of a monological belief system and associations between individual psychological differences and real-world and fictitious conspiracy theories. *British Journal of Psychology*, 102, 443–463, .doi: 10.1111/j.2044-8295.2010.02004.x.

Swami V., Furnham A., Smyth N., Weis L., Lay A., Clow (2016) A. Putting the stress on conspiracy theories: Examining associations between psychological stress, anxiety, and belief in conspiracy theories. *Personality and Individual Differences*, 99:72–76. doi: 10.1016/j.paid.2016.04.084

Swami, V., Voracek, M., Stieger, S., Tran, U. S., & Furnham, A. (2014a). Analytic thinking reduces belief in conspiracy theories. *Cognition, 133*(3), 572-585. doi:10.1016/j.cognition.2014.08.006

Umam, A. N., Muluk, H., & Milla, M. N. (2018). The need for cognitive closure and belief in conspiracy theories: An exploration of the role of religious fundamentalism in cognition, DOI: 10.1201/9781315225302-79

Van Elk, M. (2015). Perceptual biases in relation to paranormal and conspiracy beliefs. *PLoS ONE*, 10(6) doi:10.1371/journal.pone.0130422

van der Tempel, Jan & Alcock, James. (2015). Relationships between conspiracy mentality, hyperactive agency detection, and schizotypy: Supernatural forces at work?. *Personality and Individual Differences.* 82. Doi:10.1016/j.paid.2015.03.010.

Van Prooijen J.W. -. (2014). Power, politics, and paranoia: Why people are suspicious of their leaders. Cambridge: Cambridge University Press.

van Prooijen, J.W. -. (2017). Why education predicts decreased belief in conspiracy theories. *Applied Cognitive Psychology, 31*(1), 50-58. doi:10.1002/acp.3301

van Prooijen, J.W. -., & Douglas, K. M. (2018). Belief in conspiracy theories: Basic principles of an emerging research domain. *European Journal of Social Psychology,* doi:10.1002/ejsp.2530

van Prooijen, J. W. (2017). Why education predicts decreased belief in conspiracy theories. Applied Cognitive Psychology, 31, 50–58, doi: 10.1002/acp.3301.

van Prooijen, J. W., & Douglas, K. M. (2018). Belief in conspiracy theories: Basic principles of an emerging research domain. European Journal of Social Psychology, 48, 3.

Van Prooijen, J.-W. , Krouwel, A. P. M. , & Pollet, T. (2015). Political extremism predicts belief in conspiracy theories. Social Psychological and Personality Science, 6, 570–578. DOI:10.1177/1948550614567356.

Van Prooijen, J. -., & Van Dijk, E. (2014). When consequence size predicts belief in conspiracy theories: The moderating role of perspective taking. *Journal of Experimental Social Psychology, 55*, 63-73. doi:10.1016/j.jesp.2014.06.006

Warman, D.M., Lysaker, P.H., Martin, J.M., (2007) Cognitive insight and psychotic disorder: The impact of active delusions, *Schizophrenia research,* doi:10.1016/j.schres.2006.09.011

Woodward, N. D., Duffy, B., & Karbasforoushan, H. (2014). Response selection impairment in schizophrenia transcends sensory and motor modalities. *Schizophrenia Research*, *152*(0), 446–449, doi: 10.1016/j.schres.2013.11.038

Williams, D. L., Mazefsky, C. A., Walker, J. D., Minshew, N. J., & Goldstein, G. (2014). Associations between conceptual reasoning, problem solving, and adaptive ability in high-functioning autism. *Journal of autism and developmental disorders*, 44(11), 2908–2920, doi: 10.1007/s10803-014-2190-y

Wilson, Andrew. (2018). #whitegenocide, the Alt-right and Conspiracy Theory: How Secrecy and Suspicion Contributed to the Mainstreaming of Hate, doi: https://scholarworks.sjsu.edu/secrecyandsociety/vol1/iss2/1

Zhang, L., Tang, J., Dong, Y., Ji, Y., Tao, R., Liang, Z., Chen, J., Wu, Y., & Wang, K. (2015). Similarities and Differences in Decision-Making Impairments between Autism Spectrum Disorder and Schizophrenia. Frontiers in behavioral neuroscience, 9, 259, doi: 10.3389/fnbeh.2015.00259

Zhou, H. Y., Yang, H. X., Gong, J. B., Cheung, E., Gooding, D. C., Park, S., & Chan, R. (2019). Revisiting the overlap between autistic and schizotypal traits in the non-clinical population using meta-analysis and network analysis. Schizophrenia research, 212, 6–14. Doi: 10.1016/j.schres.2019.07.05

Chapter 5: Study Three

5.1 Preface for Study Three

The results of Study Two suggested that analytical thinking may be a context-dependent protective factor against conspiracy theory beliefs. Whilst the encouragement of a more systematic approach can reduce these erroneous beliefs, this may not be true for people with autistic traits. The results showed that some people who show a preference for analytical thinking and demonstrated high autistic traits, were more likely to engage in narrow-ranged information searching, or, what we termed as 'rabbit-hole' thinking, and, in turn, are more likely to hold a confirmation bias towards information that reinforces conspiracy beliefs. It could then be suggested perhaps a skillset that may more relevant would be the application of logical or critical reasoning to conspiracy accounts, rather than the preference for a more systematic approach to information gathering.

Study three built upon such previous work by examining whether scientific and logical reasoning measures are more valid protective factors against conspiracy beliefs than conventional measures of analytical thinking. In this study participants completed both standard self-report measures of analytical thinking as in previous work, measures which capture the relevant clinical factors (i.e. schizotypal traits) and conspiracy theory beliefs, and, additional performance tasks which capture scientific reasoning ability and belief flexibility (i.e. Bias Against Disconfirmatory Evidence task). The use of such performance tasks is able differentiate between self-reported scores of 'analytical thinking ability' and perhaps a more accurate, objective application of relevant reasoning skills among participants. Analysis included both a correlational analysis, and multiple regression analysis to assess scientific reasoning performance as a predictor of conspiracy beliefs whilst controlling for the aforementioned self-report predictors of conspiracy theory beliefs.

5.2 Statement of Authorship

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Principal Author

Name of Principal Author (Candidate)	Neophytos Georgiou		
Contribution to the Paper	Study concept and design, data collection, statistical analyses, writing manuscript.		
Overall percentage (%)	80		
Certification:	This paper reports on original research I conducted during the period of my Higher Degree by Research candidature and is not subject to any obligations or contractual agreements with a third party that would constrain its inclusion in this thesis. I am the primary author of this paper.		
Signature		Date	28/02/2023

Co-Author Contributions

By signing the Statement of Authorship, each author certifies that:

vii. the candidate's stated contribution to the publication is accurate (as detailed above).

viii. permission is granted for the candidate in include the publication in the thesis; and

ix. the sum of all co-author contributions is equal to 100% less the candidate's stated contribution.

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Contribution to Paper	Secondary Supervision, advice about study concept and design, manuscript proof-reading.		
Signature		Date	28/02/2023

Conspiracy Theory Beliefs, Scientific Reasoning, and the Analytical Thinking Paradox

by

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5.3 Abstract

Although many psychopathological and sociological factors have been implicated in the development of conspiracy theory (CT) beliefs, analytical thinking has been considered a key protective factor. However, it is not clear if engaging in systematic or rigorous information searching is always protective, particularly if this involves a confirmation bias or a lack of scientific reasoning. For example, higher scores on autistic traits, which are commonly associated with a tendency to engage in systematic information searching, have been found to be associated with stronger endorsement of CT beliefs. Here, we investigated whether measures of analytical reasoning need to be refined to focus specifically on scientific reasoning, as analytical thinking has recently shown a positive association with conspiracy beliefs. A total of 565 adults with varying levels of autistic traits, completed measures of CT beliefs, standard analytical reasoning and information searching measures, but also measures of scientific reasoning and belief flexibility (using the Bias Against Disconfirmatory Evidence or BADE task). We found that standard measures of analytical thinking and active-open minded thinking were positively associated with CT beliefs and autistic traits. Conversely, higher levels of scientific reasoning and belief flexibility were negatively associated with CT beliefs, autistic and schizotypal traits. The findings encourage the use of more focused measures of logical and scientific reasoning in both psychoeducation interventions and future research relating to CT beliefs.

5.4 Introduction

International opinion polls suggest that conspiracy theory (CT) beliefs are now more widely embraced across western countries than ever, with recent events such as the COVID-19 protests and Capitol riots being strong outward manifestations of these belief systems (Depoux et al., 2020; Georgiou et al., 2020; O'Connell et al., 2021; Sallam et al., 2021; Uddin et al., 2021; YouGov-Cambridge Globalism Project, 2020). Although CTs offer sometimes intriguing narratives of events (e.g. the JFK assassination by multiple actors), they are usually false and can lead to unjustified mistrust of authorities, rejection of vaccinations and harmful or hurtful rejection of crimes against humanity (Douglas et al., 2015; Jolley & Douglas, 2017; Georgiou et al., 2020). As a result, an increasing body of research has sought to understand the factors that contribute to CT beliefs.

Two principal lines of explanation have emerged to explain the formation of these belief systems (Denovan et al., 2020; Goreis & Voracek, 2019). The first view is that CT beliefs have strong sociological determinants. People who feel threatened, disenfranchised, who are exposed to corrupt or authoritarian governments tend to be more prone to CT beliefs. Such beliefs have also been found to be more common in people with lower levels of education, exposure to scientific training, or who are positioned at the more extreme ends of the political spectrum (Bowes et al., 2020; Lantian et al., 2021, in press; Pennycook, Fugeslsang & Koehler, 2015; Pytlik, Sol & Mel, 2020; van Prooijen, 2016; 2018). However, these explanations do not account for significant differences between people exposed to similar sociological conditions.

Accordingly, a second line of research has sought to identify individual differences or psychopathological variations that make certain individuals more prone to CTs than others.

Some examples of variables that have been studied include schizotypy and autism traits (Barron et al., 2018; Denovan et al., 2020; Georgiou et al., 2019: 2021, in press; Swami et al., 2016). From this research, it has been concluded that schizotypal traits (such as a pronounced tendency to engage in odd or magical thinking) and autistic traits (such as an excessive focus on particular details of events rather than the totality of evidence) may both promote CT beliefs (Barron et al., 2014: 2018; Dagnall et al., 2016: 2017; Denovan et al., 2020; Georgiou et al., 2019: 2020). Such traits make it difficult to separate truthful from fictitious information. This can lead to difficulties in adequately integrating evidence, particularly disconfirmatory evidence, which may ultimately lead to belief rigidity or inflexibility (Balzan et al., 2016; Eisenacher et al., 2016; Georgiou et al., 2021, in press; Moritz et al., 2013; Warman et al., 2007; Woodward et al., 2014).

These findings have led to research into factors that might reduce susceptibility to CT beliefs, with variations in information processing often being a focus of investigation. Particular focus has been drawn to the relationship between schizotypal and autistic traits and a person's tendency to engage in *analytical thinking*, defined as the ability to extract information and develop workable solutions for problems identified (Epstein & Norris, 2011). For example, Barron et al. (2018) suggested that the relationship between schizotypal traits (i.e. odd or magical thinking) and CT beliefs may be mediated by a person's tendency to engage in analytical thinking. Subsequent research has found people scoring highly on measures of schizotypy and CT beliefs, and lower on measures of analytical thinking, were (a) more likely to rely on an intuitive, self-referential thinking style, and (b), demonstrate a stronger sense of self-certainty regarding their beliefs (Cavajova et al., 2019; Georgiou et al., 2019, 2021; Mikuskova & Vacojova, 2020; Pennycook & Rand, 2019; van Prooijen & Milošević-Đorđević; 2020).

Despite these findings, there is some evidence to suggest that analytical processing may not always be a protective factor. Although people may often engage in a form of *analytical thinking* (e.g., systematically seek out a lot of evidence; Epstein & Norris, 2011), there are instances where this process may be undertaken inefficiently and in a biased or unscientific way (Stahl & van Prooijen, 2018; Lantian et al., 2021, in press). For example, while autistic traits have been associated with a greater tendency to engage in analytical thinking (i.e., a tendency to collect large amounts of information or "fact collecting") and strong logical and problem solving abilities (Brosnan, Lewton & Ashwin, 2016; Williams et al., 2014: 2018), this is often performed with a narrow and rigid focus (Schriber, Robins & Solomon, 2014; Stevenson, Toulmin & Youm, 2017). As a result, the preference to engage in analytical thinking may not always lead to a greater ability to appraise evidence in a balanced way. In fact, Georgiou et al. (2021, in press) recently found that analytical thinking, paradoxically, was *positively* associated with CT beliefs among people with autistic traits. One potential reason for this finding is that the typical measurement batteries of analytical thinking (e.g. the REIm Inventory, Epstein & Norris, 2011) appear to focus more on items that capture the ability to *extract* information, rather than the ability to gather scientifically valid information and adequately interpret evidence to solve problems (Cavajova et al., 2019; Georgiou et al., 2021b, in press).

These potential limitations of analytical reasoning measures have led to a greater focus on the role of other cognitive skills that may be associated with CT beliefs, such as self-reported critical thinking ability and active open-mindedness (Lantian et al., 2021, in press; Pennycook et al., 2020). It has been suggested that the ability to avoid beliefs such as CTs may be more dependent on an individual's ability to *critically and scientifically assess* the validity of information, rather than simply 'seeking out' more information. Such skills are

particularly germane to social media environments, where there is no shortage of information available (Ecreg et al., 2020; Pennycook et al., 2019a: 2019b; Pennycook & Rand, 2021). Accordingly, it may be more important to focus on an individual's ability to engage in scientific reasoning, a problem-solving process that involves critical thinking in relation to content, procedural, and epistemic knowledge (Barz & Achimaş-Cadariu, 2016). Measures of scientific reasoning (e.g., The Scientific Reasoning Scale; Drummond and Fischhoff, 2017), are believed to better capture this key aspect of analytical thinking (i.e. an individual's ability to determine the validity of information). In support of this view, Čavojová, Šrol, & Ballová Mikuskova (2020) suggests measures of this nature are stronger independent predictors of unfounded beliefs than standard measures of analytical thinking. However, little research has been conducted into whether variations in specific scientific reasoning skills might specifically protect people from CT beliefs and whether this knowledge is protective for people who have traits (i.e. autistic or schizotypy), that make them more prone to CT beliefs.

5.4.1 The Present Study

The aim of the present study was to examine whether scientific reasoning is a more valid protective factor against CT beliefs than conventional constructs of analytical thinking, which are usually more focused on information gathering than the application of logical or critical reasoning. In particular, we examined the association between CT beliefs, scientific reasoning, and belief flexibility. The Bias Against Disconfirmatory Evidence (BADE) task and the Active-Open Minded Thinking scale were used to capture belief flexibility. We anticipated that scientific reasoning scores would have a stronger negative association with CT beliefs, schizotypal and autistic traits, and the BADE task than scores on analytical thinking as measured by the REIM - R. We also included measures of self-reported information seeking previously used in Georgiou et al. (2021, in press), which captures the

level and intensity of information gathering an individual does. A strong association between these information seeking measures and analytical thinking may support the presented critiques regarding how analytical thinking is commonly measured, as they do not capture the ability to *extract* information, or to adequately interpret its validity.

Consistent with previous work (Georgiou et al., 2019; 2021a, 2021b), it was hypothesised that: (a) both schizotypy and autistic traits would be positively related with CT beliefs; (b) higher levels of CT beliefs would be positively associated with a bias against disconfirmatory evidence; (c) the intensity of self-reported information seeking would be positively associated with CT beliefs; and (d) scientific reasoning scores would be negatively associated with CT beliefs and have a stronger negative relationship than a conventional measure of analytical reasoning (mostly based on being systematic and searching for evidence). The study also controlled for level of education due in part to its association with socio-cognitive factors previously discussed and previous research suggesting it as a protective factor against CT beliefs (Swami et al., 2014; van Prooijen, 2015; Darwin, Neave & Homes, 2011).

5.5 Method

5.5.1 Participants

The study involved a total of 565 participants from an international panel drawn from Prolific (355 men, 208 women, 2 did not state) aged between 18 and 80 years (M = 27.51, SD = 12.20) from a range of countries: 61% from the US, UK, Canada and Australia and the remainder principally from continental Europe. Previous clinical diagnosis was requested in the survey to determine whether participants who scored highly on either schizotypy or autistic traits, have already been diagnosed the relevant clinical conditions (i.e. Autism Spectrum Disorder, Schizophrenia). It was found that 136 (24.1%) of the population had received a formal diagnosis of a mental health disorder; only 3 (.02%) were diagnosed with Autism Spectrum Disorder. A total of 260 (46%) reported having completed a university or college degree; 145 (25.7%) had started higher education; 91 (16.1%) had completed high school; and, 12 (2.1%) had not completed high school. *Gpower* analysis indicated that at least 200 cases would be sufficient to achieve power of 0.80 for a multiple regression with 10 predictors and anticipated R-squared value of 0.30.

5.5.2 Sampling Procedure

The study used an international panel sample drawn from Prolific.Inc and was advertised as an investigation into how people react to the different events that happen in the world. All participants received a small monetary compensation (around $US5) for their time and effort (around 20-25 minutes). The data retrieved was made anonymous and only presented in group form.

5.5.3 Study Design

The study was conducted entirely online. Participants completed several demographic questions, including items which screened for prior clinical diagnosis, such as 'Have you previously received a formal diagnosis of a mental health disorder?', and, a range of psychological, and, two cognitive assessment tasks. The study was approved by the Human Research Ethics Subcommittee in the University of Adelaide's School of Psychology as a low risk application.

5.5.4 Measures

5.5.4.1 Demographic background and situation

Participants were asked to provide demographic information, including: gender, age, country of residence, highest education level, current employment status, and, prior history of clinical diagnosis.

5.5.4.2 Analytical Thinking (REIm – R)

The REIm is a 42-item self-report measure developed by Epstein and Norris (2011), which contains a 12-item subscale that measures tendencies to engage in analytical thinking (REIm-R), and a 30- item subscale that measures tendencies towards the use of an experiential and intuitive thinking style (REIm-E/I). Within the current study, solely the REIm-R was used as solely analytical thinking was of conceptual relevance to this study. All items are rated on a 5-point scale from 1 (*Strongly disagree*) to 5 (*Strongly Agree*). The REIm-R has been shown to have good psychometric properties (Epstein & Norris, 2011; Georgiou et al., 2019; Swami et al., 2017). The Cronbach's Alpha for the present study was 0.80.

5.5.4.3 Specific information-seeking

As used in previous research (Georgiou et al., 2021d, in press; 2021b, in press), participants were asked how often they gather information online about specific topics of their interest and what sources they use to do so. This was in order to gauge the consistency and intensity of their information searching in relation to specific topics. Sources included: TV News Programming, Social Media (E.g. Facebook, Twitter), Scientific-Based News Websites, Internet Forums (E.g. Reddit, Quora), Internet News Sites (E.g. The Guardian), and other Internet Information Websites. The frequency of use was captured on a scale of 1 (Never) to 7 (Almost Continuously throughout the day). Participants were classified as high users if they scored 6 or 7 across all information sources. Cronbach's alpha was .80.

5.5.4.4 Information Seeking Behaviour

Also used in previous research (Georgiou et al., 2021d, in press; 2021b, in press) participants were asked questions to gather the context of their information seeking behaviour and, in particular, its frequency, intensity and focus. Four questions were asked: 'Do you ever find yourself researching multiple topics because they are somehow connected', 'Do you ever find yourself trying to find as much evidence as possible to back up your beliefs on a specific topic', 'Do you ever research a specific topic as much as possible because you feel that the mainstream view on the topic is wrong?', 'Do you ever find yourself researching a specific topic for an extended period of time?'. Each question was measured on a scale from 1 (Never) to 5 (Always), with those users who scored 4 or 5 across all items considered to have a highly focused interest in a topic. Cronbach's alpha was .82.

5.5.4.5 The Autism-Spectrum Quotient Short-Form (AQ - 10)

The AQ – 10 is a shortened, 10-item version devised by Hoekstra et al. (2011) of the original 50-item, self-administered instrument by Baron-Cohen (2001), designed to measure

the degree to which an adult with normal intelligence has the traits associated with the autistic spectrum. Each item allows the participant to indicate “definitely disagree”, “slightly disagree”, “slightly agree” or “definitely agree”. Likert scoring the above options from 1-4 was used based on the recommendations of Stevenson and Hart (2017). These authors suggested that Likert scoring yielded higher internal consistency and test-retest reliability when administered to populations which were predominately neurotypical (i.e. College Students), and, has further been validated in the use of general population in more recent research concerning Autistic traits and CT belief (Georgiou et al., 2021a). The Cronbach’s Alpha was 0.77.

5.5.4.6 Multidimensional Schizotypy Scale – Brief (MSS-B)

The MSS-B is a 38-item assessment developed by Gross et al. (2018) as an abbreviated form of the 77-item original scale formed by Kwapil et al. (2017) which measures positive, negative and disorganized traits of schizotypy. All items were rated on 1 (Completely Disagree) to 5 (Completely Agree). The MSS – B has been found to have very good psychometric properties in diverse populations, including recent research concerning CT beliefs (Kemp et al., 2020; Georgiou et al., 2021a: 2021b). The Cronbach’s Alpha for the present study was 0.93.

5.5.4.7 The Generalised Conspiracy Beliefs Scale (GCBS)

This measure, developed by Brotherton (2013), captures whether people tend to perceive the world form a conspiratorial perspective and focuses less on specific beliefs (Brotherton et al., 2013; Swami et al., 2018). Items are scored from 1 (Definitely not true) to 5 (Definitely true) to yield an overall score between 15 and 75 (higher scores reflect greater conspiracy ideation). The Cronbach’s Alpha for the present study was good in this sample was 0.92.

5.5.4.8 COVID-19 conspiracy beliefs (COVID – 9)

Developed by Georgiou et al. (2020), the COVID – 9 measures an individual's beliefs in conspiracy theories particularly focussed on the COVID-19 pandemic. This scale contains theories that are more current compared to other available psychometric measures (i.e. BCTI; Swami et al., 2018) and, in turn, may capture people's level of conspiracist ideation, less so reliant on their familiarity with the CT content. Participants responded on a 7-point scale ranging from 1= strongly disagree to 7= strongly degree, the extent to which they endorsed each statement. Statements included items relating to whether the virus had escaped from a lab and was a bioweapon, whether bodies had been secretly burned in China, the involvement of Bill Gates, the availability and suppression of an existing vaccine. The Alpha for this scale was good .89.

5.5.4.9 Cognitive Task: The Scientific Reasoning Scale (SRS)

Scientific reasoning skills were measured using the SRS developed by Drummond and Fischhoff (2017) and applied in the context of CT beliefs by Cavajova et al. (2020). The SRS consists of 11 short scenarios, which test participants' knowledge of basic scientific concepts, such as confounding variables, control group effects, or random assignment to conditions. For example, a scenario measuring a person's understanding of the concept of confounding variables states: 'A research project has subjects put together a jigsaw puzzle either in a cold room with a loud radio or in a warm room with no radio. Subjects solve the puzzle more quickly in the warm room with no radio'. Each scenario is then follow by a statement, and participants are asked to indicate whether it is true or false: 'The scientist cannot tell if the radio caused subjects to solve the puzzle more slowly'. In this study, we included a third option "I don't know" to reduce the probability of randomly guessing at the

correct answer. The SRS score was computed by summing the correct answers to 11 items. The Alpha of these items was .88.

5.5.4.10 Belief Flexibility: Active Open Minded Thinking Beliefs (AOT – 7) Scale

The AOT is a 7-item short-form abbreviation of the original 41-item scale developed by Stanovich & West (2007) that assesses the tendency of an individual to weigh new evidence against a favoured belief, to spend sufficient time on a problem before giving up, and, to consider carefully the opinions of others in forming one's own belief. The 7-item short form developed by Haran et al. (2013), best suited the current study with consideration of the overlap of questioning with other related measures used (i.e. the REIm- 42). The Cronbach's Alpha for the present study was .80.

5.5.4.11 Belief Flexibility: The Bias Against Disconfirmatory Evidence (BADE) 16-Item Task

Originally devised by authors Woodward, Moritz, and Chen (2006) and Woodward, Moritz, Cuttler, and Whitman (2006). The BADE consists of a possible 16 written delusion-neutral scenarios which can assess an individual's persistence to hold certain beliefs in the face of disconfirmatory evidence. Of the 16 written scenarios, 8 were used in the current study. The BADE assessment involves participant ratings of the plausibility of four statements for their fit to a specified scenario, which is based on a single piece of information (i.e. "Jenny can't fall asleep"). Each scenario had one true interpretation, two lure interpretations and one absurd interpretation from the four statements. The plausibility of the four interpretations are rated for each scenario from a scale of 0 (Poor) to 100 (Excellent).

Each scenario starts with the statement (e.g., "Jenny can't fall asleep") and participants rate the 4 statements provided. After this initial round of ratings, a second piece

of information is displayed (i.e. “Jenny can’t wait until it is finally morning”). The participants then rate the four statements again. This is repeated with a third and final piece of information (i.e. “Jenny wonders how many presents she will find under the tree”). The true interpretation (“Jenny is excited about Christmas morning”) appears uncertain initially, but becomes clearer as additional information is revealed (e.g., “Jenny is nervous about her exam the next day”), which should prompt the participant to update their choices. Meanwhile, the lure interpretations appear plausible initially, but become increasingly less implausible as additional information is revealed (e.g., “Jenny loves her bed”). Of the 8 trials, three were ‘fillers’ where the true interpretation appears to be plausible after the first statement is presented, which reduces the tendency for participants to develop a response strategy of identifying the ‘true’ interpretation from the outset; these filler trials were not analysed.

5.5.5 Statistical Analysis

Examination of the data suggested all variables were normally distributed and parametric assessment was suitable. Analysis was conducted using version 27 of IBM SPSS Statistics software. Pearson *r* correlation analysis was used to examine the relationship between performance on the BADE and the psychometric measures of this study.

BADE calculations followed the methods recommended in the meta-analysis conducted by McLean, Mattiske, & Balzan (2017), Eisenacher and Zink (2017b), Prike, Arnold and Williamson (2018), and, Georgiou et al., (2021b). First, BADE was calculated by examining the difference between the first lure ratings and final lure ratings across the scenarios. The values capture the decrease in endorsement of the lures following the presentation of additional disconfirmatory evidence. A greater decrease indicates a smaller BADE effect. Second, we calculated a BACE (Bias Against Confirmatory Evidence) metric

by calculating the difference between ratings for the third and first true ratings across all scenarios (True3 – True1). Smaller values indicate greater BACE and that participant endorsement of truthful statements did not increase as strongly in the face of additional evidence in favour of a new hypothesis. One would therefore expect these scores to have a negative association with CT beliefs, and psychopathological factors (i.e. autistic and schizotypal traits) that are hypothesised to capture a greater BADE effect. We also calculated a measure of 'liberal acceptance' based on the mean of the absurd ratings across all scenarios to capture how willing participants were to endorse absurd or generally implausible interpretations. Liberal acceptance was expected to positively correlate with belief measures.

A final metric was an evidence integration score. This was based on the sum of the ratings given to absurd ratings, the erroneous statements at the third administration and by subtracting the rating of the final true statement. Evidence Integration = [Absurd rating at statement 1 + Absurd rating at statement 2 + absurd rating at statement 3 + Neutral lure rating at statement 3 + emotional lure rating at statement 3] + [True rating at statement 3 x – 1]. Higher scores on this measure indicate poorer Evidence Integration (Sanford et al., 2014).

Pearson correlation analysis was used to examine the relationship between the principal measures. Multiple regression was then used to examine whether evidence integration scores on the BADE correlated with CT beliefs (i.e. COVID – 9, GCBS scores), after controlling for socio-cognitive and psychopathology measures.

5.6 Results

5.6.1 Data Screening

Despite some deviations from normality, the data was determined suitable for parametric testing. Two scores on the MSS – B were found to be outliers (i.e. 2.5. above the standard deviation) and were excluded because of their potential influence on exaggerated effect sizes. Once removed, analysis was then conducted using IBM SPSS v 27.

5.6.2 Descriptive Statistics: psychometric and demographic measures

Table 9 and Table 10 summarises the descriptive results for the different measures. In terms of cognitive thinking style, the sample had a relatively high preference for rational thought processing (type 2), and active open minded thinking was above the midpoint of the scale. A considerable number of the sample had received a prior clinical diagnosis (136; 24.1%), with 80 (14.1%) of the sample scoring above the clinical cut-off score for Autism Spectrum Quotient. Schizotypy (MSS – B) scores generally were in the middle range of the scale, with negative schizotypal traits above the midpoint, whilst, disorganized and positive schizotypal traits fell below the midpoint of the scale. Endorsement of general conspiracy beliefs and COVID-19 related conspiracy beliefs fell below the midpoint of both scales. Overall, the sample showed modest scores on psychopathological traits investigated, and was not strongly in support of conspiracy beliefs. One-way ANOVA indicated no demographic differences in CT beliefs that might need to be controlled in subsequent studies (e.g. age, gender, or level of education differences).

Table 9
Demographic Characteristics of sample (n = 565)

	N (%)
Gender	
Male	355 (62.8)
Female	207 (36.6)
Not stated	3 (0.5)
Age	
18-24	236 (41.8)
25-34	188 (33.3)
35-44	80 (14.2)
45-54	29 (5.1)
55-64	25 (4.4)
65+	7 (1.2)
Country	
Oceania	19 (3.8)
United Kingdom	181 (37.9)
United States of America	92 (16.2)
Canada	46 (9.1)
Other continental Europe	104 (20.6)
Rest of the World (Nations with, N < 5)	123 (21.7)
Education	
University Degree	307 (54.3)
Some College	143 (25.3)
High School Only	77 (13.6)
Less than high school	38 (6.7)
Employment Status	
Working (as employee)	242 (42.8)
Self- Employed	51 (9.0)
Temporarily off work	30 (5.3)
Looking for work	115 (20.3)
Other	127 (21.0)
Clinical History	
Received Prior Diagnosis	136 (24.1)
No formal diagnosis or suspected mental health complication	429 (75.9)

Table 10
Descriptive statistics for measures in Study Three

	N (%)	Range of Participant Scores (Range)
ASD - 10 Total	11.412 (8.21)	3 – 39 (0 – 40)
MSS – B Total	82.21 (24.00)	44-166 (38-190)
Disorganized	22.46 (8.47)	13-60 (13-65)
Negative	34.10 (6.02)	17-59 (13-65)
Positive	23.61 (9.29)	12-58 (12-60)
REIm – R (AT)	38.92 (3.52)	22 – 47 (10 – 50)
AOT	25.48 (2.17)	13 – 43 (7 – 49)
Specific Information Seeking	21.56 (5.899)	6 – 42 (6 – 42)
Information Seeking Behaviour	13.88 (2.950)	5 -20 (5 – 20)
GCBS Total	36.99 (14.82)	17-73 (15-75)
COVID – 9 Total	24.61 (10.171)	9 – 54 (7 -63)

5.6.3 Correlation Analysis: Socio-cognitive style, Psychopathological factors, CT beliefs and, Scientific Reasoning Skills

Pearson correlations are presented in Table 11. Higher levels of analytical thinking and active-open minded thinking scores were positively correlated with CT beliefs. Also, analytical thinking and active-open minded thinking were positively correlated with a higher level of information seeking behaviour, and, a higher level of specific information seeking behaviour, which, in turn, were also positively correlated with CT beliefs. A stronger tendency to engage in analytical thinking, active open-minded thinking, and both the amount and specificity of information seeking behaviour were all negatively correlated with scientific reasoning skills which, in turn, was negatively correlated with both measures of CT beliefs. Consistent with our hypothesis, all dimensions of schizotypal and autistic traits were positively correlated with both CT belief measures and negatively associated with scientific reasoning skills. In other words, higher scores on scientific reasoning skills was associated with less endorsement of CT beliefs and the other factors associated with CT beliefs.

Table 11

Pearson's Correlation analysis between all psychometric measures

	1	2	*3*	*4*	5	6	7	8	9	10	11
1. ASD											
2. AOT	.101**										
3. AT	.334**	.319**									
4. Focussed Info (rabbit)	.188**	.081	.240*								
5. Level of Info	.193**	.223**	.198**	.420*							
6. MSS - P	.109*	.325**	.193**	.143*	.361*						
7. MSS - N	.020	.263**	.214**	-.007	.124*	.505**					
8. MSS - D	-.116*	-.116*	.138*	.037	.151*	.590**	.559**				
9. GCBS	.194**	.139*	.005	.204**	.163*	.258**	.198*	.141**			
10. COVID 9	.160*	.216*	.103**	.111*	.099*	.282**	.281**	.272**	.672**		
11. SRS	-.176**	-.244**	-.016	-.198**	-.117**	-.134**	-.063	-.338**	-.263**	-.296**	

Note: *p <.05(two-tailed), **p <.01(two-tailed), ASD = The Autism Spectrum Quotient- Short Form; MSS = The Multidimensional Schizotypy Scale -Brief; REIm – R = Analytical Thinking, AOT = Active Open Minded Thinking, GCBS = Generalised Conspiracy Beliefs Scale; COVID - 9 = Beliefs in COVID – 19 related Conspiracy Theory Inventory, SRS = Scientific Reasoning Task Performance.

5.6.4 Correlation Analysis: Performance on the BADE Task

Table 12 summarises the correlation between the different BADE derived measures, scientific reasoning scores, and the psychometric measures. BADE scores via lure items showed a similar pattern of results, in that those who scored highly on psychological measures (i.e. autistic, schizotypal traits), measures of analytical thinking, active-open minded thinking, and, CT beliefs, were less likely to update their endorsement of lure interpretations in the face of disconfirmatory evidence. Similar patterns were found on BACE scores, in that those who scored highly on autistic traits, and conspiracy beliefs were less likely to update their endorsement of the true interpretations, whereas those scoring highly on scientific reasoning skills were more likely to update their endorsement.

Liberal acceptance was positively associated with both psychopathological factors, and CT belief measures, suggesting such factors were associated with a tendency to more readily accept or endorse implausible hypotheses. Finally, the Evidence Integration measure was positively associated with both psychopathological factors, active-open minded thinking, and, both measures of CT beliefs, whilst scientific reasoning showed a negative association. In other words, those with greater scientific reasoning skills showed a greater ability to integrate new evidence and endorse the true interpretation.

Table 12
Correlation of BADE-derived metrics and self-report measures

	Liberal acceptance	BACE	BADE	Evidence Integration
ASD	.131**	-.040*	-.102**	.140*
Schizotypy	.210**	-.027	-.107**	.151**
REIm - R	.052	.026	.044	-.014
AOT	.001	.021	-.046*	.102*
GCBS	.096*	-.090*	-.099*	.081*
COVID – 9	.096*	-.105*	-.145*	.146*
SRS	-.047	.107*	.012	-.100**

Note: ASD = The Autism Spectrum Quotient- Short Form; Schizotypy = The Multidimensional Schizotypy Scale -Brief; REIm – R = Analytical Thinking, AOT = Active Open Minded Thinking, GCBS = Generalised Conspiracy Beliefs Scale; COVID - 9 = Beliefs in COVID – 19 related Conspiracy Theory Inventory, SRS = Scientific Reasoning Task Performance

5.6.5 Multiple Regression

It was important to examine how well scientific reasoning skills predicted CT beliefs after controlling for other correlates of CT beliefs. As shown in Table 13 and 14, a three-stage hierarchical multiple regression was conducted with GCBS and COVID-9 scores as the dependent variable respectively. Given that our focus was on the contribution of scientific reasoning skills, compared to previously established antecedents of CT beliefs, we controlled for socio-cognitive (Step 1), and psychopathological variables (Step 2). An individual's ability integrate evidence according to the BADE task, and, scientific reasoning skills were included last (Step 3). This approach allowed us to examine the contribution of different sets of variables in separate models.

The results showed that scientific reasoning was a significant predictor of CT beliefs for both GCBS (β = -.144, p <.001), and COVID–9 scores (β = -.202, p <.001). Measures of conventional analytical thinking and, active-open minded thinking were not significant predictors of CT beliefs once psychopathological (i.e. autistic, schizotypal traits), scientific reasoning skills, and, Evidence Integration scores on the BADE task were included in both models. The best predictor of CT beliefs across both GCBS scores (β = .411, p <.001) and COVID-9 scores (β = .339, p <.001) was positive schizotypy (MSS – P). With the addition of Scientific Reasoning, Evidence Integration scores, Autistic traits, and specific information seeking, the five independent variables account for 39.1% of GCBS scores. With the addition of negative schizotypal traits, these six independent variables account for 33.3% of the variance in COVID – 9 scores.

Table 13
Summary of Hierarchical Analysis for Variables Predicting Conspiracy Ideation via GCBS scores (N = 565)

	Model 1			Model 2			Model 3		
	B	*SE B*	β	*B*	*SE B*	β	*B*	*SE B*	β
REIM - R	.401	.124	.114**	.280	.154	.036	.280	.154	.036
AOT	.392	.105	.110*	.201	.146	-.031	.201	.146	-.031
Focussed Info	.896	.120	.176**	.834	.198	.104**	.834	.198	.104**
Level of Info	.163	.111	.068	-.192	.104	-.080	-.192	.104	-.080
AQ _Total				.499	.109	.148**	.470	.104	.138**
MSS – N				.076	.106	.035	.069	.105	.032
MSS - P				.615	.068	.453**	.557	.071	.411**
MSS - D				.027	.065	.021	.022	.065	.019
BADE (EI)							.333	.120	.109*
SRS							-.613	.188	-.144**
R^2	.163**			.338**			.391**		
F for Changes in R^2	9.293**			34.890**			8.50*		

Note. All psychometric variables were centred at their means, **p* <.05, ***p*<.01.

Table 14
Summary of Hierarchical Analysis for Variables Predicting Conspiracy Ideation via COVID-9 scores (N = 565)

	Model 1			Model 2			Model 3		
	B	*SE B*	β	*B*	*SE B*	β	*B*	*SE B*	β
REIM - R	-.193	.091	-.097*	-.226	.114	-.086*	-.150	.113	-.058
AOT	.565	.111	.225**	.254	.108	.101**	.254	.108	.074
Focussed Info	.439	.158	.112**	.388	.127	.121**	.365	.122	.106**
Level of Info	.027	.080	.014	.020	.100	.002	.020	.100	.002
AQ _Total				.401	.129	.104**	.378	.119	.100**
MSS – N				.213	.078	.136*	.203	.077	.130*
MSS - P				.394	.050	.405**	.394	.050	.339**
MSS - D				-.089	.048	-.064*	-.089	.048	-.073
BADE (EI)							.019	.010	.073*
SRS							-.676	.122	-.202**
R^2	.106**			.240**			.333**		
F for Changes in R^2	8.575**			11.220**			8.44*		

Note. All psychometric variables were centred at their means, **p* <.05, ***p*<.01.

5.7 Discussion

The aim of this project was the build upon previous work by examining whether scientific and logical reasoning measures are more valid protective factors against CT beliefs than conventional measures of analytical thinking, which are usually more focused on information gathering than the application of logical or critical reasoning. Overall, the results of this study confirmed that measures of scientific and logical reasoning were negatively associated with both GCBS and COVID-9 scores, whereas information seeking and analytical thinking were not protective. In fact, the intensity of self-report information seeking behaviour were all positively associated with CT beliefs. Higher levels of CT beliefs across both measures were positively associated with a bias against disconfirmatory evidence. The study further confirmed previous findings (Georgiou et al., 2021b, in press) that ASD and schizotypy traits were positively associated with CT belief endorsement and that ASD was associated with greater information searching. We also replicated earlier findings that more active open-minded thinking is positively related to CT belief endorsement.

The results relating both scientific reasoning, analytical thinking and active-open minded thinking to CT beliefs, support the notion put forth by Stahl and van Prooijen (2018), that analytical thinking alone does not always equate with the ability to appraise information correctly and avoid erroneous conspiracy reasoning. This is consistent with the "Rational Conspiracist Hypothesis" put forth by van Prooijen (2019) which proposes that conspiracy theorists depict themselves as 'critical freethinkers' for subscribing to CT narratives, regardless of their *objective* critical thinking ability (Konda, 2019; Lantian et al., 2021). Indeed, "Do your own research" is often a catch-cry of conspiracy movements, but as, Caravoja et al. (2020) point, scientific reasoning is more than just "Doing research" and may

be more important to help people navigate the complex, fragmented and often biased information found in social media environments.

The findings also confirm previous research that certain traits are associated with CT beliefs. People who report psychopathological traits (i.e. autistic, schizotypal), were more likely to draw incorrect conclusions and were less likely to adequately integrate evidence on the BADE task. They also performed more poorly on the scientific reasoning task and were more likely to endorse CT beliefs. These findings therefore support two lines of evidence. The first is the socio-cognitive or psycho-education argument that reasoning and logic are potentially protective against CT beliefs, but the findings also support the view that CTs beliefs may be more likely in neurodivergent than neurotypical individuals who may be more likely to perceive casual connections between events or actions that are not perceived by others (Barron et al., 2018; Dagnall et al., 2015; Georgiou et al., 2019:2021, in press; van Prooijen, Douglas & De Inocencio, 2018). This is further supported by positive schizotypal traits (i.e. magical beliefs, unusual perceptual experiences), remaining the strongest predictor of conspiracy beliefs across both measures.

These findings have potential implications for how research into analytical thinking and critical thought is pursued in this area (i.e. Swami et al., 2014; van Prooijen, 2016; Georgiou et al., 2019; Lazarevic et al., 2021). Our findings suggest that research may be too reliant on self-report measures that capture information volume (i.e. analytical thinking), or diverse volumes of information (i.e. active open-minded thinking) rather than how that information should be appraised (i.e. scientific reasoning), including the relative weight that should be assigned to different knowledge claims. For this reason, we encourage future investigation of either scientific reasoning tests or performance-based measures that enable researchers to study active differences in decision-making and information assimilation.

5.7.1 Limitations

It is important to acknowledge several limitations when interpreting the results of this study. First, the use of self-report methodology and convenience sampling via online panel surveys mean that response bias cannot be ruled out. Common method variance can sometimes lead to correlates between measures being stronger than might otherwise be the case if measure completion was separated over time. Second, as with our previous research (Georgiou et al., 2021a: 2021b), although a question of prior clinical diagnosis is included, both the Autism-Spectrum Quotient and Multidimensional Schizotypy Scale capture conditions which commonly associated with other co-morbid conditions which cannot be discounted. Third, it is important to acknowledge that the BADE 16-item assessment and Scientific Reasoning Scale may not necessarily reflect real-world decision making and that social desirability or demand effects might encourage some people to respond more rationally than they might in everyday life. Future research could potentially consider more externally valid or emotionally relevant topics or tasks so that lure statements may thematically mirror content within CT belief systems.

5.7.2 Conclusion

In conclusion, this study contributes to broader debates regarding what constitutes the most likely cognitive skills likely to be protective against CT belief formation. These skills would appear to relate to logical and scientific reasoning rather than merely the ability to process large amount of evidence, even if this is from different sources. Our work also encourages greater use of performance-based assessments to complement self-evaluation measures. As well as having implications for the design of future research studies, the research also encourages greater focus on specific reasoning skills in psychoeducation strategies. The findings further suggest that debates about the relative importance of education and reasoning skills as opposed to individual differences (neurodiversity) should

increasingly adopt an interactive approach. Neurodiversity is related to how people think and process information, so that both measures of reasoning and neurodiversity are not in competition, but complementary perspectives that should both be considered in this area of research.

5.8 References

Abu-Akel, A. M., Apperly, I. A., Wood, S. J., & Hansen, P. C. (2017). Autism and psychosis expressions diametrically modulate the right temporoparietal junction. *Social neuroscience*, 12(5), 506–518, doi: 10.1080/17470919.2016.1190786

Barz, D. L., & Achimaş-Cadariu, A. (2016). The development of scientific reasoning in medical education: a psychological perspective. *Clujul* medical, 89(1), 32–37. https://doi.org/10.15386/cjmed-530

Balzan, R., Woodward. S., Delfabbro, P., Moritz, S. (2016) Overconfidence across the psychosis continuum: a calibration approach, *Cognitive Neuropsychiatry*, 21(6), pp. 510-524, doi:10.1080/23311908.2015.1135855

Baron-Cohen, S., Wheelwright, S., Hill, J., Raste, Y., & Plumb, I. (2001). The "Reading the mind in the eyes" Test revised version: A study with normal adults, and adults with Asperger syndrome or high-functioning autism. *Journal of Child Psychology and Psychiatry*, 42(2), 241–251.

Barron, D., Morgan, K., Towell, T., Altemeyer, B., & Swami, V. (2014). Associations between schizotypy and belief in conspiracist ideation. *Personality and Individual Differences*, 70, 156-159.

Barron, D., Furnham, A., Weis, L., Morgan, K. D., Towell, T., & Swami, V. (2018). The relationship between schizotypal facets and conspiracist beliefs via cognitive processes. Psychiatry Research, 259, 15-20.

Bowes, S., Costello, T. H., Ma, W., & Lilienfeld, S. O. (2020). Looking Under the Tinfoil Hat: Clarifying the Personological and Psychopathological Correlates of Conspiracy Beliefs, preprint available at: doi.org/10.31234/osf.io/9pv38

Brosnan, M., Lewton, M., & Ashwin, C. (2016). Reasoning on the Autism Spectrum: A Dual Process Theory Account. *Journal of autism and developmental disorders*, *46*(6), 2115–2125. https://doi.org/10.1007/s10803-016-2742-4

Brotherton, R., French, C. C., & Pickering, A. D. (2013). Measuring belief in conspiracy theories: The Generic Conspiracist Beliefs Scale. *Frontiers in Psychology*, 4, 279.

Čavojová, V., Šrol, J., & Ballová Mikušková, E. (2020). How scientific reasoning correlates with health-related beliefs and behaviors during the COVID-19 pandemic? *Journal of Health Psychology.*

Čavojová, V, Šrol, J, Jurkovič, M (2020) Why should we try to think like scientists? The role of scientific reasoning in susceptibility to epistemically suspect beliefs and cognitive biases. *Applied Cognitive Psychology*, 34(1): 85–95

Dagnall, N., Denovan, A., Drinkwater, K., Parker, A., & Clough, P. (2016). Toward a Better Understanding of the Relationship between Belief in the Paranormal and Statistical Bias: The Potential Role of Schizotypy, *Frontiers in Psychology*, 7, 1045,

Dagnall, N., Denovan, A., Drinkwater, K., Parker, A., & Clough, P. (2017). Statistical Bias and endorsement of conspiracy theories. *Applied Cognitive Psychology*, 31.

Darwin, H., Neave, N., & Holmes, J. (2011). Belief in conspiracy theories. The role of paranormal belief, paranoid ideation and schizotypy. *Personality and Individual Differences*, 50(8), 1289-1293.

Denovan, A., Dagnall, N., Drinkwater, K., Parker, A., and Neave, N. (2020). Conspiracist beliefs, intuitive thinking, and schizotypal facets: a further evaluation, *Applied Cognitive Psychology*, 34, 1394–1405.

Depoux, A., Martin, S., Karafillakis, E., Preet, R., Wilder-Smith, A., & Larson, H. (2020). The pandemic of social media panic travels faster than the COVID-19 outbreak. *Journal of travel medicine*, 27(3),

Douglas, K. M., Sutton, R. M., & Cichocka, A. (2017). The psychology of conspiracy theories. Current Directions in Psychological Science, 26(6), 538-542.

Drummond, C., and Fischhoff, B. (2017) Development and Validation of the Scientific Reasoning Scale. J. Behav. Dec. Making, 30: 26– 38.

Eisenacher S., Rausch, F., Mier, D., Frenske, S., Veckenstedt, R., Englisch, S (2016). Bias against disconfirmatory evidence in the at-risk mental state and during psychosis. *Psychiatry Research*. 238, 242–250.

Epstein, S., Norris, P. (2011) An Experiential Thinking Style: Its Facets and Relations With Objective and Subjective Criterion Measures, *Journal of Personality*,34(4).

Erceg, N., Ružojčić, M. & Galić, Z (2020) Misbehaving in the Corona crisis: The role of anxiety and unfounded beliefs, *Current Psychology*.

Georgiou, M., Delfabbro, P. H., & Balzan, R. (2019). Conspiracy beliefs in the general population: The importance of psychopathology, cognitive style and educational attainment, *Personality and Individual Differences*, 151

Georgiou, M., Delfabbro, P. H., & Balzan, R (2020) COVID-19-related conspiracy beliefs and their relationship with perceived stress and pre-existing conspiracy beliefs, *Personality and Individual Differences*, 166:110201.

Georgiou, N., Delfabbro, P., Balzan, R., (2021, in press) Autistic traits as a potential confounding factor in the relationship between schizotypy and conspiracy beliefs, *Cognitive Neuropsychiatry.*

Georgiou, N., Delfabbro, P., Balzan, R., (2021, in press) Could autistic traits be a risk factor for conspiracy beliefs? An analysis of cognitive style and information-seeking behaviour, *Minerva Psychiatry*.

Georgiou, N., Delfabbro, P., & Balzan, R. (2021). Conspiracy-Beliefs and Receptivity to Disconfirmatory Information: A Study Using the BADE Task. *SAGE Open.*

Goreis, A., & Voracek, M. (2019). A systematic review and meta-analysis of psychological research on conspiracy beliefs: Field characteristics, measurement instruments, and associations with personality traits. *Frontiers in Psychology*, 10, 205.

Gross, G.M., Kwapil, T.R., Raulin, M.L., Silvia, P.J., & Barrantes-Vidal, N. (2018). The Multidimensional Schizotypy Scale-Brief: Scale development and psychometric properties. *Psychiatry Research*, 216, 7-13.

Haran, U., Ritov, I., & Mellers, B. A. (2013). The role of actively open-minded thinking in information acquisition, accuracy, and calibration. *Judgment and Decision Making*, 8, 188-201

Hoekstra, R. A., Vinkhuyzen, A. A., Wheelwright, S., Bartels, M., Boomsma, D. I., Baron-Cohen, S., Posthuma, D., & van der Sluis, S. (2011). The construction and validation of an abridged version of the autism-spectrum quotient (AQ-Short). *Journal of autism and developmental disorders*, 41(5), 589–596.

Jolley, D., & Douglas, K. M. (2014b). The social consequences of conspiracism: Exposure to conspiracy theories decreases intentions to engage in politics and to reduce one's carbon footprint. *British, Journal of Psychology*, 105, 35–56.

Jolley, D., & Douglas K.M. (2017) Prevention is better than cure: Addressing anti-vaccine conspiracy theories, *Journal of Applied Social Psychology*, p. 459-469

Keith E. Stanovich & Richard F. West (2007) Natural myside bias is independent of cognitive ability, *Thinking & Reasoning*, 13:3, 225-247,

Kemp, K.C., Gross, G.M., & Kwapil, T.R. (2020). Psychometric properties of the Multidimensional Schizotypy Scale and Multidimensional Schizotypy Scale-Brief: Item and scale test-retest reliability and concordance of original and brief forms. Journal of Personality Assessment, 102, 508-515

Konda, T. M. (2019). Conspiracies of Conspiracies: How Delusions Have Overrun America. University of Chicago Press.

Kwapil, T. R., Gross, G. M., Silvia, P. J., Raulin, M. L., & Barrantes-Vidal, N. (2018). Development and psychometric properties of the Multidimensional Schizotypy Scale: A new measure for assessing positive, negative, and disorganized schizotypy. *Schizophrenia research*, 193, 209–217.

Lantian, A., Bagneux, V., Delouvée, S., & Gauvrit, N. (2020, February 7). Maybe a Free Thinker but not a Critical One: High Conspiracy Belief is Associated With low Critical Thinking Ability. Preprint available: doi.org/10.31234/osf.io/8qhx4

Lazarević, L. B., Purić, D., Teovanović, P., Lukić, P., Zupan, Z., & Knežević, G. (2021). What drives us to be (ir)responsible for our health during the COVID-19 pandemic? The role of personality, thinking styles, and conspiracy mentality. *Personality and individual differences*, 176, 110771.

Moritz, S., Favrod, J., Andreou, C., Morrison, A. P., Bohn, F., Veckenstedt, R, Karow, A. (2013). Beyond the Usual Suspects: Positive Attitudes Towards Positive Symptoms Is Associated With Medication Noncompliance in Psychosis. *Schizophrenia Bulletin*, 39(4), 917–922.

O'Connell, K., Berluti, K., Rhoads, S. A., & Marsh, A. A. (2021). Reduced social distancing early in the COVID-19 pandemic is associated with antisocial behaviors in an online United States sample. PloS one, 16(1).

Pennycook, G., Fugelsang, J. A., & Koehler, D. J. (2015). Everyday Consequences of Analytic Thinking. *Current Directions in Psychological Science*, 24(6), 425–432.

Pennycook, G., Cheyne, J. A., Koehler, D. J., & Fugelsang, J. A. (2019). On the belief that beliefs should change according to evidence: Implications for conspiratorial, moral, paranormal, political, religious, and science beliefs, doi: 10.31234/osf.io/a7k96

Pennycook, G., Rand, D. G. (2019a). Fighting misinformation on social media using crowdsourced judgments of news source quality. Proceedings of the National Academy of Sciences, USA, 116, 2521–2526. doi:10.1073/pnas.1806781116

Pennycook, G., Rand, D. G. (2019b). Lazy, not biased: Susceptibility to partisan fake news is better explained by lack of reasoning than by motivated reasoning. *Cognition*, 188, 39–50. doi:10.1016/j.cognition.2018.06.011

Pytlik, N., Soll, D., & Mehl, S. (2020). Thinking Preferences and Conspiracy Belief: Intuitive Thinking and the Jumping to Conclusions-Bias as a Basis for the Belief in Conspiracy Theories. *Frontiers in psychiatry*, 11, 568942.

Sallam, M. (2021). COVID-19 Vaccine Hesitancy Worldwide: A Concise Systematic Review of Vaccine Acceptance Rates. Vaccines, 9(2), 160. MDPI AG. Retrieved from: doi:10.3390/vaccines9020160

Sanford, N., Veckenstedt, R., Moritz, S., Balzan, R. P., & Woodward, T. S. (2014). Impaired integration of disambiguating evidence in delusional schizophrenia patients. *Psychological medicine*, *44*(13), 2729–2738.

Schriber, R. A., Robins, R. W., & Solomon, M. (2014). Personality and self-insight in individuals with autism spectrum disorder. *Journal of personality and social psychology*, *106*(1), 112–130. https://doi.org/10.1037/a0034950

Ståhl, T., & van Prooijen, J. W. (2018). Epistemic rationality: Skepticism toward unfounded beliefs requires sufficient cognitive ability and motivation to be rational. *Personality and Individual Differences*, 122, 155–163.

Stevenson, J. L., & Hart, K. R. (2017). Psychometric Properties of the Autism-Spectrum Quotient for Assessing Low and High Levels of Autistic Traits in College Students. *Journal of autism and developmental disorders*, 47(6), 1838–1853.

Stevenson, R.A., Toulmin, J.K., Youm, A. (2017). Increases in the autistic trait of attention to detail are associated with decreased multisensory temporal adaptation. *Scientific Reports,* 7, 14354.

Swami, V., Barron, D., Weis, L., Voracek, M., Stieger, S., & Furnham, A. (2017). An examination of the factorial and convergent validity of four measures of conspiracist ideation, with recommendations for researchers. *PLOS ONE*, 12, e0172617.

Swami V., Furnham A., Smyth N., Weis L., Lay A., Clow (2016) A. Putting the stress on conspiracy theories: Examining associations between psychological stress, anxiety, and belief in conspiracy theories. *Personality and Individual Differences.*

Swami, V., Voracek, M., Stieger, S., Tran, U. S., & Furnham, A. (2014a). Analytic thinking reduces belief in conspiracy theories. *Cognition*, 133(3), 572-585.

Uddin, S., Imam, T., Moni, M. A., & Thow, A. M. (2021). Onslaught of COVID-19: How Did Governments React and at What Point of the Crisis?. Population health management, 24(1), 13–19.

Van Prooijen J.W. -. (2014). Power, politics, and paranoia: Why people are suspicious of their leaders. Cambridge: Cambridge University Press.

van Prooijen, J.W. -. (2017). Why education predicts decreased belief in conspiracy theories. *Applied Cognitive Psychology*, 31(1), 50-58.

van Prooijen, J. W. (2019). Belief in conspiracy theories: Gullibility or rational skepticism? In J. P. Forgas, & R. Baumeister (Eds.), The Social Psychology of Gullibility: Conspiracy Theories, Fake News and Irrational Beliefs, pp. 319-332

van Prooijen, J.W. -., & Douglas, K. M. (2018). Belief in conspiracy theories: Basic principles of an emerging research domain. *European Journal of Social Psychology*, doi:10.1002/ejsp.2530

van Prooijen, J. W., Douglas, K. M., & De Inocencio, C. (2018). Connecting the dots: Illusory pattern perception predicts belief in conspiracies and the supernatural. *European journal of social psychology*, 48(3), 320–335.

van Prooijen, J. W. (2017). Why education predicts decreased belief in conspiracy theories. *Applied Cognitive Psychology,* 31, 50–58.

van Prooijen, J. W., & Douglas, K. M. (2018). Belief in conspiracy theories: Basic principles of an emerging research domain. *European Journal of Social Psychology*, 48, 3.

Warman, D.M., Lysaker, P.H., Martin, J.M., (2007) Cognitive insight and psychotic disorder: The impact of active delusions, *Schizophrenia research*, doi:10.1016/j.schres.2006.09.011

Williams, D. L., Mazefsky, C. A., Walker, J. D., Minshew, N. J., & Goldstein, G. (2014). Associations between conceptual reasoning, problem solving, and adaptive ability in

high-functioning autism. *Journal of autism and developmental disorders*, *44*(11), 2908–2920.

Williams, D. L., Siegel, M., Mazefsky, C. A., & Autism and Developmental Disorders Inpatient Research Collaborative (ADDIRC) (2018). Problem Behaviors in Autism Spectrum Disorder: Association with Verbal Ability and Adapting/Coping Skills. *Journal of autism and developmental disorders*, *48*(11), 3668–3677.

Woodward, N. D., Duffy, B., & Karbasforoushan, H. (2014). Response selection impairment in schizophrenia transcends sensory and motor modalities. *Schizophrenia Research*, 152(0), 446–449, doi: 10.1016/j.schres.2013.11.038

Woodward, T.S., Moritz, S., & Chen, E.Y.H., (2006). The contribution of a cognitive bias against disconfirmatory evidence (BADE) to delusions: a study in an Asian sample with first episode schizophrenia spectrum disorders. *Schizophrenia Research* ,83, 297–298, doi:10.1093/schbul/sbm013

Woodward, T.S., Moritz, S., Cuttler, C., & Whitman, J., (2006). The contribution of a cognitive bias against disconfirmatory evidence (BADE) to delusions in schizophrenia. *Journal of Clinical and Experimental Neuropsychology*, 28, 605–617, doi: 10.1080/13803390590949511

YouGov-Cambridge Centre for Public Opinion Research (2020) Globalism Project 2020: populist beliefs down but conspiracy beliefs up?, Available at: https://yougov.co.uk/topics/international/articles-reports/2020/11/12/globalism-project-2020-populist-beliefs-down-consp/

Chapter 6: Study Four

6.1 Preface for Study Four

The findings of Study Three suggested that people with high schizotypal or autistic traits were more likely to draw incorrect conclusions, less likely to integrate new evidence, and, in turn, more likely to endorse conspiracy beliefs. However, there were both similarities and differences between these traits to how these findings occurred. Those scoring highly on autistic traits showed differences across certain cognitive measures compared to those high in schizotypal traits. However, these findings, along with the majority of past-research in this area has taken a variable-centred approach which assumes that the relationships among distinct variables (i.e., autistic and schizotypal traits) are homogenous.

Given these circumstances, Study Four used a Latent Profile Analysis (LPA) to assess the extent the within-individual variation in schizotypal, autistic traits and previously applied socio-cognitive tendencies are associated with CT beliefs, scientific reasoning and cognitive flexibility. LPA uses a person-centred approach, which assumes populations are heterogeneous, and in relation to schizotypy and autistic traits, allows one to examine whether there may be subgroups (i.e. latent profiles) not identified by the previous research within this thesis project. This statistical approach may also provide further insights into whether certain individuals appear to display different risk profiles for the susceptibility to conspiracy beliefs.

6.2 Statement of Authorship

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Principal Author

Name of Principal Author (Candidate)	Neophytos Georgiou		
Contribution to the Paper	Study concept and design, data collection, statistical analyses, writing manuscript.		
Overall percentage (%)	80		
Certification:	This paper reports on original research I conducted during the period of my Higher Degree by Research candidature and is not subject to any obligations or contractual agreements with a third party that would constrain its inclusion in this thesis. I am the primary author of this paper.		
Signature		Date	28/02/2023

Co-Author Contributions

By signing the Statement of Authorship, each author certifies that:

x. the candidate's stated contribution to the publication is accurate (as detailed above).
xi. permission is granted for the candidate in include the publication in the thesis; and
xii. the sum of all co-author contributions is equal to 100% less the candidate's stated contribution.

Name of Co-Author	Professor Paul Delfabbro		
Contribution to the Paper	Principal Supervision, advice about study concept and design, manuscript proof-reading.		
Signature		Date	28/02/2023
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Contribution to Paper	Secondary Supervision, advice about study concept and design, manuscript proof-reading.		
Signature		Date	28/02/2023

Latent Profile Analysis of Schizotypy, Autistic traits and Conspiracy Theory Beliefs: Associations with Cognitive Flexibility and Scientific Reasoning Performance

by

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Statement and Declarations

Data Availability Statement

The data that support the findings of this study are available from the corresponding author.

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This project is not associated with a source of funding.

Conflicts of Interest.

The current paper has no conflicts of interest to report.

Ethics Approval Statement

This project received ethics approval by the Human Research Ethics Subcommittee in the University of Adelaide's School of Psychology as a low risk application.

6.3 Abstract

Schizotypal and autistic traits have both been implicated in the development of conspiracy theory (CT) beliefs. However, there are both similarities and differences between these traits that may increase an individual's susceptibility to CT beliefs. Past research has often taken a variable-centred approach which assumes that the relationships among distinct variables (i.e. schizotypy, autistic traits) are homogenous. Given these circumstances, Latent Profile Analysis (LPA) was used to assess the extent to which within-individual variation in schizotypal, autistic traits and associated socio-cognitive tendencies are associated with CT beliefs, cognitive flexibility, and scientific reasoning performance. In a sample of 565 adults, five distinct classes were identified. Those with the lowest clinical scores (Class 1) had the highest scientific reasoning and lowest level of CT beliefs, whilst those with the highest clinical scores (Class 4 and 5), had the lowest scientific reasoning and highest CT belief scores. Further analysis revealed some evidence for mixed groups (e.g., Class 4) in which higher analytical reasoning scores co-occurred with higher CT beliefs, but lower scientific reasoning scores. The results did not provide evidence that higher autistic traits independently predicted CT beliefs, but the results support the view that scientific reasoning appears to better differentiate variation in CT beliefs across groups than differences in analytical reasoning.

6.4 Introduction

Conspiracy theory (CT) beliefs and conspiracy culture have become a growing topic of interest to researchers over the past decade (Butter & Knight, 2020). Previous research has identified a range of factors that explain how conspiracy beliefs emerge and how they are promulgated within society. Studies have examined how these beliefs often emerge during major events or crises such as the COVID-19 pandemic (van Bavel et al., 2020; Douglas, 2021); the role of group belief systems (Douglas, 2021; Cichoka, Marchlewska & Golec de Zavala, 2016); and, importantly, what individual differences encourage greater acceptance and adoption of conspiracy beliefs (Furnham, 2021; Georgiou et al., 2020; Gligoric et al., 2021). Much of this individual difference research has focused on the role of psychopathological traits and socio-cognitive factors (e.g., education, critical reasoning and cognitive style) associated with CT beliefs (Barron et al., 2018; van Prooijen & Douglas, 2018; Georgiou et al., 2019; Gores and Voracek, 2019).

6.4.1 The role of Psychopathological factors in Conspiracy Beliefs

Several studies support the view that schizotypal personality traits are a significant predictor of belief in conspiracy theories (Barron et al., 2018; Denovan et al., 2020; Georgiou et al., 2019; Swami et al., 2016). Schizotypy is a complex, multidimensional psychological construct that possesses positive, negative and disorganized dimensions that resemble the factorial models of schizophrenia (Barron et al., 2014; Balzan et al., 2016; Bental, Claridge & Slade, 1989; Dagnall et al., 2016). Although different researchers propose alternative models of schizophrenia/psychosis-proneness (Claridge & Beech, 1995; Kwapil et al., 2012; Grant, Green & Mason, 2018), research that has examined conspiracy beliefs and other related paranormal beliefs in non-clinical populations have focussed on the dimensional approach to schizotypy (Barron et al., 2014, Dagnall, 2015; Drinkwater et al., 2021b; 2022; Georgiou et

al., 2021b). This approach suggests that schizotypy is a latent personality organisation on the lower end of a spectrum, which reflects the propensity to develop schizophrenia-spectrum disorders (Gross et al., 2014). Thus, the dimensional approach acknowledges that schizotypal traits may influence cognitive-perceptual processing in the general population,and, so doing, contribute to the formation/maintenance of shared unorthodox beliefs such as conspiracy theories (Barron et al., 2014; Denovan et al., 2020; Georgiou et al., 2019). As a result, Barron et al. (2018) claimed the dimensional model acts as a coherent conceptual framework for investigating conspiracy beliefs in the general population.

Following the seminal work of Darwin, Neave and Holmes (2011), a robust number of studies have reported a moderate significant positive association between schizotypy and conspiracy beliefs (Barron et al., 2014; Georgiou et al., 2019; van der Tempel & Alcock, 2015; Swami et al., 2016). A particular focus has been upon the potential role of perceptual oddities (i.e., illusions to hallucinations); disruptions in the content of thought (odd beliefs and magical ideation though to delusions (Balzan et al., 2016; Georgiou et al., 2019); and suspiciousness or paranoia (Brotherton et al., 2014; Galliford & Furnham, 2017; Moritz et al., 2013). Schizotypy is seen to have a direct association with conspiracy beliefs (Barron et al., 2014; Georgiou et al., 2019; Swami et al., 2014), but also an indirect influence arising from a lower propensity to process information analytically or critically (Barron et al., 2018; Georgiou et al., 2019; Lantian et al., 2021). Attempts to capture these differences in information processing have involved the study of differences in performance on of a range of problem-solving tasks (e.g., Bias Against Disconfirmatory Evidence Task; Balzan et al., 2016; Georgiou et al., 2021a, 2021d, in press) or the administration of measures that capture individual ability to assess the validity of information (i.e., Scientific Reasoning; Cavajova et

al., 2020; Georgiou et al., 2021d, in press).

Whilst research concerning the relationship between schizotypy and CT beliefs has been well acknowledged, much of this work holds the assumption that schizotypal characteristics are the principal predisposing factor to conspiracist beliefs. However, as shown in recent research by Georgiou et al. (2021a), it may also be important to consider other potentially influential conditions, including autism spectrum disorder (ASD) which was shown to be a significant predictor of conspiracy beliefs after controlling for schizotypy in statistical models. These findings follow a larger body of research that has recognised the significant overlap between traits of schizotypy and autism in the domains of social cognition (i.e., cognitive mentalizing, probabilistic reasoning; Barlati et al., 2016; Barlati et al., 2020; Caldridge & McDonald, 2009; Fernandes et al., 2018; Pinkham & Sasson, 2020; Williams et al., 2014; Zhang et al., 2015). In the context of unorthodox beliefs, like schizotypy, autistic traits can feature a rigid, inflexible thinking style which may involve an abnormal intensity or focus on specific details and points of interest when interpreting information (Georgiou et al., 2021a; Sommer et al., 2018). Thus, schizotypy and autistic traits may similarly promote CT beliefs as they both encourage a less adaptable thinking style which, in turn, is less receptive to disconfirmatory evidence (Georgiou et al., 2021b; 2021c).

Georgiou et al. (2021c, 2021d, in press) suggest, however, that autistic traits may promote CT beliefs through a potentially different mechanism from what is observed in schizotypy. Although both measures of schizotypy and autistic traits were positively associated with CT beliefs and lower performance on cognitive flexibility (i.e., BADE task; Woordward et al., 2006) and scientific reasoning tasks (i.e., Scientific Reasoning Scale;

Drummond & Fischhoff, 2017), different associations were found across self-report measures of analytical thinking, open-mindedness, and information seeking behaviour (Georgiou et al., 2021b; 2021d, in press). Specifically, people scoring higher on ASD and CT beliefs were also found to engage in greater analytical thinking and information searching, which is generally considered to be a protective factor against CT beliefs. The findings raised the possibility that it is not the style of thinking that is always important (i.e., analytical vs. emotive), but whether people apply analytical thought process in an unbiased and scientific way. Hence, it may be that merely engaging in a lot of information searching could be a risk factor for stronger CT beliefs in some individuals if it was framed by confirmation bias.

6.4.2 The Present Study

Schizotypy and autistic traits are both associated with a susceptibility to CT beliefs. This relationship is suggested to arise from a poorer ability to engage in critical thinking skills that enable a person to accept disconfirmatory evidence to counter CT beliefs. In previous studies, a consistent positive association has been observed between schizotypy, autistic traits and conspiracy beliefs (Georgiou et al., 2021a, 2021b, 2021d). Conclusions have been based on variable-centred approaches using correlations, regressions, or mediation-based models to examine how both constructs relate to conspiracy beliefs (Georgiou et al., 2021a; 2021c). A variable-centred approach assumes that results from any analysis is an estimate of the relationships among the distinct variables (i.e., autistic traits, schizotypy), are average across the whole population, and, are expected to be homogeneous (Orri et al., 2017; Denovan et al., 2018). In contrast, person-centred approaches assume populations are heterogeneous, and in relation to autistic traits and schizotypy, allow one to examine whether there may be subgroups (i.e., latent profiles) not identified by the previous approaches of Georgiou (2021a; 2021c; 2021d, in press). As suggested by previous research concerning the

overlap of schizotypal and autistic traits in the domain of social cognition (Bartali et al., 2020; Pinkham & Sasson, 2020), subgroups may be easily differentiated based on psychopathological traits (i.e. there may be significant overlap between those scoring high on autistic and schizotypal traits across latent profiles). However, such analytical approaches may provide further insights into whether there are individuals who do not follow the expected clustering of variables usually observed in studies of schizotypy; namely, higher schizotypy associated with lower scores on analytical reasoning and higher scores on CT beliefs (Barron et al., 2018). Using a more case-centred approach might help to elucidate whether there are individuals who score higher on ASD, CT beliefs and analytical thought, but lower on scientific reasoning.

Accordingly, in recognition of the potential limitations of the traditional individual differences approach, the present paper adopted a person or case-centred perspective. This, via Latent Profile Analysis (LPA), used class membership as a method to examine whether certain individuals appear to display different risk profiles for susceptibility to CT beliefs (Denovan et al., 2018). Profiles were developed based upon scores on ASD and schizotypy traits, cognitive flexibility (as measured by the BADE and active-open minded thinking; Balzan et al., 2016; Georgiou et al., 2021b); scientific reasoning (Cavajova et al., 2020; Georgiou et al., 2021d, in press); analytical thinking, and CT beliefs. Based on the methodology of Georgiou et al., (2021c), a measure of active-open minded thinking has: (a) been previously used to capture belief inflexibility alongside the BADE, and, (b) has previously shown a positive association to analytical thinking and conspiracy beliefs. Given the novelty of this approach, the researchers did not specify *a priori* the number of latent profiles in advance. Nevertheless, based on previous work (Georgiou et al., 2019; 2021a; 2021b; 2021c; 2021d, in press) it was hypothesised that profiles would indicate that individuals with high CT beliefs would have high clinical scores (high schizotypy/ASD

traits), lower scientific reasoning scores, and demonstrate the strongest bias against disconfirmatory evidence. The study also examined the role of level of education across latent profiles due in part to its association socio-cognitive factors previously discussed (i.e. analytical thinking, active open-mindedness, scientific reasoning scores) and, previous research which has suggested it as a protective factor against CT beliefs (Swami et al., 2014; van Prooijen, 2015; Darwin, Neave & Homes, 2011).

6.5 Method

6.5.1 Participants

The study involved a total of 565 participants (M = 355, F = 208, Prefer not to say = 2). The majority lived in the United Kingdom (38%), other countries from continental Europe (20%), and the United States of America (16%). The majority (about 80%) received a formal education beyond secondary level. It was found that 136 (24.1%) of the sample had received a formal diagnosis of a mental health disorder; only 3 (.02%) reported receiving a previous diagnosis of ASD. Schizotypy (MSS – B) scores generally were in the middle range of the scale, with negative schizotypal traits above the midpoint, whilst, disorganized and positive schizotypal traits fell below the midpoint of the scale. Full details are presented in Georgiou, Delfabbro and Balzan (2021c).

6.5.2 Sampling Procedure

The online research participation website *Prolific.Inc* was used to recruit participants and the study was advertised as being about people's individual differences in interpreting real-world events. There was a small monetary fee (around 3 UK pounds). Participants were provided and completed written consent before begging the study.

6.5.3 Study Design

Demographic information and other measures, (including the measurement of Autism Spectrum Disorder and a screening for prior clinical diagnosis), and, two cognitive assessments, were completed online. The study was approved by the Human Research Ethics Subcommittee in the University of Adelaide's School of Psychology.

6.5.4 Measures

6.5.4.1 Demographic background and situation

Participants were asked to provide demographic information, including: gender, age, country of residence, highest education level, current employment status, and, prior history of clinical diagnosis.

6.5.4.2 The Autism-Spectrum Quotient Short-Form (AQ - 10)

The AQ – 10 is a shortened, 10-item version devised by Hoekstra et al. (2011) of the original 50-item, self-administered instrument by Baron-Cohen (2001), designed to measure the degree to which an adult with normal intelligence has the traits associated with the autistic spectrum. Each item allows the participant to indicate "definitely disagree", "slightly disagree", "slightly agree" or "definitely agree". Only 1 point could be scored for each item, with 1 point for the answers "definitely or slightly agree" on items 1, 7, 8 and 10, or for the answers "definitely or slightly disagree" on items 2, 3, 4, 5, 6 and 9. Scores of above 7 out of 10 were considered to be individuals likely to be on the autistic spectrum. The Cronbach's Alpha was 0.77.

6.5.4.3 Multidimensional Schizotypy Scale – Brief (MSS-B)

The MSS-B is a 38-item assessment developed by Gross et al. (2018) as an abbreviated form of the 77-item original scale formed by Kwapil et al. (2017) which measures positive, negative and disorganized traits of schizotypy. All items were rated from 1 (Completely Disagree) to 5 (Completely Agree). Previous research concerning CT Beliefs has shown the MSS – B to have very good psychometric properties in diverse populations (Kemp et al., 2020; Georgiou et al., 2021b; 2021c). The Cronbach's Alpha for the present study was 0.93.

6.5.4.4 Analytical Thinking (REIm – R)

The REIm is a 42-item self-report measure developed by Epstein and Norris (2011), which contains a 12-item subscale that measures tendencies to engage in analytical thinking (REIm-R), and a 30-item subscale that measures tendencies towards the use of an experiential and intuitive thinking style (REIm-E/I). Within the current study, solely the REIm-R will be used for reasons previously mentioned in Georgiou et al. (2021d, in press). All items are rated on a 5-point scale from 1 "Strongly disagree", to 5 "Strongly Agree". The REIm- R has been shown to have good psychometric properties (Epstein & Norris, 2011; Georgiou et al., 2019; Swami et al., 2017). The Cronbach's Alpha for the present study was 0.80.

6.5.4.5 The Generalised Conspiracy Beliefs Scale (GCBS)

This measure, developed by Brotherton (2013), captures whether people tend to perceive the world from a conspiratorial perspective and focuses less on specific beliefs (Brotherton et al., 2013; Swami et al., 2017). Items are scored from 1 (Definitely not true) to 5 (Definitely true) to yield an overall score between 15 and 75 (higher scores reflect greater conspiracy ideation). The Cronbach's Alpha for the present study was 0.92.

6.5.4.6 COVID-19 conspiracy beliefs (COVID – 9)

Developed by Georgiou et al. (2020), the COVID – 9 Conspiracy Belief Scale measures an individual's beliefs in conspiracy theories particularly focussed on the COVID-19 pandemic. This scale contains theories that are more current compared to other available psychometric measures (i.e., BCTI; Swami et al., 2017). Participants responded on a 7-point scale ranging from 1= strongly disagree to 7= strongly degree, the extent to which they endorsed each statement. Statements included items relating to whether the virus had escaped from a lab and was a bioweapon, whether bodies had been secretly burned in China, the involvement of Bill Gates, the availability and suppression of an existing vaccine. The Cronbach's Alpha for this scale was .89.

6.5.4.7 Cognitive Task: The Scientific Reasoning Scale (SRS)

As in Georgiou et al., (2021, in press), scientific reasoning skills were measured using the SRS developed by Drummond and Fischhoff (2017) which comprises 11 short scenarios designed to test participants' knowledge of basic scientific concepts. This includes concepts such as confounding variables, control group effects, or random assignment to conditions. For example, a scenario measuring a person's understanding of the concept of confounding variables states: 'A research project has subjects put together a jigsaw puzzle either in a cold room with a loud radio or in a warm room with no radio. Subjects solve the puzzle more quickly in the warm room with no radio'. Each scenario is then followed by a statement, and participants are asked to indicate whether it is true or false: 'The scientist cannot tell if the radio caused subjects to solve the puzzle more slowly'. In this study, we included a third option "I don't know" to reduce the probability of randomly guessing at the correct answer. The SRS score was computed by summing the correct answers to 11 items. The Cronbach's Alpha for these items was .88.

6.5.4.8 Belief Flexibility: Active Open Minded Thinking Beliefs (AOT – 7) Scale

The AOT is a 7-item short-form abbreviation of the original 41-item scale developed by Stanovich and West (2007) that assesses the tendency of an individual to weigh new evidence against a favoured belief, to spend sufficient time on a problem before giving up, and, to consider carefully the opinions of others in forming one's own belief. As in Georgiou et al. (2021c), it has also served as a secondary measure of cognitive flexibility alongside the BADE 16-item assessment. The 7-item short form developed by Haran et al. (2013), best suited the current study with consideration of the overlap of questioning with other related measures used (i.e. the REIm- 42). The Cronbach's Alpha for the present study was .80.

6.5.4.9 Belief Flexibility: The Bias Against Disconfirmatory Evidence (BADE) Task

Originally devised by authors Woodward, Moritz, and Chen (2006) and Woodward, Moritz, Cuttler, and Whitman (2006). The BADE consists of a possible 16 written delusion-neutral scenarios which can assess an individual's persistence to hold certain beliefs in the face of disconfirmatory evidence. As in Georgiou et al., (2021d, in press), 8 scenarios were used in the current study (for full details of BADE assessment, see Georgiou et al. 2020; 2021d, in press). Of interest to the present study, BADE scores were calculated by examining the difference between the first lure ratings and final lure ratings across the scenarios (Neutral Lure 1 – Neutral Lure 3 and Emotional Lure 1 – Emotional Lure 3). The values capture the decrease in endorsement of the lures following the presentation of additional evidence. A greater decrease indicate a smaller BADE effect. One would therefore expect a negative association between these scores and other measures that are hypothesised to capture a greater BADE effect. Scores were converted down to a range of 0 to 10 when conducting LPA.

6.4.6. Statistical Analysis

6.5.4.10 Preliminary Analysis

Analyses used version 27 of IBM SPSS Statistic software, apart from the Latent Profile Analysis (LPA), which required version 17 of the program STATA. Following the initial data screening and preliminary analysis within SPSS, Pearson *r* correlation analysis was conducted as shown in Georgiou et al. (2021c). AQ-10 cut off scores were then used to establish independent groups within the sample (those likely to demonstrate autistic traits compared to those below the suggested cut-off score) across all psychometric measures, scientific reasoning scores, and belief flexibility measures (i.e. AOT and BADE scores) via independent samples t-tests. As shown in Georgiou et al (2021c), BADE calculations

followed the methods recommended in the meta-analysis by McLean, et al. (2017), Eisenacher and Zink (2016), and Georgiou et al., (2021b).

6.5.5 Latent Profile Analysis

For the purposes of exploratory LPA, in accordance with the recommendations of previous research (i.e. Deleuze et al., 2015; Hussain et al., 2015; Denovan et al., 2018), psychometric measures using Likert scales were recoded. On both measures of CT beliefs ratings of 0-4 were coded as "0" (indicating uncertainty or disagreement) and ratings of 5-7 were coded as "1" (agreement). MSS-B and REIm – R scores across each subscale of 0 -3 were coded as "0" (indicating disagreement or uncertainty) and ratings of 4-5 coded as "1" (agreement). Scoring for both Scientific Reasoning and the BADE task were not recoded.

Next, based on scores of MSS-B, AQ-10, REIm-R, AOT -7, SRS, CT beliefs (i.e. COVID – 9, GCBS) and BADE scores, an exploratory LPA determined the potential latent group membership of the sample. The optimal number of latent classes was determined by considering a range of indices; the Akaike Information Criterion (AIC; Akaike, 1987), the Bayesian Information Criterion (BIC; Schwarz, 1978) the sample-size adjusted BIC (ssaBIC; Sclove, 1987), the Lo-Mendell-Rubin-adjusted likelihood radio test (LMR-A-LRT; Lo et al., 2001), and a standardized measure of entropy (Ramaswamy et al., 1993). For AIC, BIC, and ssaBIC scores, smaller value indicates a better fit of the model. The LMR-A-LRT score does not rely on chi-square distribution for the difference in model likelihood values and normally occur alongside an associated *p*-value. Progressive class solutions are computed until a LMR-A-LRT value is found that is non-significant, which indicates the model cannot be improved for fit. Lastly, entropy ranges from 0 to 1, with higher values suggesting a better classification of participants. According to Ramaswamy et al., (1993), an entropy value of above 0.80 reflects a sound separation of identified classes in relation to the data. Once LPA exploratory

analysis has been conducted, Latent Class membership acted as a group variable for assessing whether differences existed on scientific reasoning and BADE scores.

6.6 Results

Table 9, Table 10, Table 11 and Table 12of Georgiou et al., (2021d, in press) summarises the descriptive statistics for the measures used in this study, and performance on both scientific reasoning and BADE tasks across all psychometric measures of interest within the present study. From this sample, 80 participants (14.1%) scored above the AQ clinical cut-off for ASD, with multidimensional schizotypy scores (MSS – B) generally falling the middle range of the scale.

6.6.1 Latent Profile Analysis

Prior to conducting LPA, potential covariates of CT beliefs as suggested in van Prooijen (i.e., level of education, 2016: 2018), such as level of education and gender were examined for their potential influence on scores across measures of psychopathological (i.e. AQ-10, MSS-B scores), socio-cognitive factors (i.e. REIm – R, AOT scores) and CT beliefs. An independent-samples t-test revealed no significant gender differences for all measures, while a one-way ANOVA indicated no significant differences across the reported level of education.

An initial comparison of 1-class and 2-class models was undertaken. AIC, BIC and ssaAIC indices suggested superior fit of the 2-class model, and the LMR-A-LRT for the 2-class model indicated significant improvement over the 1-class model (see Table 15). A further comparison of 2-class and 3-class solutions then revealed that the 3-class solution was superior, due to lower AIC, BIC, ssaBIC statistics, higher entropy scores (0.79 vs 0.76), and a significant LMR-A-LRT *p*-value. Next, a 4-class solution designated superior fit in comparison to the 3-class solution, again, evident from lower AIC, BIC, ssaBIC values, higher entropy scores (0.84 vs 0.79), and a significant LMR-A-LRT *p*-value. A five-class model then indicated a slightly superior fit in comparison to the 4-class solution, with lower AIC, BIC, ssaBIC values, higher entropy value (0.86 vs 0.84), and a significant LMR-A-LRT

p-value. Finally, a six-class model did not indicate a significant improvement from a 5-class solution, hence, no further consideration of solutions was conducted.

Table 15
Fit of Competing Latent Profile Models

Model	AIC	BIC	ssaBIC	LMR – A	LMR – A (*p* -value)	Entropy
1 – class	23,317.18	23,394.77	23,360.41			
2 – class	21,155.89	21,420.21	21,484.20	712.55	<.001	0.76
3 – class	20,917.22	20,888.39	20,700.12	582.21	<.001	0.79
4 – class	18,400.62	18,527.60	18,460.10	318.10	<.001	0.84
5 – class	18,297.95	18,312.71	18,309.66	280.02	<.001	0.86
6 – class	18,232.01	18,299.14	18,303.07	190.66	.090	0.87

Note: AIC, Akaike Information Criterion; BIC, Bayesian Information Criterion; ssaBIC, sample-size adjusted BIC; LMR – A, Lo-Mendell-Rubin-adjusted likelihood ratio test.

The 5-class solution represented the model most likely to be of best fit. In this model (see Table 16), 37.1% (n = 210) of the sample were assigned into class 1, scoring low on schizotypy, autistic traits, conspiracy beliefs and intermediate on analytical thinking, active-open minded thinking and scientific reasoning. Class 2 represented 23.0% (n = 130) of the sample, demonstrating low scores on schizotypy, autistic traits, analytical thinking, scientific reasoning, and intermediate scores on active-open minded thinking and conspiracy beliefs. Class 3 represented 17.8% (n = 101) of the sample, demonstrating low scores of schizotypy, active-open minded thinking, and moderate scores of autistic traits, analytical thinking, scientific reasoning and conspiracy beliefs. Class 4 represented 9.0% (n =51) of the sample, with low scores on scientific reasoning and active-open minded thinking, high/intermediate scores on schizotypy, autistic traits and conspiracy beliefs. Finally, Class 5 represented 12.9%

(n = 73) of the sample, with low scores on scientific reasoning, analytical thinking, intermediate scores on autistic traits and active-open minded thinking, and high scores on schizotypy and conspiracy beliefs. Average latent class probabilities for most likely latent class membership were 0.93 for class 1, 0.91 for class 2, 0.83 for class 3, 0.80 for class 4, and 0.93 for class 5, which indicates good overall discriminate validity between most classes.

The mean score of all psychometric measures as a function of Latent Class was presented in Table 16. Consistent with our hypotheses and previous work of Georgiou et al., (2021b), those within Class 4 and Class 5 who scored highest on both psychopathological measures (i.e. AQ – 10, MSS – B) and CT belief measures, had the lowest SRS scores of all classes. Further, those within Class 1, who scored highest on SRS scores, had scored the lowest on both measures of CT beliefs and psychopathological measures. However, scores on measures of Analytical thinking (i.e. REIm – R) and open-mindedness (AOT) did not follow a distinct pattern as a function of Latent Class.

Table 16

Mean Score (Standard Deviations) of all psychometric measures as a function of Latent Class

	Class 1 (*n* = 210)	**Class 2** (*n* = 130)	**Class 3** (*n* = 101)	**Class 4** (*n* = 51)	**Class 5** (*n* = 73)
AQ – 10	1.31 (0.97)	3.07 (1.06)	4.21 (1.12)	7.04 (0.85)	8.21 (0.72)
MSS – B	10.52 (2.59)	13.32 (3.40)	11.52 (3.89)	22.90 (2.24)	27.10 (3.01)
REIm – R	8.52 (1.70)	6.78 (2.02)	8.33 (2.14)	8.21 (2.43)	6.85 (1.57)
AOT	4.04 (1.01)	5.38 (1.42)	3.77 (1.21)	4.08 (1.03)	4.33 (1.22)
SRS	8.02 (1.42)	6.05 (1.88)	6.90 (2.39)	4.23 (3.10)	3.87 (1.42)
COVID- 9	1.89 (1.73)	2.44 (2.02)	2.57 (2.28)	5.21 (1.75)	7.88 (2.43)
GCBS	4.55 (1.39)	7.38 (2.84)	7.12 (2.77)	9.55 (2.98)	10.03 (2.47)

Note: Pattern of mean scores as a function of latent class models across the Autism Quotient – 10, AQ – 10; Multidimensional Schizotypy Scale – Brief, MSS – B; Rational Experiential and Inventory – Rational subscale, REIm – R; Active Open-Minded Thinking Scale, AOT; Scientific Reasoning Scale, SRS; COVID -19 Conspiracy Scale, COVID – 9; General Conspiracy belief scale, GCBS.

As shown in Table 17, *Post-hoc* pairwise comparisons with Bonferroni correction were used to assess SRS, CT beliefs (via GCBS and COVID – 9 scores) and BADE performance as a function of class membership. As further support of Georgiou et al. (2021b), the 'more likely clinical' cases represented by Class 4 and 5 who had scored highest across both CT belief measures, lowest on SRS scores, also demonstrated a lower change in plausibility ratings across BADE items when directly compared to Class 1, Class 2 and Class 3. Also, Class 5 being the 'most likely clinical' latent group showed significantly higher COVID – 9 scores, and a lower change in plausibility ratings across BADE items compared to Class 4. Consistent with Georgiou et al. (2021c, in press), those in Class 1 who had scored lowest across both CT belief measures, had the highest SRS scores of the sample. However,

there were no significant differences between Class 2 and 3. As both classes could not be distinguished via *post-hoc* comparison, in accordance with the recommendations of Ramaswamy et al. (1993), LPA analysis was conducted once again using a 4-Class Model (see Table 18), as its entropy value exceeds 0.80.

Within a 4-Class Latent model, Class 1 represented 203 (25.9%) of the sample and alike the previous model presented, scored low on schizotypy, autistic traits, conspiracy beliefs and intermediate on analytical thinking, active open-minded thinking and scientific reasoning. Class 2 represented 238 (42.1%) cases, scoring low on schizotypy, COVID – 19 related conspiracy beliefs and scientific reasoning, and intermediate on autistic traits, general conspiracy beliefs, analytical thinking and active open minded thinking. Class 3 represented 54 (9.5%) of the sample with low scores on scientific reasoning and active-open minded thinking, high/intermediate scores on schizotypy, autistic traits and conspiracy beliefs. Class 4 represented 70 (12.3%) of the sample, with low scores on scientific reasoning, analytical thinking, intermediate scores on autistic traits and active-open minded thinking, and high scores on schizotypy and conspiracy beliefs. Average latent class probabilities for most likely class membership was once again 0.92 for Class 1, followed by 0.92 for Class 4, 0.83 for class 3, and 0.79 for class 3 which again, indicates good discriminant validity between most classes.

Table 17

Pairwise Comparisons (Mean Differences) and BADE performance as a function of class membership.

Class Contrast	**COVID – 9** Mean diff. (Sig.)	**GCBS** Mean diff. (Sig.)	**SRS** Mean diff. (Sig.)	**BADE** Mean diff. (Sig.)
Class 1 vs. Class 2	0.55 (0.623)	-2.83 (0.042)	1.98 (0.048)	0.04 (0.541)
Class 1 vs. Class 3	0.68 (0.211)	-2.47 (0.045)	1.12 (0.390)	0.10 (0.920)
Class 1 vs. Class 4	-3.32 (0.021)	-5.00 (0.001)	-3.80 (0.038)	0.60 (0.057)
Class 1 vs. Class 5	-5.99 (0.001)	-5.48 (0.001)	-4.15 (0.001)	1.44 (0.012)
Class 2 vs. Class 3	0.13 (0.851)	-0.26 (0.118)	0.85 (0.203)	0.12 (0.752)
Class 2 vs. Class 4	-2.77 (0.004)	-2.17 (0.063)	1.82 (0.037)	0.42 (0.664)
Class 2 vs. Class 5	-5.44 (0.001)	-2.65 (0.001)	2.18 (0.001)	1.02 (0.001)
Class 3 vs. Class 4	-2.64 (0.046)	-2.43(0.011)	1.67(0.081)	0.21(0.299)
Class 3 vs. Class 5	-5.31 (0.030)	-2.91 (0.007)	3.03 (0.001)	0.94 (0.023)
Class 4 vs. Class 5	-2.67 (0.032)	-0.48(0.228)	0.36 (0.130)	0.44 (0.037)

Once again, as shown in Table 18 and Table 19, *Post-hoc* pairwise comparisons with Bonferroni correction revealed that Class 2 displayed significantly higher CT beliefs, and demonstrated a lower level of scientific reasoning compared to Class 1. Moreover, there was significant differences between Class 2 and Class 3, and, Class 2 and Class 4 across both measures of CT beliefs, and SRS scores. As hypothesised, the difference in scores between Class 4 and Class 1 highlights the pattern expected based on the existing literature, in that high clinical scores on schizotypy and autistic traits (Class 4), also resulted in high CT beliefs and lower reasoning scores across the BADE and SRS measures, the opposite of Class 1. Consistent with Georgiou et al. (2021, in press), Class 3 showed stronger autistic traits, higher rational reasoning but lower scientific reasoning and higher CT belief scores. Class 2 exhibited intermediate scores on autistic traits, and could be considered a borderline group. Comparing Class 1 and Class 2, Class 2 scored higher on autistic traits and demonstrated a

lower reasoning score and higher CT beliefs, yet no significant difference across the BADE task.

Table 18

Mean Score (Standard Deviations) of all psychometric measures as a function of a 4 Latent Class Model

	Class 1 (*n* = 203)	**Class 2** (*n* = 238)	**Class 3** (*n* = 54)	**Class 4** (*n* = 70)
AQ – 10	1.30 (0.95)	3.68 (0.98)	7.12 (0.89)	8.37 (0.80)
MSS – B	10.17 (2.49)	12.88 (2.67)	22.47 (2.10)	27.60 (3.14)
REIm – R	8.72 (1.70)	7.02 (1.85)	8.30 (2.37)	6.81 (1.56)
AOT	3.85 (1.12)	4.65 (1.22)	3.94 (0.87)	4.21 (0.76)
SRS	8.22 (1.36)	6.55 (1.42)	4.31 (3.05)	3.84 (1.32)
COVID- 9	1.71 (1.90)	2.54 (1.82)	5.20 (1.75)	7.87 (2.43)
GCBS	4.53 (1.39)	7.21 (2.34)	9.57 (2.98)	10.01 (2.46)

Note: Pattern of mean scores as a function of latent class models across the Autism Quotient – 10, AQ – 10; Multidimensional Schizotypy Scale – Brief, MSS – B; Rational Experiential and Inventory – Rational subscale, REIm – R; Active Open-Minded Thinking Scale, AOT; Scientific Reasoning Scale, SRS; COVID -19 Conspiracy Scale, COVID – 9; General Conspiracy belief scale, GCBS.

Table 19

Pairwise Comparisons (Mean Differences) and BADE performance as a function of the 4 - class model.

Class Contrast	**COVID – 9** Mean diff. (Sig.)	**GCBS** Mean diff. (Sig.)	**SRS** Mean diff. (Sig.)	**BADE** Mean diff. (Sig.)
Class 1 vs. Class 2	-0.80 (0.111)	-2.68 (0.001)	1.67 (0.032)	0.13 (0.261)
Class 1 vs. Class 3	-3.49 (0.001)	-5.04 (0.001)	3.91 (0.001)	0.62 (0.042)
Class 1 vs. Class 4	-6.16 (0.001)	-5.48 (0.001)	4.38 (0.001)	1.43 (0.001)
Class 2 vs. Class 3	-2.66 (0.041)	-2.36 (0.023)	2.24 (0.017)	0.44 (0.095)
Class 2 vs. Class 4	-5.33 (0.001)	-2.80 (0.012)	2.71 (0.079)	0.93 (0.017)
Class 3 vs. Class 4	-2.67(0.044)	-0.44 (0.312)	0.47 (0.122)	0.41 (0.056)

6.7 Discussion

The present study assessed the extent to which latent class membership, combining scores on autistic and schizotypy traits, along with associated socio-cognitive factors, was related to CT beliefs and related performance measures (i.e., scientific reasoning, cognitive flexibility). LPA analysis identified five latent profiles as based on the variable combinations within the present sample. As hypothesised, it was found individuals with high CT beliefs, would have the highest clinical scores, lower scientific reasoning scores and a stronger bias against disconfirmatory evidence. No significant group differences were found for socio-demographic factors such as education and gender.

6.7.1 Latent Profile Analysis (LPA) Outcomes

In terms of overall 5-class structure, the emergence of Class 1 (37.1%) which had low clinical scores and conspiracy beliefs, intermediate analytical thinking, but high scientific reasoning is consistent with previous variable centred approach of Georgiou et al (2021c). Specifically, this supports the notion that individuals who possess higher scientific reasoning ability and lower clinical scores appeared to be less likely to hold CT beliefs. These findings are consistent with the findings of Cavajova et al. (2020) Lantian et al., (2021) and Pennycook et al. (2021) who have argued that increasing critical reasoning skills within the general population could help to debunk and reduce the influence of conspiracy beliefs. The second group of participants, or Class 2 (23.0%), appeared to support this logic quite well. This group had low clinical (AQ or schizotypy) scores but had lower scientific reasoning scores and higher levels of CT beliefs, which indicates that the absence of good scientific reasoning skills (as opposed to other clinical characteristics) may have been influential (Georgiou et al., 2021c; Cavajova et al. 2020).

The identification of Classes 4 and 5 in the 5-Class structure possessing intermediate to high scores on both clinical measures (i.e., autistic and schizotypal traits) and with the lowest scores on scientific reasoning and highest conspiracy belief scores supports previous CT literature that has found a consistent positive association between schizotypy, autistic traits and conspiracy beliefs (see Orri et al., 2017; Barron et al., 2014: 2018; Denovan et al., 2020; Georgiou et al., 2019: 2021c). The LPA also highlighted the co-occurrence of autistic and schizotypal traits as indicated by Class 4 and 5, but some support was also obtained for the diametrical model of autism (Abu-Akel & Bailey, 2000; Salice & Henriksen, 2021). Class 4 represents individuals who scored above the clinical threshold for autism spectrum disorder, who reported engaging in analytical thought but who were still prone to stronger CT beliefs, whereas Class 5 contained highly schizotypal individuals with higher CT beliefs, and were more susceptible to cognitive biases as indicated by their poor performance on the BADE task (Barron et al., 2014: 2018; Denovan et al., 2020; Georgiou et al., 2019; Georgiou et al., 2021b). This evidence of mixed groups, in which higher analytical reasoning scores co-occurred with higher CT beliefs, also supports the suggestions of Georgiou et al. (2021a: 2021c) that multiple avenues may exist to CT beliefs in neurodivergent individuals. Moreover, alike the findings of Class 2, the results of Class 4 support Georgiou et al. (2021c) as those with relatively intact analytical thinking still demonstrated poor scientific reasoning skills, which, in turn, suggests that a lack of scientific reasoning is the more accurate antecedent to endorsing CT beliefs.

In terms of the 4-Class structure, the emergence of Class 2 (42.1%), which could be considered a borderline group with intermediate scores on autistic traits and moderate levels of CT beliefs, demonstrates that CT beliefs are not exclusive to the higher ends of psychopathology (Georgiou et al., 2021a: 2021c: 2021d). This finding aligns with the

dimensional approach to CT beliefs in the general population put forth by Barron et al. (2018) as individuals below the clinical threshold for autism demonstrated a similar propensity to adopt erroneous beliefs as those potentially in the more extreme groups (i.e., likely to have received a formal diagnosis). In this context, future research using latent profiles could provide a more sophisticated understanding of interactions between socio-cognitive factors and conspiracy beliefs to better understanding potential borderline groups (i.e., subclinical levels of autistic traits).

6.7.2 Limitations

It is important to acknowledge the several limitations of the current study. First, the relative distributions of belief in conspiracy theories, schizotypy and autistic traits are a potential limitation on the current study. As respondents came from a general, non-clinical population, measures of schizotypy and autism tended toward scores below the clinical cut-off and may not be generalizable to clinical cases. Further, the distinctions made between analytical thinking and scientific reasoning performance are based upon self-report. Hence, the use of a behavioural measure of analytical thinking would benefit future research. Although LPA may acknowledge the co-occurrence of schizotypy and autistic traits, it does not account for all potential psychological comorbidities. The latent profiles might also differ in more diverse samples, in that most people in the current study were highly educated. Further, although a case-centred approach has many benefits as previously discussed, LPA results need to be interpreted with caution. It is important to acknowledge that LPA merely identifies categories across dimensions included within the model not categories of individuals present within the population (see Lanza and Rhoades, 2013).

6.7.3 Conclusion

In sum, the current study contributes to the previous variable-centred research that debate what may be predictive of CT beliefs. When accounting for the co-occurrence of autistic and schizotypal traits, we did not find support that higher autistic traits independently predicted CT beliefs, but the results did support the view of Georgiou et al. (2021c) that scientific reasoning appears to better differentiate variation in CT beliefs across groups than differences in analytical reasoning. As in Georgiou et al. (2021c), LPA analysis has affirmed that the ability to process large amounts of evidence, in conjunction with logical and scientific reasoning skills, are the likely protective factors against CT belief formation. As LPA offers a heterogenic approach to CT beliefs, future studies using latent profiles could provide a more sophisticated understanding of the interactions between socio-cognitive factors that may be important barriers to conspiracy beliefs (i.e. scientific reasoning ability, adaptable thinking styles) within potential borderline groups (i.e. subclinical levels of schizotypy and autistic traits), particularly in the context of future CT research focussed on an intervention approach.

6.8 References

Abu-Akel, A., & Bailey, A. L. (2000). The possibility of different forms of theory of mind impairment in psychiatric and developmental disorders. *Psychological medicine*, *30*(3), 735–738.

Akaike, H. (1987). Factor analysis and AIC. *Psychometrika* 52, 317–332.

Balzan, R., Woodward. S., Delfabbro, P., Moritz, S. (2016) Overconfidence across the psychosis continuum: a calibration approach, *Cognitive Neuropsychiatry*, 21(6), pp. 510-524.

Barlati, S., Deste, G., Ariu, C., Vita, A., (2016) Autism Spectrum Disorder and Schizophrenia: Do They Overlap, *International Journal of Emerging Mental Health and Human Resilience,* 18, 760–3.

Barlati, S., Minelli, A., Ceraso, A., Nibbio, G., Carvalho Silva, R., Deste, G., Turrina, C., & Vita, A. (2020). Social Cognition in a Research Domain Criteria Perspective: A Bridge Between Schizophrenia and Autism Spectra Disorders. *Frontiers in psychiatry*, *11*, 806.

Baron-Cohen, S., Wheelwright, S., Hill, J., Raste, Y., & Plumb, I. (2001). The "Reading the mind in the eyes" Test revised version: A study with normal adults, and adults with Asperger syndrome or high-functioning autism. *Journal of Child Psychology and Psychiatry*, 42(2), 241–251.

Barron, D., Furnham, A., Weis, L., Morgan, K. D., Towell, T., & Swami, V. (2018). The relationship between schizotypal facets and conspiracist beliefs via cognitive processes. *Psychiatry Research*, 259, 15-20.

Barron, D., Morgan, K., Towell, T., Altemeyer, B., & Swami, V. (2014). Associations between schizotypy and belief in conspiracist ideation. *Personality and Individual Differences*, 70, 156-159.

Bavel, J., Baicker, K., Boggio, P. S., Capraro, V., Cichocka, A., Cikara, M., Crockett, M. J., Crum, A. J., Douglas, K. M., Druckman, J. N., Drury, J., Dube, O., Ellemers, N., Finkel, E. J., Fowler, J. H., Gelfand, M., Han, S., Haslam, S. A., Jetten, J., Kitayama, S., Willer, R. (2020). Using social and behavioural science to support COVID-19 pandemic response. *Nature human behaviour*, *4*(5), 460–471.

Bentall, R. P., Claridge, G. S., & Slade, P. D. (1989). The multidimensional nature of schizotypal traits: A factor analytic study with normal subjects. *British Journal of Clinical Psychology, 28*(4), 363–375.

Brotherton, R., French, C. C., & Pickering, A. D. (2013). Measuring belief in conspiracy theories: The Generic Conspiracist Beliefs Scale. *Frontiers in Psychology*, 4, 279.

Brotherton, R., French, C. (2014) Belief in Conspiracy Theories and Susceptibility to the Conjunction Fallacy, *Applied Cognitive Psychology*, 28 (2), p. 238-248,

Butter, M., & Knight, P. (2020). *Routledge handbook of conspiracy theories*. (1st ed.) (Conspiracy theories).

Čavojová, V., Šrol, J., & Ballová Mikušková, E. (2020). How scientific reasoning correlates with health-related beliefs and behaviors during the COVID-19 pandemic? *Journal of Health Psychology*, 27 (3): 534-547.

Čavojová, V, Šrol, J, Jurkovič, M (2020) Why should we try to think like scientists? The role of scientific reasoning in susceptibility to epistemically suspect beliefs and cognitive biases. *Applied Cognitive Psychology*, 34(1): 85–95

Cichocka, A., Marchlewska, M., Golec de Zavala, A., & Olechowski, M. (2016). 'They will not control us': Ingroup positivity and belief in intergroup conspiracies. *British journal of psychology*, 107(3): 556–576.

Claridge, G., & Beech, T. (1995). Fully and quasi-dimensional constructions of schizotypy. In A. Raine, T. Lencz, & S. A. Mednick (Eds.), *Schizotypal personality* (pp. 192–216). *Cambridge University Press.*

Claridge, G., & McDonald, A. (2009). An investigation into the relationships between convergent and divergent thinking, schizotypy, and autistic traits. *Personality and Individual Differences,* 46(8), 794–799.

Dagnall, N., Denovan, A., Drinkwater, K., Parker, A., & Clough, P. (2016). Toward a Better Understanding of the Relationship between Belief in the Paranormal and Statistical Bias: The Potential Role of Schizotypy. *Frontiers in psychology*, 7, 1045.

Dagnall, N., Drinkwater, K., Parker, A., Denovan, A., & Parton, M. (2015). Conspiracy theory and cognitive style: A worldview. *Frontiers in Psychology, 6,* 206.

Darwin, H., Neave, N., & Holmes, J. (2011). Belief in conspiracy theories. The role of paranormal belief, paranoid ideation and schizotypy. *Personality and Individual Differences, 50*(8), 1289–1293.

Deleuze, J., Rochat, L., Romo, L., Van der Linden, M., Achab, S., Thorens, G., et al. (2015). Prevalence and characteristics of addictive behaviors in a community sample: a latent class analysis. *Addictive Behaviour Reprint.* 1, 49–56.

Denovan, A., Dagnall, N., Drinkwater, K., & Parker, A. (2018). Latent Profile Analysis of Schizotypy and Paranormal Belief: Associations with Probabilistic Reasoning Performance. *Frontiers in psychology*, *9*, 35.

Denovan, A., Dagnall, N., Drinkwater, K., Parker, A., and Neave, N. (2020). Conspiracist beliefs, intuitive thinking, and schizotypal facets: a further evaluation, *Applied Cognitive Psychology*, 34, 1394–1405.

Douglas, K. M. (2021). COVID-19 conspiracy theories. *Group Processes & Intergroup Relations*, *24*(2), 270–275.

Drinkwater, K. G., Dagnall, N., Denovan, A., & Williams, C. (2021). Paranormal Belief, Thinking Style and Delusion Formation: A Latent Profile Analysis of Within-Individual Variations in Experience-Based Paranormal Facets. *Frontiers in psychology*, 12, 670959.

Drinkwater, K. G., Dagnall, N., Denovan, A., Parker, A., & Escolà-Gascón, Á. (2022). Paranormal Experience Profiles and Their Association With Variations in Executive Functions: A Latent Profile Analysis. *Frontiers in psychology*, *12*, 778312.

Drummond, C., and Fischhoff, B. (2017) Development and Validation of the Scientific Reasoning Scale, *Journal of Behaviour and Decision Making,* 30: 26– 38.

Eisenacher S., Rausch, F., Mier, D., Frenske, S., Veckenstedt, R., Englisch, S (2016). Bias against disconfirmatory evidence in the at-risk mental state and during psychosis. *Psychiatry Research*. 238, 242–250.

Epstein, S., Norris, P. (2011) An Experiential Thinking Style: Its Facets and Relations With Objective and Subjective Criterion Measures, *Journal of Personality*,34(4).

Fernandes, J. M., Cajão, R., Lopes, R., Jerónimo, R., & Barahona-Corrêa, J. B. (2018). Social Cognition in Schizophrenia and Autism Spectrum Disorders: A Systematic Review and Meta-Analysis of Direct Comparisons. *Frontiers in psychiatry*, *9*, 504.

Furnham, A., & Grover, S. (2021). Do you have to be mad to believe in conspiracy theories? Personality disorders and conspiracy theories. *International Journal of Social Psychiatry*, Doi: 0.1177/00207640211031614

Galliford, N., & Furnham, A. (2017). Individual difference factors and beliefs in medical and political conspiracy theories. *Scandinavian Journal of Psychology, 58*(5), 422–428.

Georgiou, M., Delfabbro, P. H., & Balzan, R. (2019). Conspiracy beliefs in the general population: The importance of psychopathology, cognitive style and educational attainment, *Personality and Individual Differences*, 151, 109521.

Georgiou, M., Delfabbro, P. H., & Balzan, R (2020) COVID-19-related conspiracy beliefs and their relationship with perceived stress and pre-existing conspiracy beliefs, *Personality and Individual Differences*, 166:110201.

Georgiou, N., Delfabbro, P., Balzan, R., (2021a) Autistic traits as a potential confounding factor in the relationship between schizotypy and conspiracy beliefs, *Cognitive Neuropsychiatry,* 26 (4): 273 -292.

Georgiou, N., Delfabbro, P., Balzan, R., (2021e) Could autistic traits be a risk factor for conspiracy beliefs? An analysis of cognitive style and information-seeking behaviour, *Minerva Psychiatry*, 62 (4): 231- 240.

Georgiou, N., Delfabbro, P., & Balzan, R. (2021b). Conspiracy-Beliefs and Receptivity to Disconfirmatory Information: A Study Using the BADE Task. *SAGE Open*, 1(11): 1-9.

Georgiou, N., Delfabbro, P., & Balzan, R. (2021c) Conspiracy Theory Beliefs, Scientific Reasoning and the Analytical Thinking Paradox, *Applied Cognitive Psychology,* 35 (6): 1523 – 1543.

Goreis, A., & Voracek, M. (2019). A systematic review and meta-analysis of psychological research on conspiracy beliefs: Field characteristics, measurement instruments, and associations with personality traits. *Frontiers in Psychology*, 10, 205.

Gligorić, V., Silva, M., Eker, S. G., van Hoek, N., Nieuwenhuijzen, E., Popova, U., & Zeighami, G. (2021) The Usual Suspects: How psychological motives and thinking styles predict the endorsement of well-known and COVID-19 conspiracy beliefs, 35 (5): 1171 – 1181.

Grant, P., Green, M. J., & Mason, O. J. (2018). Models of Schizotypy: The Importance of Conceptual Clarity. *Schizophrenia bulletin*, *44*(2): 556–563.

Gross, G.M., Kwapil, T.R., Raulin, M.L., Silvia, P.J., & Barrantes-Vidal, N. (2018). The Multidimensional Schizotypy Scale-Brief: Scale development and psychometric properties. *Psychiatry Research*, 216, 7-13.

Gross, G. M., Mellin, J., Silvia, P. J., Barrantes-Vidal, N., & Kwapil, T. R. (2014). Comparing the factor structure of the Wisconsin Schizotypy Scales and the Schizotypal Personality Questionnaire. *Personality Disorders: Theory, Research, and Treatment, 5*(4), 397–405.

Haran, U., Ritov, I., & Mellers, B. A. (2013). The role of actively open-minded thinking in information acquisition, accuracy, and calibration. *Judgment and Decision Making*, 8, 188-201

Hoekstra, R. A., Vinkhuyzen, A. A., Wheelwright, S., Bartels, M., Boomsma, D. I., Baron-Cohen, S., Posthuma, D., & van der Sluis, S. (2011). The construction and validation

of an abridged version of the autism-spectrum quotient (AQ-Short). *Journal of autism and developmental disorders*, 41(5), 589–596.

Hussain, Z., Williams, G. A., and Griffiths, M. D. (2015). An exploratory study of the association between online gaming addiction and enjoyment motivations for playing massively multiplayer online role-playing games. *Computers in Human Behaviour,* 50, 221–230.

Kemp, K.C., Gross, G.M., & Kwapil, T.R. (2020). Psychometric properties of the Multidimensional Schizotypy Scale and Multidimensional Schizotypy Scale-Brief: Item and scale test-retest reliability and concordance of original and brief forms. *Journal of Personality Assessment*, 102, 508-515

Kwapil, T., Brown, L., Silvia, P., Myin-Germeys, I., & Barrantes-Vidal, N. (2012). The expression of positive and negative schizotypy in daily life: An experience sampling study. *Psychological Medicine, 42*(12), 2555-2566.

Kwapil, T. R., Gross, G. M., Silvia, P. J., Raulin, M. L., & Barrantes-Vidal, N. (2018). Development and psychometric properties of the Multidimensional Schizotypy Scale: A new measure for assessing positive, negative, and disorganized schizotypy. *Schizophrenia research*, 193, 209–217.

Lantian, A., Bagneux, V., Delouvée, S., & Gauvrit, N. (2021, in press) Maybe a Free Thinker but not a Critical One: High Conspiracy Belief is Associated With low Critical Thinking Ability, Preprint available: doi.org/10.31234/osf.io/8qhx4

Lanza, S. T., & Rhoades, B. L. (2013). Latent class analysis: an alternative perspective on subgroup analysis in prevention and treatment. *Prevention science : the official journal of the Society for Prevention Research*, *14*(2), 157–168.

Lo, Y., Mendell, N. R., and Rubin, D. B. (2001). Testing the number of components in a normal mixture. *Biometrika,* 88, 767–778.

McLean, B. F., Mattiske, J. K., & Balzan, R. P. (2017). Association of the Jumping to Conclusions and Evidence Integration Biases With Delusions in Psychosis: A Detailed Meta-analysis. *Schizophrenia bulletin*, *43*(2), 344–354.

Moritz, S., Favrod, J., Andreou, C., Morrison, A. P., Bohn, F., Veckenstedt, R., Tonn, P., & Karow, A. (2013). Beyond the usual suspects: positive attitudes towards positive symptoms is associated with medication noncompliance in psychosis. *Schizophrenia bulletin*, *39*(4), 917–922.

Orri, M., Pingault, J.B., Rouquette, A., Lalanne, C., Falissard, B., Herba, C.M., Côté, S.M., & Berthoz, S. (2017). Identifying affective personality profiles: A latent profile analysis of the Affective Neuroscience Personality Scales. *Scientific Reports,* 7(1): 4548.

Pennycook, G., Epstein, Z., Mosleh, M., Arechar, A., Eckles, D., Rand, D., (2021) Shifting attention to accuracy can reduce misinformation online, *Nature*, 592, 590-595.

Pinkham, A., & Sasson, N. (2020). The benefit of directly comparing autism and schizophrenia, revisited. *Psychological Medicine, 50*(3), 526-528.

Ramaswamy, V., DeSarbo, W. S., Reibstein, D. J., and Robinson, W. T. (1993). An empirical pooling approach for estimating marketing mix elasticities with PIMS data, *Marketscience*, 12, 103–124.

Salice, A., & Henriksen, M. G. (2021). Disturbances of Shared Intentionality in Schizophrenia and Autism. *Frontiers in psychiatry*, *11*, 570597.

Schwarz, G. (1978). Estimating the dimension of a model, *Open Journal of Statistics*, 6, 461-464.

Sclove, S. L. (1987). Application of model-selection criteria to some problems in multivariate analysis. *Psychometrika,* 52, 333–343.

Sommer, M., Döhnel, K., Jarvers, I., Blaas, L., Singer, M., Nöth, V., Schuwerk, T., & Rupprecht, R. (2018). False Belief Reasoning in Adults with and without Autistic Spectrum Disorder: Similarities and Differences. *Frontiers in psychology,* 9, 183.

Stanovich, K. E., & West, R. F. (2007). Natural myside bias is independent of cognitive ability. *Thinking & Reasoning, 13*(3), 225–247.

Swami, V., Barron, D., Weis, L., Voracek, M., Stieger, S., & Furnham, A. (2017). An examination of the factorial and convergent validity of four measures of conspiracist ideation, with recommendations for researchers. *PLOS ONE*, 12, e0172617.

Swami V., Furnham A., Smyth N., Weis L., Lay A., Clow (2016) A. Putting the stress on conspiracy theories: Examining associations between psychological stress, anxiety, and belief in conspiracy theories. *Personality and Individual Differences,* 99, 72-76.

van der Tempel, J., & Alcock, J. E. (2015). Relationships between conspiracy mentality, hyperactive agency detection, and schizotypy: Supernatural forces at work? *Personality and Individual Differences, 82,* 136–141.

van Prooijen, J. W., & Douglas, K. M. (2018). Belief in conspiracy theories: Basic principles of an emerging research domain. *European Journal of Social Psychology*, 48, 3.

Williams, D. L., Mazefsky, C. A., Walker, J. D., Minshew, N. J., & Goldstein, G. (2014). Associations between conceptual reasoning, problem solving, and adaptive ability in

high-functioning autism. *Journal of autism and developmental disorders*, 44(11), 2908–2920.

Woodward, T.S., Moritz, S., & Chen, E.Y.H., (2006). The contribution of a cognitive bias against disconfirmatory evidence (BADE) to delusions: a study in an Asian sample with first episode schizophrenia spectrum disorders. *Schizophrenia Research* ,83, 297–298.

Woodward, T.S., Moritz, S., Cuttler, C., & Whitman, J., (2006). The contribution of a cognitive bias against disconfirmatory evidence (BADE) to delusions in schizophrenia. *Journal of Clinical and Experimental Neuropsychology*, 28, 605–617.

Zhang, L., Tang, J., Dong, Y., Ji, Y., Tao, R., Liang, Z., Chen, J., Wu, Y., & Wang, K. (2015). Similarities and Differences in Decision-Making Impairments between Autism Spectrum Disorder and Schizophrenia. Frontiers in behavioral neuroscience, 9, 259.

Chapter 7: Study Five

7.1 Preface for Study Five

Both Study One and Study Two found associations between autistic traits, analytical thinking and conspiracy theory beliefs. The findings suggested that analytical thinking may not always be a protective factor against CT beliefs if it is subject to confirmation bias and unbalanced information searching. Instead, Study 3 show that an individual's scientific reasoning ability is the better predictor of whether they may be able to reject conspiracy theory beliefs. The Latent Profile Analysis conducted in Study Four affirmed that the higher scores on the measures that capture ability to process large amounts of evidence, in conjunction with logical and scientific reasoning skills, are more likely to coincide with lower scores on conspiracy theory belief measures. Importantly, the findings of both Study Three and Study Four imply scientific reasoning skills may be amenable to an intervention approach to conspiracy beliefs.

The final study of this thesis (Study Five) therefore examined whether scientific-based reasoning skills could be fostered in people who may be prone to conspiracy beliefs, and, in turn, applied to challenge conspiracy information. This was conducted via an intervention design with two conditions in which people are placed in either a condition designed to promote the use of scientific reasoning skills against conspiracy theories (i.e. an inoculation approach) or a control condition. Participants completed baseline of a designed conspiracy beliefs task pre-intervention, analytical thinking, schizotypal and autistic traits, as well as a scientific reasoning task. Post-intervention, both groups new measures of conspiracy beliefs and liberal acceptance (i.e. the tendency to accept absurd information). Analysis included both a correlational analysis, then an ANCOVA analysis to compare experimental groups post-intervention. This approach also examined whether individual differences (i.e. covariates) influenced the main effect of the experimental manipulation. The principal hypothesis was that participants encouraged to analyse the logical flaws in relation to specific set of CT beliefs would generalise this learning to other CT related beliefs in the post-test.

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Principal Author

Name of Principal Author (Candidate)	Neophytos Georgiou		
Contribution to the Paper	Study concept and design, data collection, statistical analyses, writing manuscript.		
Overall percentage (%)	80		
Certification:	This paper reports on original research I conducted during the period of my Higher Degree by Research candidature and is not subject to any obligations or contractual agreements with a third party that would constrain its inclusion in this thesis. I am the primary author of this paper.		
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Co-Author Contributions

By signing the Statement of Authorship, each author certifies that:

xiii. the candidate's stated contribution to the publication is accurate (as detailed above).

xiv. permission is granted for the candidate in include the publication in the thesis; and

xv. the sum of all co-author contributions is equal to 100% less the candidate's stated contribution.

Name of Co-Author	Professor Paul Delfabbro		
Contribution to the Paper	Principal Supervision, advice about study concept and design, manuscript proof-reading.		
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Contribution to Paper	Secondary Supervision, advice about study concept and design, manuscript proof-reading.		
Signature		Date	28/02/2023

The effectiveness of a scientific reasoning intervention for conspiracy theory beliefs

by

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Statement and Declarations

Data Availability Statement

The data that support the findings of this study are available from the corresponding author.

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Conflicts of Interest.

The current paper has no conflicts of interest to report.

Ethics Approval Statement

This project received ethics approval by the Human Research Ethics Subcommittee in the University of Adelaide's School of Psychology as a low risk application.

7.3 Abstract

Conspiracy theory (CT) beliefs have become an important policy-relevant research area since the events of the COVID-19 pandemic. Increasing interest has been directed towards strategies that might reduce people's susceptibility to conspiratorial beliefs. In this study, we examined whether encouraging a stronger orientation toward critical scientific appraisal of conspiratorial accounts could reduce CT acceptance. After completing baseline measures of COVID-19 related beliefs and analytical and scientific reasoning abilities, a total of 700 adults were randomly allocated to a control or scientific reasoning manipulation. People assigned to the scientific reasoning condition were found to display significantly lower CT belief endorsement post-intervention as compared to the control group. As well as having implications for the design of future intervention studies, the results of this study encourage a greater focus on specific reasoning skills that may be amenable to a psychoeducation approach, in order to further develop methods to prevent CT beliefs.

7.4 Introduction

At the time of the first wave of the COVID-19 pandemic in 2020, misinformation regarding the virus was ubiquitous across many social media platforms (Agley & Xiao, 2022; Georgiou et al., 2020a; Pennycook et al., 2020; Ripp & Röer, 2022). Although more compelling public health information emerged that clarified the cause and potential risk of the COVID–19 virus, increasingly less plausible CTs surfaced (e.g., the Bill Gates - 5G conspiracy theory; Pavela-Banai et al., 2021; De Coninck et al., 2021). Individuals who support these beliefs show a profound distrust of authorities, identify with fringe movements (e.g. QAnon), and reject established medical treatments and preventative measures against the pandemic (Georgiou et al., 2020b; 2021b; Ripp & Röer, 2022). These developments have made conspiracy beliefs an important area of psychological research, with studies having focused attention on individual differences that appear to make some people more susceptible to these beliefs (Georgiou et al., 2021; Mulukom et al., 2022).

Research has commonly examined how socio-cognitive factors – such as thinking style, critical reasoning, and prior education – play a role in the formation of CT beliefs (Georgiou et al., 2021c; Denovan et al., 2020). The principal view is that people who are less likely to prefer an analytical thinking style (i.e., a preference to systematically seek out information on a given topic) and who are less educated may be less likely to develop the necessary critical reasoning skills needed to debunk CT beliefs (Epstein & Norris, 2011; Lantian et al., 2021; Stahl & van Prooijen, 2018). However, recent work by Georgiou et al. (2021c) suggests that self-reported analytical thinking styles may not necessarily be protective if it involves confirmation bias (i.e., searching for information only in support of conspiracy beliefs in a meticulous manner), which appears to be more likely in populations displaying higher schizotypal and/or ASD traits (Georgiou et al., 2021d; 2022a). Georgiou et

al. argued that systematically seeking information and being more 'analytical' may be less protective than the ability to analyse that information in a scientific way. In other words, it might not be whether people are analytical, but whether they can analyse information in a way that tests hypotheses using scientific reasoning that matters. It was observed that 'do your own research' is often a catchcry of the conspiracy movement which implies systematic attempts to analyse information, but not necessarily in a critical manner (Čavojová et al., 2020; Gjoneska et al., 2021; Georgiou et al., 2021c; Pennycook et al., 2019; Pennycook & Rand, 2021; Pytlik, Soll & Mehl, 2020; Roberts & Risen et al., 2022; Rutjen et al., 2022).

These findings have led to the suggestion that a greater focus on scientific education may be the most effective way to counter CT beliefs. This is exemplified in the work of Orosz et al. (2016), who examined different intervention strategies to counteract CT beliefs. Using a repeated-measures design, the authors provided participants with a 'rational' argument against the premises of CT beliefs (e.g., pointing out flaws in logic and encouraging a similar process to the participant). Other studies with a particular focus on online misinformation have employed similar methods referred to as the 'accuracy-nudge' approach (Ecker et al., 2022; Pennycook et al., 2021; Pennycook & Rand, 2022; Roozenbeek et al., 2020).

The premise of an 'accuracy-nudge' intervention is to encourage people who would otherwise freely accept misinformation, to consider the accuracy of what they share and to redirect attention to the concept of accuracy to increase sharing discernment (Pennycook et al., 2020; Pennycook & Rand., 2022; Rozenbeek et al.., 2020). In doing so, it was found that both pre-emptive ('prebunking') and reactive ('debunking') interventions whereby people were prompted to evaluate the accuracy of online content reduced the likelihood of demonstrating a misinformation effect (Ecker et al., 2022; Pennycook et al., 2021: 2022).

However, despite the increasing focus on scientific reasoning in recent studies (De Coninck et al., 2021; Gjoneska et al., 2021; Georgiou et al., 2021c; 2022a, in press), research has yet to examine whether fostering scientific reasoning skills may 'nudge' people to 'debunk' future CT beliefs, and, in turn, serve as a viable avenue for a CT intervention. Whilst accuracy-nudge approaches to date focus on the concept of accuracy and the quality of information, there is an assumption that people may alter their viewpoint depending on whether they can assess the quality of information presented. Such approaches would appear to assume that those prone to CT beliefs may lack a foundational understanding of key scientific concepts important to evaluate such conspiracist information or possess the necessary skills but apply these skills inconsistently or selectively (e.g., concepts of causality, confounding variables, response bias; De Connick et al., 2021; Drummond & Fischhoff, 2017; Georgiou et al., 2021c; Gjoneska et al., 2021). This points to the need for interventions to hone scientific reasoning skills.

Research has also suggested that susceptibility to CT beliefs and the identified protective factors may not be equally distributed across the population. As well as differences in education, it is also important to acknowledge findings that report of an association between certain clinical conditions and CT beliefs. In particular, studies show that people scoring higher on measures of trait schizotypy and autism spectrum disorder (ASD) appear more likely to endorse conspiracy beliefs, and score lower on scientific reasoning compared to the general population (Georgiou et al., 2022). As each of these traits has been shown to independently predict CT beliefs and would be an important factor to be controlled for in research that concerns changing conspiracy beliefs (Georgiou et al., 2022). People who score highly on schizotypal and autistic traits have been shown to have issue with separating fictitious from credible information and are more likely to liberally accept conspiratorial

information in the face of counterevidence (Balzan et al., 2016; Georgiou et al., 2020c; Georgiou et al., 2021b; Georgiou et al., 2022). Schizotypal traits have been suggested to be one of the foremost predictors of conspiracy beliefs, as they include anomalies in cognition (e.g., odd, or magical thinking); excessive focus on details of events rather than the overall situation; and, a greater likelihood of drawing unfounded inferences (Balzan et al., 2015; Eisenacher et al., 2015; Moritz et al., 2013; Woodward et al., 2014). Although less studied, autistic traits are associated with a less adaptable thinking style not as open to disconfirmatory evidence (Georgiou et al. 2022a; Mckenzie et al., 2018). People with autistic traits can sometimes find events more ambiguous and may, therefore, resort to CT beliefs that reinforce previously formed schemas to reduce ambiguity (i.e., world events are pre-determined or controlled), a tendency referred to as a 'need for sameness' (Pegado et al., 2020; Uljarevic et al., 2017; Williams et al., 2014: 2018). A recent latent profile analysis by Georgiou et al., (2022) suggests that autistic and schizotypal traits are often correlated or overlapping (Nenadic et al., 2021; Zhou et al., 2019), in that people with high CT beliefs also demonstrated high levels of both traits.

7.4.1 The Present Study

The aim of the present study is to examine whether scientific-based reasoning skills can be fostered in people who are prone to CT beliefs and, in turn, applied to challenge conspiracist ideas. This was conducted via an intervention design with two conditions developed from Orosz et al. (2016), whereby people are placed in either a condition designed to promote the use of scientific reasoning skills against CTs or a control condition. Based on previous research, we anticipated that people who are exposed to the scientific reasoning condition may be better able to reject conspiracy theory beliefs than the control group. Moreover, we hypothesized that people with more adept scientific reasoning skills, would be

less likely to endorse conspiracy beliefs pre/post intervention, and score lower on co-variates of CT beliefs (i.e., schizotypy and autistic traits). As previously discussed, it would also be expected that measures of autistic and schizotypal traits would be positively associated with conspiracy beliefs both before and after the intervention.

In order to assess our hypothesis, we examined whether post-intervention scores on CT beliefs (see Appendix 2 and 5 of Supplementary Materials) differed for those in the 'scientific condition' compared to the control group. The post-intervention CT belief measure captured an individual's ability to apply the key scientific concepts to debunk an array of conspiracy theories (see Appendix 6 of Supplementary Materials). The 'scientific condition' would act to 'nudge' individuals toward the appropriate scientific skills that may 'debunk' CTs, whilst the control condition involved a neutral presentation of information regarding the COVID-19 pandemic (see Appendix 3 of Supplementary Materials). In conjunction with the post-intervention CT belief measure, participants were administered a sub-measure of the Bias Against Disconfirmatory evidence task (Woodward, Moritz, & Chen, 2006; Georgiou et al., 2020b) to capture individual differences in *liberal acceptance*, which refers to how easily people are to liberally accept incongruous beliefs. In accordance with the recommendations of Hopewell et al. (2011), Figure 6 describes the assignment of participants and experimental design through a CONSORT flowchart, whilst Table 20 describes the hypotheses of this study. As mentioned, the study controlled for both schizotypy and autistic traits, as they have both shown an association with CT beliefs, decreased scientific reasoning performance and differed in their association to analytical thinking (Georgiou et al., 2021a; 2021b; 2021c; 2021d). Schizotypy has also shown an association with the post-intervention measure of liberal acceptance (Balzan et al., 2016). The study also controlled for educational differences based on previous research which supports that this can be a protective factor against CT

belief formation (see Van Prooijen, Krouwel & Pollet, 2015; Darwin, Neave & Holmes, 2011).

Table 20

Summary of Expected Outcomes of the Experimental Manipulation (Top) and associations between Co-Variates and Outcome measures (Bottom)

Hypothesis 1. It is hypothesized that those exposed to the scientific reasoning condition would show lower CT beliefs post-intervention than the Control condition.				
Hypothesis 2. It is hypothesized that there will be no differences in CT beliefs pre-intervention across both Scientific Reasoning and Control conditions.				
	Scientific Reasoning (SRS)	Analytical Thinking (REIM –R)	Schizotypy (MSS – B)	Autistic Traits (AQ – 10)
CT Beliefs (Pre- Intervention)	–	–	+	+
CT Beliefs (Post Intervention)	–	–	+	+
Liberal Acceptance	–	–	+	+

Note: SRS = Scientific Reasoning Scale, REIm – R = Rational and Experiential Multimodal Inventory (Rational Subscale), MSS – B = Multidimensional Schizotypy Scale – Brief, AQ – 10 = Autistic Spectrum Quotient – 10 Brief, Where there is indicated a + symbol, a positive association is expected between co-variate and outcome measure. A – symbol denotes an expected negative association between the co-variates and outcome measures.

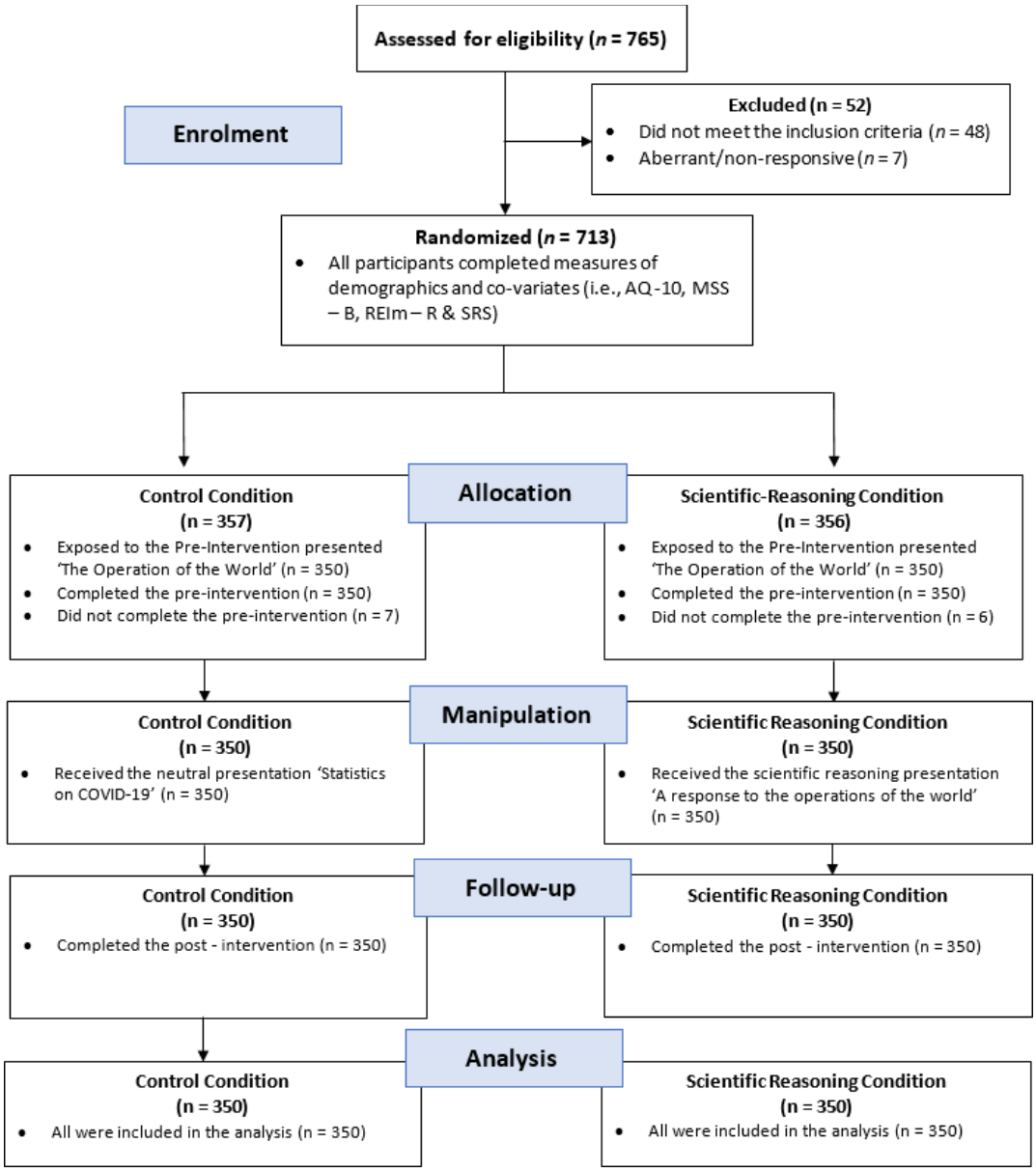

Figure 6 *CONSORT flow diagram of the progress of participants and experimental design through pre and post intervention according to condition.*

7.5 Method

7.5.1 Participants

As shown in Table 21, the study involved a total of 700 participants (347 men, 349 women, 4 others), aged between 18-80 years (M = 29.25, SD = 13.21) from a range of countries: 69% from US, UK, Canada, Australia and South Africa and the remainder principally from continental Europe. In terms of prior clinical diagnosis, 185 (26.4%) of the sample reported they had received a formal diagnosis by a medical professional. A total of 372 (53.1%) reported having completed some form of college or bachelor's degree at a university, 178 (25.4%) had started some form of tertiary education, 138 (19.7%) had completed high school with 12 (1.7%) not completing high school. *Gpower* analysis indicated that at least 400 cases, or 200 per experimental condition (scientific reasoning vs. control) would be sufficient to achieve power of 0.80 for a multiple regression with 10 predictors and anticipated R-squared value of 0.30.

7.3.2. Sampling Procedure

The study used an international panel sample drawn from *Prolific.Inc* and was advertised as research interested in how people react to media and world events. The advertisement and study design received ethical approval by the Human Research Ethics Subcommittee in the University of Adelaide's School of Psychology as a low-risk participation. All participants received a small monetary compensation (around $US7) for their time and effort (around 45 minutes). Participants were also screened into the study based on the pre-screening assessment done by *Prolific.Inc*, by having 'neutral' or 'negative' beliefs towards the current COVID-19 vaccination programs in their respective country. As previous work has suggested that CT beliefs have been associated with decreased vaccine intentions (Berlin et al., 2020; Fridman et al., 2021), this ensured participants who are likely

to endorse CT beliefs regarding the pandemic were selected. The data retrieved was made anonymous and only presented in group form.

7.3.3. Study Design

The study was conducted entirely online. After consent was received and participants were debriefed, they completed several demographic questions (including survey items which asked for prior clinical diagnosis), a range of psychometric assessments, before they were assigned to one of two experimental conditions (see Study Procedure 2.4.). The current study employed a 2 Condition (Scientific/Control) assessment. The dependent variable being the measures of CT beliefs across both conditions, with pre-intervention acting as a baseline for statistical analysis on post-test scores (see Study Analysis 2.8).

7.3.4. Study Procedure

Once participants had provided informed consent and completed a series of demographic and psychometric measures, participants listened to the first audio recording by a 'journalist' labelled 'The operation of the world' (for the full transcript, see Appendix 1 of Supplementary Materials). Building upon previous work by Orosz et al. (2016), this 11-minute recording presented a complex conspiracy theory regarding the origin and 'purpose' of the COVID-19 pandemic. The information within this presentation reflected COVID-19 related CTs previously measured (i.e., the COVID – 9 scale of Georgiou et al., 2020). All participants listened to the recording unless indicating in the pre-screening they were unable to, whereby they would be given a written transcript form (N = 35). To ensure participants paid attention throughout the video, there were programmed attention checks at 3 points of the recording and meta-analytics of all participants were recorded to ensure they watched the presentation in its entirety. Participants could not move on to the next section until they had completed the video.

After participants had listened to the recording of 'The operations of the world', they answered 12 questions relating to the content of the script. These questions asked participants about: a) their endorsement of the CT beliefs contained within the recording, and b) how credible the information seemed to them. After this questionnaire, participants were then randomly assigned to one of two conditions: the scientific reasoning condition (5:59 min) or the control condition (4:54 min). As with the first presentation, attention checkpoints and meta-analytics (i.e., time spent on page, page interaction checks) were recorded to ensure participants had paid attention to their respective condition. Participants could not move on to the next section until they had completed their respective video.

In the scientific reasoning condition, participants listened to 'a response to the operations of the world', a video which challenged the claims made in the first recording and targeted the key scientific concepts the 'journalist' failed to consider. 'A response to the operations of the world' also provided a series of objections to point out the logical inconsistencies of the CTs presented (see Appendix 2 of Supplementary Material). As suggested in Georgiou et al. (2021c), the aim of this condition was to provide a form of psychoeducation regarding the importance of scientific reasoning in conspiracy beliefs, and, to help identify the logical flaws of the content first presented. In the control condition, participants listened to a neutral recording which detailed the current statistics of COVID-19 cases across the world and did not provide any counterevidence to CTs put forth in 'the operations of the world' (see Appendix 3 of Supplementary Material). The transcripts of all three audio presentations were offered to the participant if they preferred to read the script rather than listen to the audio recording as indicated in the pre-screening recording. To ensure participants were paying attention throughout each presentation, meta-analytics of both the video content and survey were recorded, whereby participants could only move on to the next section of the study if certain attention parameters were met (i.e., video completion, video

interaction indices).

Once participants had listened to the audio presented or read the script, in either the scientific reasoning or control condition, they then completed the post-intervention assessment of conspiracy beliefs and the Liberal Acceptance Task. These measures differed to the pre-intervention CT belief assessment to curb issues of demand characteristics. As this study presented content that may be distressing or false (i.e., the presented conspiracy theories), participants were debriefed both before and after completion of the study regarding the content and false nature of some of the content presented. Upon completion of the study, all participants were debriefed regarding the fabricated nature of the content presented within the three presentations to ensure they were not interpreted as true accounts of events.

7.3.5. Demographic and Covariate Measures

7.5.1.1 Demographic background and situation

Participants provided demographic information, including: gender, age, country of residence, highest education level, current employment status, and, prior history of clinical diagnosis.

7.5.1.2 Analytical Thinking (REIm – R)

The REIm is a 42-item self-report measure developed by Epstein and Norris (2011), which contains a 12-item subscale that measures tendencies to engage in analytical thinking (REIm-R), and a 30- item subscale which captures a person's tendencies to use an experiential and intuitive thinking style (REIm-E/I). Within the current study, solely the REIm-R will be used for reasons previously mentioned. All items are rated on a 5-point scale from 1 (*Strongly disagree*), to 5 (*Strongly Agree*). The REIm- R has been shown to have good psychometric properties (Epstein & Norris, 2011; Georgiou et al., 2019; Georgiou et al., 2021a: 2021c; Swami et al., 2017). The Cronbach's Alpha for the present study is 0.83.

7.5.1.3 Cognitive Task: The Scientific Reasoning Scale (SRS)

As in Georgiou et al., (2021c: 2022), scientific reasoning skills were measured using the SRS developed by Drummond and Fischhoff (2017) which comprises 11 short scenarios designed to test participants' knowledge of basic scientific concepts. This includes concepts such as confounding variables, control group effects, or random assignment to conditions. For example, a scenario measuring a person's understanding of the concept of confounding variables states: 'A research project has subjects put together a jigsaw puzzle either in a cold room with a loud radio or in a warm room with no radio. Subjects solve the puzzle more quickly in the warm room with no radio'. Each scenario is then followed by a statement, and participants are asked to indicate whether it is true or false: 'The scientist cannot tell if the radio caused subjects to solve the puzzle more slowly'. In this study, we included a third option "I don't know" to reduce the probability of randomly guessing at the correct answer. The SRS score was computed by summing the correct answers to 11 items. The Cronbach's Alpha for these items was .83.

7.5.1.4. The Autism-Spectrum Quotient Short-Form (AQ-10)

The AQ – 10 is a validated, shortened 10-item version devised by Hoekstra et al. (2011) of the self-administered 50-item instrument by Baron-Cohen (2001) designed to measure the degree to which an adult has the traits associated with the autistic spectrum. Alike Georgiou et al., (2021a: 2021c), the AQ – 10 was used as a continuous measure, with each option scored from 1 – 4 based on the recommendations of Stevenson and Hart (2017). Likert scoring yielded higher internal consistency and test-retest reliability when administered to populations which are predominately neurotypical and has been used in the context of CT beliefs previously (see Georgiou et al., 2021c for further details). The Cronbach's Alpha was 0.87.

7.5.1.4 Multidimensional Schizotypy Scale – Brief (MSS-B)

The MSS-B is a 38-item assessment developed by Gross et al. (2018) as an abbreviated form of the 77-item original scale formed by Kwapil et al. (2017) which measures positive, negative and disorganized traits of schizotypy. All items were rated on 1 (Completely Disagree) to 5 (Completely Agree). The MSS – B has been found to have very good psychometric properties in diverse populations, including recent research concerning CT beliefs (Kemp et al., 2019; Georgiou et al., 2021a: 2021c: 2022a). The Cronbach's Alpha for the present study was very good: 0.95.

7.5.2 Pre-Intervention Assessment

7.5.2.1 Pre-Intervention Conspiracy Assessment Task

Developed from the original Conspiracy Assessment Tool (CAT; Orosz et al., 2016), a six-item assessment was created which captured CTs shown in the first presentation 'the operation of the world' (see Appendix 4 of Supplementary Material). The COVID-19 related conspiracy beliefs presented within the script were adopted from multiple sources, such as: items within the COVID – 9 Scale of Georgiou et al. (2020), CTs items presented within Douglas et al. (2021), and, reputable articles drawn from online news outlets reporting on recent COVID-19 conspiracist movements (i.e., the Guardian, C – SPAN, BBC). These items covered topics such as: a) whether COVID-19 was designed to target minority groups, b) the role of Bill Gates, and the Bill & Melinda Gates Foundation in the COVID-19 pandemic, and c) the intentions of large pharmaceutical companies in the production of a COVID-19 vaccine, along with international strategy towards vaccination programs.

Each item contained a scientifically flawed concept that is otherwise measured on the Scientific Reasoning Scale. For example, the item "It is no mistake that COVID death rates in the population of minority people has been higher than in majority groups. This is a purposeful act by the global elites to suppress the influence of minority populations (e.g.,

African Americans).” demonstrated a false use of *causality*, which draws parallels to the *Causality Item* of the Scientific Reasoning Scale “An American researcher finds American States with larger parks have fewer endangered species. True or False? Increasing the size of the park will result in fewer endangered species.” (Drummond & Fischhoff, 2017).

Participants responded to the CT theories presented via two Likert scale assessments. Items were rated on a 5-point scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). Higher scores on this measure reflected agreement with the first recording and stronger conspiracy beliefs. Participants were also asked to rate the credibility of the information presented from 1 (Highly Fictitious) to 6 (Highly Credible). In addition, there were some questions designed to capture the participants ability to pay attention to the content presented in the first recording. Scores across all 6 items a mean score from both ratings of credibility and agreement were summed and used to create a CT belief score pre-intervention. The Cronbach’s alpha of both the agreement scale (a = 0.76), and credibility scale (a = 0.78) were good, with the overall scale sufficient for analysis (a = 0.79).

7.5.3 Post Intervention Assessment

7.5.3.1 Post- Intervention Conspiracy Assessment Task

Once participants had listened to the recording presented in either the control or been exposed to the psychoeducational content of the scientific reasoning condition was designed to capture whether participants could apply the necessary scientific reasoning skills to debunk conspiracy theories unrelated to the content within the first recording pre-intervention. This measure was used to assess whether participants would demonstrate the reasoning skills encouraged within the scientific reasoning condition beyond the context of COVID-19

related CTs presented within the ‘operations of the world’ presentation.

Within the seven excerpts presented, three were dummy items and were scientifically correct. The four CT excerpts covered topics such as (1) the role of ‘natural’ health remedies in cancer treatment, (2) the role of fluoride in our diets, and (3), the relationship between vaccinations (e.g., the Mumps, Measles and Rubella Vaccine) and autism prevalence. The content of these excerpts was purposefully different from the content of ‘the operations of the world’, to examine whether people in the scientific reasoning condition could apply the necessary scientific reasoning skills in a new context. One at a time, participants were presented the series of seven excerpts from various ‘news articles’ available from online websites or blogs (See Appendix 5 of Supplementary Material). For example, the following CT excerpt was drawn from an online source;

> “There are many health risks that we may be unaware of that can cause harm to our children. Some of those risks are right in front of us, in our own kitchen. For several decades the government has been putting fluoride concentrate in our water without our consent, which is said to prevent tooth decay. However, those made aware know that fluoridated water also has resulted in a decrease in our children’s IQ scores. One study in the peer reviewed journal *JAMA Pediatrics*, found that mothers who had consumed fluoridated tap water while they were pregnant tended to give birth to children who ended up having slightly lower IQ scores by ages 3 to 4. This important piece of research is evidence that action must be taken to stop our drinking water undergoing fluoridation.”

Similar to the method used for administering the pre-intervention CT measure, after each excerpt participants were asked to rate on a 6-point scale how credible the information in the excerpt is from 1 (Highly Fictitious) to 6 (Highly Credible), and, on a 5-point scale, how likely the point raised by the excerpt is to be true from 1 (Strongly Disagree) to 5 (Strongly Agree). This captured people’s level of agreement with the conspiracy, and, how credible they believe the information was in the excerpt. Scores across all 4 items a mean score from both ratings of credibility and agreement were then summed to create a CT belief

score post-intervention. The Cronbach's alpha of both the agreement scale ($a = 0.77$), and credibility scale ($a = 0.75$) were very good, with the overall scale sufficient for analysis ($a = 0.78$).

7.5.3.2 Post-Intervention: The Liberal Acceptance Task

A sub-measure of the Bias Against Disconfirmatory Evidence (BADE) task developed by Woodward, Moritz and Chen (2006), the Liberal Acceptance task consisted of five scenarios that assessed an individual's willingness to endorse absurd or generally implausible information. The original BADE task consists of up to 16 written delusion-neutral scenarios that assess an individual's persistence to hold certain beliefs in the face of disconfirmatory evidence. The BADE assessment involved participants ratings of the plausibility of four statements for their fit to a specified scenario, which is based on a single piece of information ("i.e., Jenny can't fall asleep"). Each scenario has one true interpretation from the four statements, two lure interpretations, and, important to this study, one absurd interpretation. In the original BADE, after participants rate the four statements, they are presented a second piece of information (i.e., "Jenny wonders how many presents she will find under the tree"), then a third piece of information (i.e. "Jenny is excited about Christmas morning"), whereby participants are asked to rate the plausibility on those same four statements. This process would yield four metrics based on participant's changes in plausibility ratings of those four statements. However, the level of a participants "liberal acceptance" of absurd statements (as recommended by correspondence with Professor Woodward; Georgiou et al., 2021a), is only calculated once all three pieces of information are presented to the participant: Mean rating of the absurd ratings across all scenarios once all three pieces of information are presented. This reflects how willing participants were to endorse absurd or generally implausible interpretations, and, has been shown to positively correlate with CT belief measures (Georgiou et al., 2020b; 2021a). As a result, the current

study has presented the five scenarios with all three pieces of information already presented. Higher levels of *liberal acceptance* have been negatively associated with scientific reasoning, and, positively associated with CT beliefs (Georgiou et al., 2021c). In other words, those who are more likely to liberally accept the absurd statements, are likely to show less diligence when evaluating information that may contain false causality and confounding factors common to conspiracist accounts. Hence, a measurement of *liberal acceptance* post-intervention provides a means to measure the effectiveness of key concepts introduced within the scientific reasoning condition and measures by the SRS pre-intervention outside of the context of CT beliefs.

7.5.4 Statistical Analysis

Examination of the data suggested all variables were normally distributed and parametric assessment was suitable. Analysis was conducted using version 27 of IBM SPSS Statistics software. Pearson's r correlation analysis was used to examine the relationship between the psychometric variables of this study, and performance on the measures of CT beliefs pre/post intervention and Liberal Acceptance assessment task. Liberal acceptance calculations followed the methods recommended in the meta-analysis conducted by McLean, Mattiske & Balzan (2017). To assess the effectiveness of the experimental manipulation, a simple effects analysis was conducted to assess whether there were significant differences between conditions pre/post intervention. A 2 Condition (Scientific/Control) between groups ANCOVA compared CT beliefs post-intervention. This analysis made it possible to examine whether there were differences across conditions post-intervention even when controlling known co-variates (i.e., schizotypal and autistic traits, scientific reasoning performance, level of analytical thinking), and, in turn, whether those differences could be attributable to the intervention approach. It also examined whether individual differences (the covariates) influenced the main effects of the model.

Table 21

Demographic Characteristics of sample in Study Five (n = 565)

	N (%)
Gender	
Male	347 (49.5)
Female	349 (49.8)
Not stated	4 (0.7)
Age	
18-24	240 (34.2)
25-34	319 (45.5)
35-44	91 (13.0)
45-54	37 (5.3)
55-64	8 (1.1)
65+	5 (0.7)
Country	
Oceania	32 (4.5)
United Kingdom	192 (27.4)
United States of America	219 (31.2)
Canada	6 (0.9)
South Africa	34 (4.8)
Other continental Europe	146 (20.8)
Rest of the World (Nations with, N < 5)	71 (10.1)
Education	
University Degree	372 (53.1)
Some College	178 (25.4)
High School Only	138 (19.7)
Less than high school	12 (1.7)
Employment Status	
Working (as employee)	360 (51.4)
Self- Employed	110 (15.7)
Temporarily off work	20 (2.9)
Looking for work	117 (16.7)
Other	81 (11.6)
Clinical History	
Received Prior Diagnosis	185 (26.4)
No formal diagnosis	515 (74.6)

7.6 Results

7.6.1 Descriptive Statistics: Demographic and Psychometric measures

Descriptive statistics of the above-mentioned psychometric variables with their associated ranges, mean scores, standard deviations are presented in Table 22. In terms of cognitive style and performance, the sample showed a relatively high level of education and preference for analytical thinking but scored below the midpoint on the Scientific Reasoning Scale. Similar trends within a highly educated sample have been found in previous works, supporting the notion that a person's level of education and preferences in thinking style are not necessarily indicative of critical reasoning ability in the context of CT beliefs (Konda, 2019; Georgiou et al., 2019: 2021c: 2022; Lantian et al., 2021). Covariates such as autistic (AQ -10) and schizotypy (MSS – B) scores generally were in the middle of the scale with all three schizotypal scales falling just below the midpoint.

Table 22

Descriptive statistics for measures

	M (SD)	Range of Participant Scores (Range)
ASD - 10 Total	21.45 (3.54)	12 – 38 (10 - 40)
MSS – B Total	88. 57 (22.70)	38 – 157 (38 – 190)
Disorganized	26.83 (10.18)	12 – 58 (12 – 60)
Negative	30.68 (8.78)	13 – 59 (13 – 65)
Positive	31.06 (10.26)	13 – 63 (13 – 65)
REIm – R (AT)	44.94 (7.10)	16 – 60 (12 – 60)
SRS Scores	4.44 (1.94)	2 – 11 (0 – 11)
CT Beliefs (Pre-Intervention)		
Control	4.88 (1.32)	2 -11 (2 -11)
Scientific condition	4.94 (1.21)	2 -11 (2 -11)
CT beliefs (Post-Intervention)		
Control	4.73 (1.14)	2 -11 (2 -11)
Scientific Condition	4.29 (0.93)	2 -11 (2 -10)

7.6.2 Correlation Analysis: Psychometric variables and performance on cognitive tasks before and after intervention

Table 23 displays the Pearson correlations between measures. The strong positive association between scores on both CT belief measures before and after the intervention, suggests that the CT belief content covered may overlap, supporting the construct validity of the assessment. Moreover, a weak positive association between post-intervention CT beliefs and Liberal Acceptance (i.e., LA – T scores) suggests that the two are related, but distinct measures. Consistent with our hypothesis, there was a negative association between scientific reasoning with CT beliefs before and after intervention. There was also a negative association between a preference for analytical/rational thinking and scientific reasoning.

As found in previous research of Georgiou et al. (2021a: 2021b: 2021c: 2021d), higher levels schizotypal traits positively correlated with CT belief measures intervention, whilst autistic traits showed a weak but significant positive association with conspiracy measures. Further, schizotypal traits were positively correlated with higher levels of liberal acceptance. Autistic and schizotypal traits had opposing associations with a preference for rational thinking (i.e., REIm – R scores) and both were negatively associated with scientific reasoning performance.

Table 23

Pearson's Correlation analysis between all psychometric measures in Study Five

	1	2	*3*	*4*	5	6	7	8	9
1. AQ – 10									
2. MSS –N	.200** (<.001)								
3. MSS –P	.066 (.091)	.220** (<.001)							
4. MSS –D	.420** (<.001)	.444** (<.001)	.633** (<.001)						
5. REIm-R	.199** (<.001)	-.210** (<.001)	-.349** (<.001)	-.213** (<.001)					
6. SRS	-.067* (.021)	-.101* (.013)	-.109* (.022)	-.097* (.014)	-.095* (.016)				
7. CT (pre)	.173** (<.001)	.431** (<.001)	.420** (<.001)	.088* (.037)	.113* (.012)	-.302** (<.001)			
8. CT (post)	.043* (.031)	.221** (<.001)	.320** (<.001)	.042* (.033)	.097* (.020)	-.351** (<.001)	.643** (<.001)		
9. LA – T	.015* (.048)	.028* (.019)	.117** (<.001)	.055* (.038)	-.017 (0.16)	-.099** (<.001)	.108* (.024)	.096* (.030)	

Note: Statistical significance of each correlation is provided in brackets after the correlation coefficient, AQ – 10 = Autism Spectrum Quotient, MSS – N = Negative traits of Schizotypy, MSS – P = Positive traits of Schizotypy, MSS – D = Disorganized traits of Schizotypy, REIm-R = Preference for Analytical thinking style, SRS = Scientific Reasoning Score, CT pre = Conspiracy Beliefs pre-intervention, CT post = Conspiracy Beliefs post-intervention, LA – T = Liberal Acceptance Rating.

7.6.3 Measuring the effectiveness of the Experimental manipulation

First, no significant effects were found across the different presentation formats (i.e., audio or written; $p > .05$). A simple effects analysis suggests that there were no significant differences observed across the two conditions for the baseline pre-intervention CT beliefs ($p > .05$) which confirmed that the two groups were similar before the manipulation. Post-intervention, those in the scientific condition showed significantly lower levels of CT beliefs post-intervention ($M = 4.29$, $SD = 0.93$) compared to the control group ($M = 4.73$, $SD = 1.14$; $t(698) = 2.03$, $p = .042$, $d = .153$. These results suggest that the manipulation in the scientific condition appeared to generalise to broader CT beliefs post-test (see Figure 7). Further, results may also suggest that those in the scientific condition showed a lower likelihood to liberally accept information post-intervention compared to the control group with differences close to significance $t(698) = 1.29$, $p = .09$, $d = .093$. This suggests that this learning effect may have also been observed in another context related to CT beliefs.

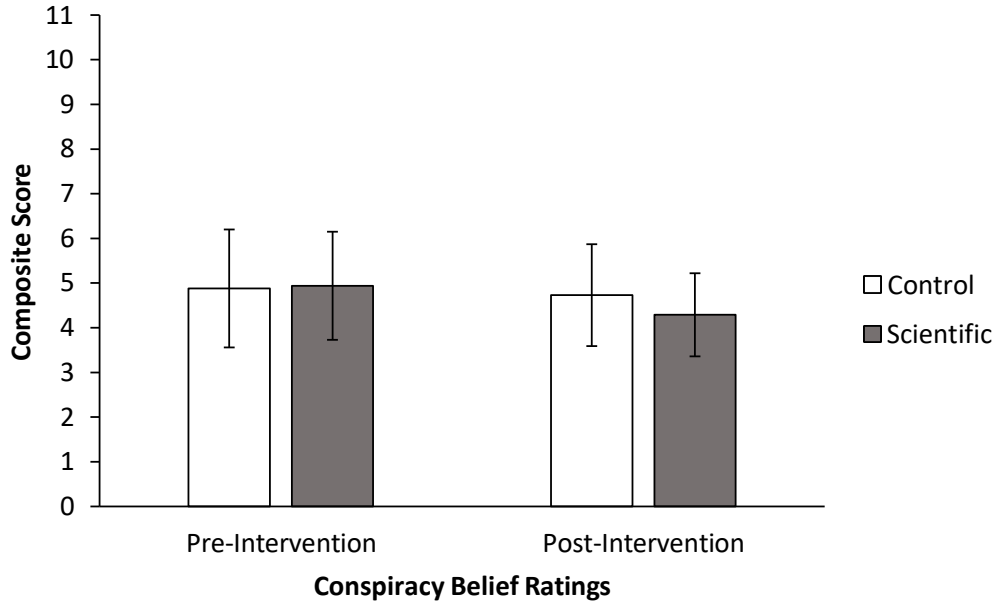

Figure 7 *Comparison of Conspiracy Theory Belief Scores Before and After Experimental Manipulation*

Note: This figure presents the conspiracy belief scores of both the scientific reasoning condition and control condition before and after the experimental manipulation. Composite score = mean credibility score + mean likelihood score for both measures.

7.6.4 Post-Intervention: Measuring the effect of Socio-Cognitive Factors on the Experimental Manipulation

An ANCOVA analysis post-intervention was conducted to assess whether there was a statistically significant difference across both conditions post-intervention (i.e., scientific reasoning vs control) whilst controlling for a preference for rational/analytical thinking (i.e., REIm – R scores) and scientific reasoning performance (i.e., SRS scores). After controlling for both REIM – R scores and SRS scores, there was still a significant effect of experimental condition on CT belief scores post-intervention $F(2, 698) = 6.80$, $p < .001$, $\eta_p^2 = .036$. SRS scores were significantly related to CT belief scores post-intervention $F(1, 699) = 4.10$, $p = .04$, $\eta_p^2 = .030$, whilst REIm – R scores were not significant ($p > .05$). These results suggest that whilst scientific reasoning performance was related to post-intervention CT beliefs, the experimental manipulation still appeared to be associated with participants' CT beliefs in the post-test. In other words, it seems regardless of a person's scientific reasoning ability, the intervention approach appears to have still influenced responses to post-intervention CTs.

7.6.5 Post Intervention: Controlling for Clinical Measures on the Experimental Manipulation

An ANCOVA with post-intervention scores was also conducted to examine whether differences across experimental condition would still hold after controlling for the variance associated with Schizotypy (MSS – B scores) or autistic traits (AQ – 10 scores). After controlling for MSS – B and AQ – 10 scores, there was still a significant effect of condition on conspiracy beliefs post intervention $F(2, 698) = 6.63$, $p < .001$, $\eta_p^2 = .034$. Schizotypal traits were significantly related to CT beliefs post-intervention $F(1, 699) = 6.29$, $p = .013$, $\eta_p^2 = .031$. Autistic traits were significantly related to post intervention CT beliefs $F(1, 699) = 5.88$, $p = .016$, $\eta_p^2 = .019$. These results suggest that autistic and schizotypal traits were positively related to post-intervention CT beliefs but did not affect the strength of the experimental manipulation effect. Overall, of clinical measures, schizotypal traits appeared to be a stronger predictor of conspiracy beliefs than the other clinical measures.

7.7 Discussion

The aim of the present study was to examine whether scientific-based reasoning skills can be fostered in people who are prone to CT beliefs and if these can be used to challenge CT-related information. Overall, the results of this study suggest that people exposed to the scientific reasoning condition showed a significant difference in CT beliefs post-intervention compared to the control condition. This learning effect may then have been generalised to another 'liberal acceptance' task post-intervention. Consistent with previous studies (Georgiou et al., 2021c), the results showed that a preference for analytical thinking was not protective and was associated with CT beliefs pre/post intervention. This supports the notion that scientific reasoning performance, rather than the tendency to engage in analytical thinking, was a stronger predictor of lower CT beliefs. The study also replicated other previously observed findings in CT research; namely, that people with higher schizotypal and autistic trait scores are positively related to CT beliefs. We observed this effect both in the pre and post intervention scores. Those who scored higher on schizotypal traits also showed a higher level of liberal acceptance.

7.7.1 The Effectiveness of the Scientific Reasoning Intervention

In previous research, Orosz et al. (2016) showed that CT beliefs could be reduced if a person is exposed to the rational, logical argument against the dubious premises of a conspiracy theory. This finding was elaborated upon by Pennycook et al. (2020), who argued that CT beliefs may arise for an inattention to the accuracy of information presented to them. Such observations led to the development of accuracy-nudge interventions based on the presentation of more accurate factual information (Roozenbeek et al., 2021). The current study has shown that an alternative exposure method, could be to present/educate people on how to apply the key principles of scientific enquiry in the context of reasoning or problem-

solving situations (i.e., conspiracist accounts). Whilst an accuracy-nudge approach focuses on improving the quality of information made available to an individual which may, in turn, prevent CT beliefs being formed from misinformation, the current approach draws tries to improve scientific reasoning skills or the manner by which information is analysed. By presenting how to apply the methods of scientific enquiry to conspiracy beliefs, as well as examples of their application, people were then potentially reminded or taught how to look for scientific merit in subsequent conspiracy accounts post-intervention.

The approach to foster scientific reasoning skills may also be viable within more at-risk cohorts (i.e., those scoring higher on schizotypy, autistic traits, or, that perform poorly on the scientific reasoning performance task; Cavajova et al., 2020; Douglas et al., 2017; 2020; Georgiou et al., 2021a; 2021c; 2021d). Although the analysis was based solely on post-intervention scores, those within the scientific reasoning condition did show a significant decrease on CT beliefs, and, showed lower CT beliefs than those in the control group. This approach has also been effective when applied to more topical CT beliefs than those presented within Orosz et al. (2016). These results also support the conclusions drawn from the seminal work of Pennycook et al. (2022) on the 'accuracy nudge' approach to misinformation, in that our findings suggest that the issues common to the emerging issues of online information associated with CT beliefs, may be amenable if an individual is made aware of the necessity to assess such information more diligently. Further, consistent with more recent papers (i.e., Čavojová et al., 2020: Georgiou et al., 2021c; Mulukom et al., 2022), our results as well as inspection of CT culture show that analytical thinking per se (which often involves an application of logic to interpret information) can paradoxically lead to the maintenance of CT beliefs. We suspect that this is because people seek out information

that is consistent with their beliefs (confirmation bias) and can apply logical arguments, but which are founded on erroneous premises.

7.7.2 Controlling for clinical measures

The effects observed in this study still held after controlling for individual differences and clinical traits associated with CT beliefs. Both ASD and schizotypy scores were positively associated with CT beliefs throughout the study. In particular, the positive relationships found between schizotypy, CT beliefs pre/post intervention, and the Liberal Acceptance task (i.e., a subtest of the BADE task; Georgiou et al., 2021c) are noteworthy. Such relationships have generally only been reported previously in highly schizotypal samples or individuals who have also been previously diagnosed with a form of psychotic disorder (Balzan et al., 2016; Georgiou et al., 2021b; Moritz et al., 2022; Ward & Garety, 2019). The reasons for these associations are that both ASD and schizotypal traits are known to be associated with a more inflexible thinking style when interpreting information which may make people less susceptible to counterevidence (i.e., the intervention within the scientific condition) and are associated with higher levels of CT beliefs (Barron et al., 2018; Furnham & Grover, 2021; Gjoneska et al., 2021; Wilkinson et al., 2018). Indeed, it may be of interest in future studies to examine whether the 'scientific nudge' approach of this study could be applied in a more clinical context (i.e., populations with borderline or clinical levels across the psychosis continuum; Moritz et al., 2022; Ward & Garety, 2019).

7.7.3 The Limitations of this Study

The authors must acknowledge that the decision to have a solely post-intervention analysis is a limitation to the current study. In doing so, the study does not hold the same statistical rigour compared to common place experimental designs which use repeated

measures to create a 2 x 2 analysis. In turn, the results of the experimental manipulation (i.e., the differences across conditions) are limited to use of less powerful statistical analysis (e.g., simple effects analysis, group differences). Also, the 'difference in CT beliefs' could be argued to be based on a proxy-measure of CT beliefs post-intervention. On the other hand, the significant difference between groups on the non-identical measure of CT beliefs post-intervention may suggest that people in the scientific reasoning condition may have transferred the skills taught to a new context of CT beliefs. Another limitation to mention is that it cannot be suggested for certain that participants have improved their scientific reasoning skills as a result of this intervention. Without a manipulation check, it is also possible that the intervention encouraged scepticism specific to conspiracy theories.

Future work would benefit from the addition of an identical measure of CT beliefs pre/post intervention with an added manipulation check to the current design. This would both more accurately reflect whether CT beliefs change across repeated measurement and examine whether this effect is transferred to a different context of CT beliefs. Further, a future repeated measures design of CT beliefs would benefit from a longitudinal approach. It could be argued that the current study may solely indicate that people are upskilling in their approach to evaluating CT content, but, not whether they may alter pre-existent and future CT beliefs themselves. Hence, considering the post-test only approach, and, the argued proxy-measure for CT beliefs, the results of the present study would benefit from future work that may address these concerns, and, in turn, may provide an empirical manipulation check for whether the scientific reasoning intervention approach of this study is effective against CT beliefs.

It is important to acknowledge the several other limitations of the present study. First, the effect sizes found across experimental manipulations were small. However, there are several factors that can contextualise these results. Individual changes in beliefs are likely to be small given the time-consuming and time-limited nature of the task. We also need to consider the role of exposure to either the conspiracy theories presented or strong pre-existing beliefs regarding the COVID-19 pandemic (which may vary according to country; Schlipphak et al., 2021), and, the potential for social desirability bias inherent to CT beliefs (see details in Uscinski et al., 2022). Second, it is important to acknowledge the potential for demand characteristics. Participants may have become aware of the experimental design (i.e., an intervention approach) and the aims of the current study. This may have led some of them to respond in a way consistent with inferred expectations (i.e., showing reduced endorsement for CT beliefs in the post-intervention measure). Third, the decision to screen individuals who held 'neutral' or 'negative' beliefs towards vaccination programs means the sample would be restricted in its range of beliefs. Although the specificity of the sample may invite people who are more likely to hold CT beliefs, it may not be reflective of the wider population.

A fourth issue is that it is important to acknowledge that, although the designed pre/post intervention measures of CT endorsement better reflect real-world decision making on more relevant topics when compared to measures of previous research (e.g., General Conspiracy belief Scale, Brotherton et al., 2013; CAT measure of Orosz et al., 2016), it is difficult to replicate an individual's method of information searching that may have led to CT beliefs. Thus, if the current study has focussed on the method of evaluating CT content then future research could consider an individual's method of sourcing CT content that has led to belief formation. Fifth, the use of convenience sampling via an online panel is another

limitation. Although a question of prior clinical diagnosis is included, both the Autism-Spectrum Quotient and Multidimensional Schizotypy Scale capture conditions commonly associated with other co-morbid conditions. As previously stated, future work which directly draws from a clinical sample, is more likely to rule out the presence of other co-morbid conditions in the results.

7.7.4 Conclusion

In conclusion, the promotion of scientific reasoning may be a future method of intervention against CT beliefs. In the present study, via an experimental design, it was shown that conspiracy beliefs could be reduced post-intervention in those who were instructed the necessary scientific reasoning skills. As well as having implications for the design of future intervention studies, and, considering the limitations of the approach, the research also encourages a greater focus on specific reasoning skills that may be amenable to a psychoeducation approach in order to further develop methods to prevent CT beliefs. Moreover, the findings of this intervention approach further suggest the relative importance of neurodiversity (e.g., schizotypal and autistic traits) in how people may process information on contemporary issues. Further work that examines perhaps the response of more clinical cohorts to this intervention approach, will further our understanding of how scientific reasoning skills may benefit those individuals.

7.8 References

Agley, J., Xiao, Y. (2021) Misinformation about COVID-19: evidence for differential latent profiles and a strong association with trust in science. *BMC Public Health* 21, 89.

Balzan, R., Woodward. S., Delfabbro, P., Moritz, S. (2016) Overconfidence across the psychosis continuum: a calibration approach, *Cognitive Neuropsychiatry*, 21(6), pp. 510-524, doi:10.1080/23311908.2015.1135855

Barron, D., Furnham, A., Weis, L., Morgan, K. D., Towell, T., & Swami, V. (2018). The relationship between schizotypal facets and conspiracist beliefs via cognitive processes. Psychiatry Research, 259, 15-20.

Baron-Cohen, S., Wheelwright, S., Hill, J., Raste, Y., & Plumb, I. (2001). The "Reading the mind in the eyes" Test revised version: A study with normal adults, and adults with Asperger syndrome or high-functioning autism. *Journal of Child Psychology and Psychiatry*, 42(2), 241–251.

Bertin, P., Nera, K., & Delouvée, S. (2020). Conspiracy Beliefs, Rejection of Vaccination, and Support for hydroxychloroquine: A Conceptual Replication-Extension in the COVID-19 Pandemic Context. Frontiers in psychology, 11, 565128.

Brotherton, R., French, C. C., & Pickering, A. D. (2013). Measuring belief in conspiracy theories: The Generic Conspiracist Beliefs Scale. *Frontiers in Psychology*, 4, 279.

Čavojová, V., Šrol, J., & Ballová Mikušková, E. (2020). How scientific reasoning correlates with health-related beliefs and behaviors during the COVID-19 pandemic? *Journal of Health Psychology.*

Čavojová, V, Šrol, J, Jurkovič, M (2020) Why should we try to think like scientists? The role of scientific reasoning in susceptibility to epistemically suspect beliefs and cognitive biases. *Applied Cognitive Psychology*, 34(1): 85–95

Darwin, H., Neave, N., & Holmes, J. (2011). Belief in conspiracy theories. The role of paranormal belief, paranoid ideation and schizotypy. *Personality and Individual Differences*, 50(8), 1289-1293.

De Coninck, D., Frissen, T., Matthijs, K., d'Haenens, L., Lits, G., Champagne-Poirier, O., Carignan, M. E., David, M. D., Pignard-Cheynel, N., Salerno, S., & Généreux, M. (2021). Beliefs in Conspiracy Theories and Misinformation About COVID-19: Comparative Perspectives on the Role of Anxiety, Depression and Exposure to and Trust in Information Sources. *Frontiers in psychology*, *12*, 646394.

Denovan, A., Dagnall, N., Drinkwater, K., Parker, A., and Neave, N. (2020). Conspiracist beliefs, intuitive thinking, and schizotypal facets: a further evaluation, *Applied Cognitive Psychology*, 34, 1394–1405.

Douglas, K. M., Sutton, R. M., & Cichocka, A. (2017). The psychology of conspiracy theories. Current Directions in Psychological Science, 26(6), 538-542.

Douglas, K. M. (2021). COVID-19 conspiracy theories. *Group Processes & Intergroup Relations*, *24*(2), 270–275.

Drummond, C., and Fischhoff, B. (2017) Development and Validation of the Scientific Reasoning Scale. J. Behav. Dec. Making, 30: 26– 38.

Ecker, U. K., Lewandowsky, S., Cook, J., Schmid, P., Fazio, L. K., Brashier, N & Amazeen, M. A. (2022). The psychological drivers of misinformation belief and its resistance to correction. *Nature Reviews Psychology*, *1*(1), 13-29.

Eisenacher S., Rausch F., Ainser F., Mier D., Veckenstedt R., Schirmbeck F., et al. . (2015). Investigation of Metamemory functioning in the at-risk mental state for psychosis, *Psychology and Medicine*, 45, 3329–3340. Doi:10.1017/S0033291715001373

Epstein, S., Norris, P. (2011) An Experiential Thinking Style: Its Facets and Relations With Objective and Subjective Criterion Measures, *Journal of Personality*,34(4).

Fridman A, Gershon R, Gneezy A (2021) COVID-19 and vaccine hesitancy: A longitudinal study. PLoS ONE 16(4): e0250123

Georgiou, M., Delfabbro, P. H., & Balzan, R. (2019). Conspiracy beliefs in the general population: The importance of psychopathology, cognitive style and educational attainment, *Personality and Individual Differences*, 151

Georgiou, M., Delfabbro, P. H., & Balzan, R (2020) COVID-19-related conspiracy beliefs and their relationship with perceived stress and pre-existing conspiracy beliefs, *Personality and Individual Differences*, 166:110201.

Georgiou, N., Delfabbro, P., Balzan, R., (2021a) Autistic traits as a potential confounding factor in the relationship between schizotypy and conspiracy beliefs, *Cognitive Neuropsychiatry.*

Georgiou, N., Delfabbro, P., Balzan, R., (2021d) Could autistic traits be a risk factor for conspiracy beliefs? An analysis of cognitive style and information-seeking behaviour, *Minerva Psychiatry*.

Georgiou, N., Delfabbro, P., & Balzan, R. (2021b). Conspiracy-Beliefs and Receptivity to Disconfirmatory Information: A Study Using the BADE Task. *SAGE Open.*

Georgiou, N., Delfabbro, P., & Balzan, R. (2021c) Conspiracy Theory Beliefs, Scientific Reasoning and the Analytical Thinking Paradox, *Applied Cognitive Psychology*, doi:10.1002/acp/3885

Georgiou, N., Delfabbro, P., & Balzan, R. (2022, in press) Latent Profile Analysis of Schizotypy, Autistic traits and Conspiracy Theory Beliefs: Associations with

Cognitive Flexibility and Scientific Reasoning Performance, *Journal of Experimental Psychopathology*, in press.

Gjoneska B. (2021). Conspiratorial Beliefs and Cognitive Styles: An Integrated Look on Analytic Thinking, Critical Thinking, and Scientific Reasoning in Relation to (Dis)trust in Conspiracy Theories. *Frontiers in psychology*, *12*, 736838.

Goreis, A., & Voracek, M. (2019). A systematic review and meta-analysis of psychological research on conspiracy beliefs: Field characteristics, measurement instruments, and associations with personality traits. *Frontiers in Psychology*, 10, 205.

Gross, G.M., Kwapil, T.R., Raulin, M.L., Silvia, P.J., & Barrantes-Vidal, N. (2018). The Multidimensional Schizotypy Scale-Brief: Scale development and psychometric properties. *Psychiatry Research*, 216, 7-13.

Hopewell, S., Hirst, A., Collins, G. S., Mallett, S., Yu, L. M., & Altman, D. G. (2011). Reporting of participant flow diagrams in published reports of randomized trials. *Trials*, *12*, 253. https://doi.org/10.1186/1745-6215-12-253

Kwapil, T. R., Gross, G. M., Silvia, P. J., Raulin, M. L., & Barrantes-Vidal, N. (2018). Development and psychometric properties of the Multidimensional Schizotypy Scale: A new measure for assessing positive, negative, and disorganized schizotypy. *Schizophrenia research*, 193, 209–217.

Lantian, A., Bagneux, V., Delouvée, S., & Gauvrit, N. (2020, February 7). Maybe a Free Thinker but not a Critical One: High Conspiracy Belief is Associated With low Critical Thinking Ability. Preprint available: doi.org/10.31234/osf.io/8qhx4

McKenzie, K., Murray, A. L., Wilkinson, A., Murray, G. C., Metcalfe, D., O'Donnell, M., & McCarty, K. (2018). The relations between processing style, autistic-like traits, and emotion recognition in individuals with and without Autism Spectrum Disorder. *Personality and Individual Differences, 120,* 1–6.

Moritz, S., Klein, J. P., Lysaker, P. H., & Mehl, S. (2022). Metacognitive and cognitive-behavioral interventions for psychosis: new developments. *Dialogues in clinical neuroscience*.

Moritz, S., Favrod, J., Andreou, C., Morrison, A. P., Bohn, F., Veckenstedt, R, Karow, A. (2013). Beyond the Usual Suspects: Positive Attitudes Towards Positive Symptoms Is Associated With Medication Noncompliance in Psychosis. Schizophrenia Bulletin, 39(4), 917–922. Doi:10.1093/schbul/sbs005

Nenadić, I., Meller, T., Evermann, U., Schmitt, S., Pfarr, J. K., Abu-Akel, A., & Grezellschak, S. (2021). Subclinical schizotypal vs. autistic traits show overlapping and diametrically opposed facets in a non-clinical population. *Schizophrenia research*, *231*, 32–41.

Orosz, G., Krekó, P., Paskuj, B., Tóth-Király, I., Bőthe, B., & Roland-Lévy, C. (2016). Changing Conspiracy Beliefs through Rationality and Ridiculing. *Frontiers in psychology*, *7*, 1525. https://doi.org/10.3389/fpsyg.2016.01525

Pavela Banai, I., Banai, B., & Mikloušić, I. (2021). Beliefs in COVID-19 conspiracy theories, compliance with the preventive measures, and trust in government medical officials. *Current psychology (New Brunswick, N.J.)*, 1–11. Advance online publication.

Pegado, F., Hendriks, M., Amelynck, S., Daniels, N., Steyaert, J., Boets, B., & Op de Beeck, H. (2020). Adults with high functioning autism display idiosyncratic behavioral patterns, neural representations and connectivity of the 'Voice Area' while judging the appropriateness of emotional vocal reactions. *Cortex; a journal devoted to the study of the nervous system and behavior*, *125*, 90–108.

Pennycook, G., McPhetres, J., Zhang, Y., Lu, J. G., & Rand, D. G. (2020). Fighting COVID-19 Misinformation on Social Media: Experimental Evidence for a Scalable Accuracy-Nudge Intervention. *Psychological science*, *31*(7), 770–780.

Pennycook, G., Cheyne, J. A., Koehler, D. J., & Fugelsang, J. A. (2019). On the belief that beliefs should change according to evidence: Implications for conspiratorial, moral, paranormal, political, religious, and science beliefs, doi: 10.31234/osf.io/a7k96

Pennycook, G., Rand, D. G. (2019a). Fighting misinformation on social media using crowdsourced judgments of news source quality. Proceedings of the National Academy of Sciences, USA, 116, 2521–2526. doi:10.1073/pnas.1806781116

Pennycook, G., Rand, D. G. (2019b). Lazy, not biased: Susceptibility to partisan fake news is better explained by lack of reasoning than by motivated reasoning. *Cognition*, 188, 39–50. doi:10.1016/j.cognition.2018.06.011

Pennycook, G., & Rand, D. G. (2021). The Psychology of Fake News. *Trends in cognitive sciences*, *25*(5), 388–402. https://doi.org/10.1016/j.tics.2021.02.001.

Pennycook, G., & Rand, D. G. (2022). Nudging Social Media toward Accuracy. *The ANNALS of the American Academy of Political and Social Science*, *700*(1), 152–164.

Pytlik, N., Soll, D., & Mehl, S. (2020). Thinking Preferences and Conspiracy Belief: Intuitive Thinking and the Jumping to Conclusions-Bias as a Basis for the Belief in Conspiracy Theories. *Frontiers in psychiatry*, *11*, 568942.

Ripp, T., & Röer, J. P. (2022). Systematic review on the association of COVID-19-related conspiracy belief with infection-preventive behavior and vaccination willingness. *BMC psychology*, *10*(1), 66. https://doi.org/10.1186/s40359-022-00771-2

Roberts, R., & Risen, J. L. (2022). Introducing Conspiracy Intuitions to Better Understand Conspiracy Beliefs. *Current Opinion in Psychology*, 101395

Roozenbeek, J., Schneider, C. R., Dryhurst, S., Kerr, J., Freeman, A. L., Recchia, G., ... & Van Der Linden, S. (2020). Susceptibility to misinformation about COVID-19 around the world. *Royal Society open science*, *7*(10), 201199

Rutjen, B. T., & Većkalov, B. (2022). Conspiracy beliefs and science rejection. *Current Opinion in Psychology*, 101392.

Ståhl, T., & van Prooijen, J. W. (2018). Epistemic rationality: Skepticism toward unfounded beliefs requires sufficient cognitive ability and motivation to be rational. *Personality and Individual Differences*, 122, 155–163.

Stevenson, J. L., & Hart, K. R. (2017). Psychometric Properties of the Autism-Spectrum Quotient for Assessing Low and High Levels of Autistic Traits in College Students. *Journal of autism and developmental disorders*, 47(6), 1838–1853.

Swami, V., Barron, D., Weis, L., Voracek, M., Stieger, S., & Furnham, A. (2017). An examination of the factorial and convergent validity of four measures of conspiracist ideation, with recommendations for researchers. *PLOS ONE*, 12, e0172617.

Uljarević, M., Richdale, A. L., Evans, D. W., Cai, R. Y., & Leekam, S. R. (2017). Interrelationship between insistence on sameness, effortful control and anxiety in adolescents and young adults with autism spectrum disorder (ASD). *Molecular autism*, *8*, 36. https://doi.org/10.1186/s13229-017-0158-4

Uscinski, J., Enders, A. M., Klofstad, C., & Stoler, J. (2022). Cause and Effect: On the Antecedents and Consequences of Conspiracy Theory Beliefs. *Current Opinion in Psychology*, 101364.

van Mulukom, V., Pummerer, L. J., Alper, S., Bai, H., Čavojová, V., Farias, J., Kay, C. S., Lazarevic, L. B., Lobato, E., Marinthe, G., Pavela Banai, I., Šrol, J., & Žeželj, I. (2022). Antecedents and consequences of COVID-19 conspiracy beliefs: A systematic review. *Social science & medicine (1982)*, *301*, 114912. https://doi.org/10.1016/j.socscimed.2022.114912

Van Prooijen, J. W., Krouwel, A. P., & Pollet, T. V. (2015). Political extremism predicts belief in conspiracy theories. *Social Psychological and Personality Science*, *6*(5), 570-578.

Ward, T., & Garety, P. A. (2019). Fast and slow thinking in distressing delusions: A review of the literature and implications for targeted therapy. *Schizophrenia research*, *203*, 80–87.

Williams, D. L., Mazefsky, C. A., Walker, J. D., Minshew, N. J., & Goldstein, G. (2014). Associations between conceptual reasoning, problem solving, and adaptive ability in high-functioning autism. *Journal of autism and developmental disorders*, *44*(11), 2908–2920.

Williams, D. L., Siegel, M., Mazefsky, C. A., & Autism and Developmental Disorders Inpatient Research Collaborative (ADDIRC) (2018). Problem Behaviors in Autism Spectrum Disorder: Association with Verbal Ability and Adapting/Coping Skills. *Journal of autism and developmental disorders*, *48*(11), 3668–3677.

Woodward, N. D., Duffy, B., & Karbasforoushan, H. (2014). Response selection impairment in schizophrenia transcends sensory and motor modalities. *Schizophrenia Research*, *152*(0), 446–449, doi: 10.1016/j.schres.2013.11.038

Woodward, T.S., Moritz, S., & Chen, E.Y.H., (2006). The contribution of a cognitive bias against disconfirmatory evidence (BADE) to delusions: a study in an Asian sample with first episode schizophrenia spectrum disorders. *Schizophrenia Research* ,83, 297–298, doi:10.1093/schbul/sbm013

Zhou, H. Y., Yang, H. X., Gong, J. B., Cheung, E., Gooding, D. C., Park, S., & Chan, R. (2019). Revisiting the overlap between autistic and schizotypal traits in the non-clinical population using meta-analysis and network analysis. *Schizophrenia research*, *212*, 6–14. https://doi.org/10.1016/j.schres.2019.07.050.

Chapter 8: General Discussion

8.1 Overview

The principal aim of this thesis project was to explore the relationship between individual differences and conspiracy beliefs and what cognitive processes appear to contribute to these differences. Previous research has generally proposed two principal sets of vulnerability factors that increase susceptibility to CT beliefs. The first relates to the presence of clinical or subclinical conditions such as schizotypy that appear to make certain individuals more prone to certain, often unusual, beliefs. The second relates to socio-cognitive differences that suggest that a lack of education in logic and the underuse of analytical thinking styles may contribute to bias information-processing and an inability to discern the common flaws in CT logic. The research here builds upon this work by examining whether related conditions such as ASD (a correlate of schizotypy) is also associated with CT beliefs and if there may be different cognitive pathways: one based on a certain susceptibility to aberrant beliefs and another based more upon a more analytical, but selective use of information. Importantly, the research as a whole examining whether existing studies based principally on differences in the use of analytical thinking styles are: (a) always protective, given the 'do your own research (DYOR)' mantra of conspiracy movements and (b) whether more refined measures of logical and scientific reasoning should feature more prominently in this area of research.

8.2 Summary of principal papers and their findings

The first study included in this thesis examined the potential role of autistic traits as a correlate of conspiracy theory beliefs, with a particular focus drawn on whether the relationship between schizotypy and conspiracy beliefs remained after controlling for autistic traits. Using a cross-sectional design, the study asked participants to complete a range of psychological measures, including measures of information searching and cognitive style.

The results indicated that scores on an autism spectrum (ASD) measure were positively associated with conspiracy theory beliefs, although the effect was not as strong as for schizotypal traits. There was some evidence to suggest that the associations with CT beliefs observed for these two measures may have both similarities and differences (e.g., in relation to preferred thinking style and discomfort with ambiguity). These findings suggested that to reduce conspiracy theory beliefs in people with autistic traits may require an examination of broader meta-cognitive factors. This could include, for example, how to appraise or reflect upon large volumes of information in a way that highlights contradictions, or the relative weight of difference pieces of information.

The second study then investigated whether people high in autistic traits also differed in the manner they engage in information-searching behaviours online and whether this played a role in the formation of conspiracy beliefs. Using the same measures included in the first study, participants were also asked questions to gather the level and the context of their information seeking behaviour, in particular, its frequency, intensity and focus. This study also included the use of a clinical cut-off score for Autistic Spectrum Disorder to conduct group comparisons. The results suggested that people high in autistic traits (or in this case above the clinical cut-off score), although higher in analytical thinking, were less open- minded and only focussed on a narrow range of detail information searching (e.g., only conspiracy theory content), and, in turn, were less likely to accept information that contradicted conspiracy beliefs. In conjunction with the findings of the first study, the results of the second study suggest that analytical thinking (previously considered a barrier to conspiracy beliefs), may be a context-dependent protective factor against conspiracy theory beliefs when the role of autistic traits is also considered. Indeed, a more refined approach focussed to the role of specific reasoning skills and how people may avoid biases may be important.

The third study of this research project sought to provide a more refined interpretation of whether there may be a more valid protective factor against conspiracy theory beliefs than such measures of analytical thinking – namely the problem-solving skills related to scientific reasoning. This study then presented an integrated approach (i.e., included measures of autistic and schizotypal traits) that, in particular, examined the association between conspiracy theory beliefs, scientific reasoning and belief flexibility. The results indicated that people who showed a higher scientific reasoning ability, were less likely to adopt conspiracy theory beliefs, and, paradoxically, measures of analytical thinking were positively associated with both conspiracy theory beliefs and autistic traits. These findings suggested that scientific reasoning may constitute the cognitive skills more likely to be protective against conspiracy theory beliefs and may represent a more promising avenue for future psychoeducation strategies.

The findings of the third study also further highlighted both the similarities and differences between schizotypal and autistic traits in how they may lead to conspiracy theory beliefs. The results once again suggested that autistic traits were associated with a more analytical thinking style, yet these respondents were less likely to exhibit the necessary scientific reasoning skills that may be needed to debunk conspiracy theory beliefs and to demonstrate belief flexibility. On the other hand, schizotypal traits were negatively associated with analytical thinking and scientific reasoning, but were also associated with conspiracy beliefs and less flexible beliefs. Although these results are consistent with the view that both autistic and schizotypal traits are distinct variables, these results emphasise that different forms of neurodiversity are related to how people think and process information, and both measures of reasoning and neurodiversity are not in competition but are convergent influences within this area of research.

The fourth study then sought to further assess the extent within-individual variation in schizotypal and autistic traits were associated with the highlighted socio-cognitive tendencies (i.e., analytical thinking, scientific reasoning) and conspiracy theory beliefs. This was conducted by a Latent Profile Analysis, a categorical latent variable approach that focuses on identifying latent sub-populations within a population based sample. In this context, LPA examined whether certain individuals appear to display different risk profiles for susceptibility to CT beliefs. The results indicated that the co-occurrence of autistic and schizotypal traits (or mixed groups) in the two classes highest in conspiracy beliefs, in which analytical reasoning scores still co-occurred with higher conspiracy beliefs, supported the notion that multiple avenues may exist to conspiracy beliefs in neurodivergent individuals. Inspection of the emergent classes further showed that individuals with the highest level of scientific reasoning were still the least likely to adopt conspiracy beliefs. Overall, the findings of Study Three and Four suggest that, regardless of statistical approach and variation in neurodivergent groups, scientific reasoning seems to best differentiate variation conspiracy beliefs among the general population.

The findings within this research project that highlight scientific reasoning as a potential protective factor in conspiracy theory beliefs cultivated in the intervention approach of the fifth study. The fifth study examined whether scientific-based reasoning skills could be fostered in people prone to conspiracy theory beliefs and, in turn, applied to challenge conspiracist ideas. Through an experimental design (or inoculation approach), participants were assigned to a control or scientific reasoning condition. The results of Study Five suggested that people exposed to a scientific reasoning condition (i.e. a designed psychoeducational program aimed to promote scientific appraisal skills) demonstrated a learning effect and reduced their conspiracy theory endorsement post-intervention and, showed a significantly lower level of conspiracy endorsement compared to the control group.

These results then present an alternative intervention approach to previously popularised methods implicated in the context of CT beliefs (i.e. the use of accuracy-nudge interventions to misinformation; Pennycook et al., 2020).

The results Study Five also suggested a scientific reasoning-based intervention may also be viable within more at-risk cohorts highlighted in previous works (e.g., those scoring higher on schizotypy and autistic traits). The effects observed in this study still held after controlling for autistic and schizotypal traits. Indeed, as well as having implications for the design of future intervention studies, such results indicate it may of interest in future studies to examine whether the 'scientific intervention' approach of this study could be applied in a more clinical context (i.e., populations with borderline or clinical levels across the psychosis continuum as highlighted within Study Four).

Collectively, the findings of all five studies provide a more advanced and integrated account regarding the relationship between individual differences and conspiracy beliefs, as well as the cognitive process which appear to contribute to these differences. The results have demonstrated that autistic traits both correlate with schizotypy traits and conspiracy theory beliefs, and, represent the potential of a different cognitive pathway to conspiracy beliefs: one based on a more analytical, but selective use of information and less likely to critically appraise selected conspiracy content. The experimental findings also supported the notion that scientific reasoning is both the more valid protective barrier to CT beliefs, and, may be amenable to an effective intervention approach to conspiracy theory beliefs. The findings of this research project also highlight the relative importance of neurodiversity in how people may process information on contemporary issues. These findings have several theoretical and methodological implications which are outlined in Section 8.4.

8.3 Significance of the Research

The research conducted in this thesis project has several important implications for the area of conspiracy theory beliefs, particularly regarding the benefits of adopting a more integrated approach. Accordingly, the following section will discuss the more significant findings of this thesis project and their implications to both conspiracy theory research and other relevant fields.

8.3.1 The contribution of Autistic traits to Conspiracy Theory Research

In both this thesis and previous literature, it is clear that schizotypal personality traits are regarded as the strongest predictor of conspiracy theory beliefs. This view is supported by a number of studies which demonstrate how schizotypal traits appear to encourage less empirically supported or logical views (Balzan et al., 2016; Barron et al., 2014, Dagnall, 2015; Drinkwater et al., 2021b; 2022; Woodward et al., 2006). Similar findings were observed in this research project in that schizotypal traits were associated with several cognitive biases related to how people process and problem-solve information (e.g., the BADE Task, Liberal Acceptance Task; Study 3, Study 5). This association is thought to arise because these traits can lead to unorganized or delusional thinking. At the same time, the findings in this thesis project have also highlighted the importance of considering other related traits or conditions before furthering the discourse regarding the role of schizotypal traits in CT belief formation.

In particular, a consistent positive relationship was found between autistic traits, schizotypal traits, and conspiracy theory beliefs. This finding not only supports existing research which suggest the co-occurrence of autistic and schizotypal traits, but also highlights the limitations of research that conceptualizes conspiracy theory beliefs as typically a result

of more hasty and simplistic methods of reasoning (Study One, Study Two). Autistic traits have consistently shown an association with a more analytical thinking style, a more systematic approach to information seeking online, yet, similar to schizotypy, were also associated with biases in thinking (e.g., Bias Against Disconfirmatory Evidence; Study Three, Study Four) and a stronger endorsement of conspiracy theories.

However, although schizotypy and autistic traits were positively associated in each study, they showed paradoxical or differing relationships with the socio-cognitive measures (e.g., preferences in thinking style, open mindedness). Even when accounting for the within-individual variation in both autistic and schizotypal traits in Study Four (i.e., rather than viewing each as distinct variables), the same distinctions were still found in cognitive approach when comparing latent profile characteristics. This supports the idea that CT beliefs are likely to have varying cognitive pathways, as illustrated by Figure 8.

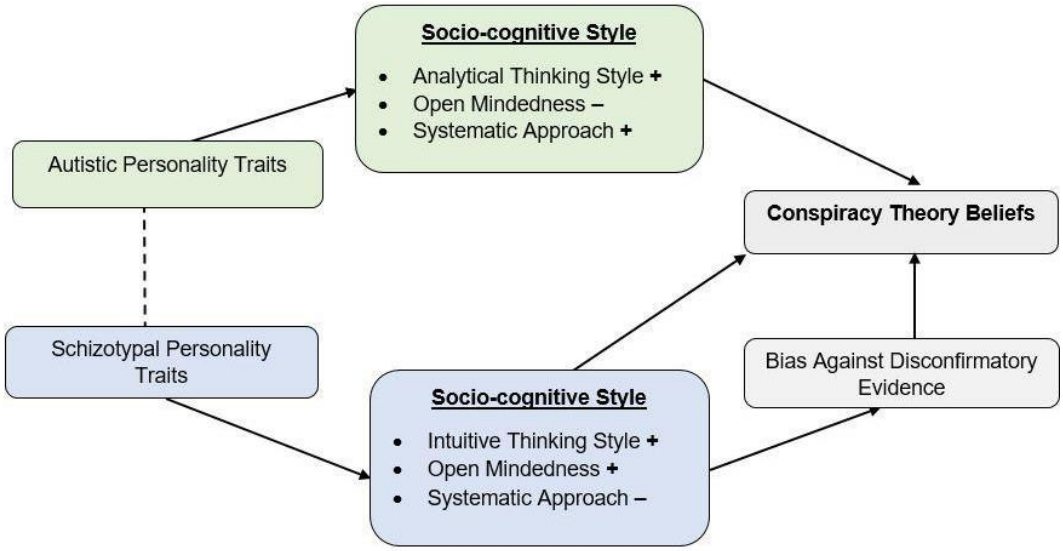

Figure 8 *Proposed Alternative Pathways to Conspiracy Theory Beliefs, accounting for both Autistic and Schizotypal Traits*

Note: The directional arrows indicate the association between the two variables, whereas the dotted line between Autistic and Schizotypal traits indicate their potential co-occurrence and overlap. Where there is indicated a (+) symbol in socio-cognitive tendencies, a positive association is expected between co-variates. A (–) symbol in socio-cognitive tendencies denotes an expected negative association between co-variates.

One of the important implications of the research is that a process of overanalysing information probably leads to conspiracy theory beliefs. Thus, while people with autistic traits are more systematic, they may be more likely to engage in a bias method of information searching that reinforces prior conspiracy theory beliefs. This means that regardless of the approach to conspiracy theory related content, the underlying importance should be placed on whether an individual with autistic traits possesses good judgment when selecting information, or, whether they are willing to also incorporate contradictory information regardless of their thinking disposition instead of remaining fixated to certain aspects of CT content – what was termed as ‘rabbit-hole’ thinking in Study Two.

8.3.2 The contribution of Conspiracy Theory Beliefs to Autism Research

Although the proposed secondary pathway is novel in the context of conspiracy theory research, it is well documented in clinical research that fixated interests or 'hyper-systemized' thinking (i.e. the drive to excessively analyse and construct logical systems) are rather common in autistic individuals during problem-solving scenarios (Baron-Cohen, 2017; Uddin 2022). Moreover, some research suggests that in scenarios with high variance or change (i.e. everyday events), people high in autistic traits can become ‘change-resistant’ and remain resolute in both their epistemological process and formed conclusions – often referred to as a ‘need for sameness’ (Baron-Cohen, 2008; Pegado et al., 2020; Fujino et al., 2019; Williams et al., 2014). As conspiracy theories often present a set of infallible and consistent premises regarding how the world works, people with CT beliefs may in effect reduce the amount of decisions they would make, if those CT beliefs apply across multiple contexts. For example, most conspiracy theories are based on the premise the world is run by world elites and involve acts of collusion – a belief that can be used to justify and explain many high variance circumstances in everyday life (e.g., the COVID-19 pandemic, the 2008 financial crisis). Given the often all-encompassing and infallible nature of conspiracy theories, the findings of this thesis project could represent a topical example of how this ‘change resistant’ epistemological process observed in ASD is possibly applied in a real-world context.

From a broader theoretical perspective, the findings of this thesis project also support the diametrical model of autism and psychosis in clinical research. This model proposes that autism and psychosis are opposite ends of a cognitive spectrum (Abu-Akel & Bailey, 2000; Crespi and Badcock, 2008; Salice & Henriksen, 2021). Autism is characterized by a focus on systematic and rule-bound thinking, but a reduced emphasis on intuition or open-minded ideas. In contrast, psychosis is characterized by a focus on intuition and open-mindedness,

but a reduced emphasis on systematic or logic based thinking (Dinsdale et al., 2013; Ford and Crewther, 2014; Ford et al., 2017). Each study in this thesis showed such cognitive styles also emerge in the general population through measures of schizotypal and autistic traits, particularly in sub-clinical or borderline groups (Study Four). Thus, the findings of this thesis project support the tendencies of the diametrical model in people who potentially fall below the clinical threshold, an aspect not often considered in other research.

The findings of this thesis project could also have potential implications for autism research conducted within clinical cohorts. The traditional clinical approach suggests individual differences observed in people who exhibit some or most autistic traits would not be applicable to people formally diagnosed with ASD. This is because people with ASD would meet a set of diagnostic criteria used in screening, with each criteria based on several important cognitive processes, such as deficits in Theory of Mind (TOM), metacognitive awareness or emotional recognition (Harms et al., 2010; Lozier et al., 2014; Nuske et al., 2013; Tager-Flusberg, 2007; Uljarevic & Hamilton, 2013). However, research has begun to encounter challenges in replicating some of these established indicators of Autism Spectrum Disorder. For example, many recent works by authors Brewer, Lim and Young (2022) have demonstrated there are no autism-related deficits in some indicators of ASD from early clinical research (i.e., TOM, emotional recognition; Brewer et al., 2022a; Brewer et al., 2022b; Brewer et al., 2022a; Lim et al., 2021, Lim et al., 2022b). Moreover, recent studies suggest that people who do not meet the diagnostic criteria for ASD still exhibit similar behavioral and cognitive traits to those who do, which implies that the diagnostic boundaries might be too narrow or that some of the selected criteria may not be sufficiently distinct (Volkmar et al., 2013; Hodges et al., 2020; Jellet et al., 2022; Samadi et al., 2022). As the understanding of ASD continues to change, it has become more apparent that there is a "grey area" between those who meet the diagnostic criteria and those who do not (Gallagher et al.,

2015; Vivanti et al., 2021). Therefore, this research project, which draws from a general population sample and examines the cognitive tendencies and beliefs of individuals who possess autistic traits within this "grey area", may provide an insight into the prevalence of autistic traits and their potential impact on popular beliefs. In effect, it further emphasises the notion that ASD, by name and definition, suggests a continuum of severity and significant variation in symptomology such that many ASD traits might be expected to be prevalent in more than just those who meet the formal clinical diagnosis.

8.3.3 The significance of Scientific Reasoning Skills in Conspiracy Theory Research

The findings of this thesis supports previous research that suggests scientific reasoning skills are a more relevant skillset to precluding belief in conspiracy theories than other suggested cognitive processes, such as analytical thinking (Cavajova et al., 2022; Cichocka et al., 2018). Several studies within this thesis project have shown that scientific reasoning is a more significant predictor of reduced belief in conspiracy theories, even when controlling for other socio-cognitive factors. Indeed, according to Study Three and Five, scientific reasoning may even attenuate the relationship between analytical thinking and conspiracy theory beliefs. This is also in line with the proposed hierarchical structure of cognitive styles suggested by Gjoneska (2021; see Figure 1), to which scientific reasoning is considered the highest in order and most advanced skillset, followed by critical thinking and analytical thinking. These findings highlight the importance of advanced cognitive skills, such as induction, deduction, and causal reasoning, in enabling people to appropriately evaluate information and reject conspiratorial content.

Moreover, the integrated approach taken within this project has revealed a more nuanced understanding of how certain ‘barriers’ to conspiracy beliefs other than scientific reasoning skills, such as analytical thinking, may be context-dependent. Previous research has

suggested in the context of conspiracy theory beliefs, people who are more likely to systematically seek out information on a given topic rather than rely upon intuition, are more likely to establish a reliable understanding of facts, and, on this basis, would not accept a conspiracy theory at face value (van Prooijen, 2016; Pytilk et al., 2020). The limitation of this view was that it assumed this more 'analytical thinking' approach is free of bias. The findings of this thesis challenge this assumption, as shown through the autistic traits pathway to conspiracy beliefs included in Figure 8, analytical thinking has in fact shown a paradoxical, positive relationship with conspiracy theory beliefs (Study Three, Four and Five). It is evident that some people (i.e. those scoring highly in autistic traits), may use a more systematic approach in a manner that is biased toward conspiratorial content, and, in turn, only consume information that further supports prior conspiracy beliefs. Hence, analytical thinking is better suggested as a context dependent barrier to conspiracy beliefs. This finding also further emphasises the value of scientific reasoning skills, which remained a consistent predictor of decreased conspiracy beliefs regardless of context.

The findings of this thesis project also support the "Rational Conspiracist Hypothesis" put forth by van Prooijen (2019), which proposes that conspiracy theorists may depict themselves as 'critical freethinkers' for subscribing to CT narratives, regardless of their objectively ability to critically appraise information (Konda, 2019; Lantian et al., 2021). Those with high conspiracy beliefs have consistently self-reported as high in analytical thinking, and active-open mindedness, but then performed poorly on cognitive tasks which measure for biases in thinking and scientific appraisal skills (Study Three, Four and Five). This suggests that the abilities required to debunk conspiracy beliefs are more than just "doing research", as it may be more important for people to be able to navigate the complex, fragmented and often bias information found in social media environments.

Furthermore, the methodology used to assess scientific reasoning skills has shed light on how individuals who subscribe to conspiracy beliefs often make inaccurate self-attributions regarding their level of critical appraisal abilities. In previous conspiracy theory research, many measures relied on self-report to capture socio-cognitive factors related to thinking patterns, reasoning, or dispositional preferences (Goreis & Voracek, 2019; Pilch et al., 2023). However, as the DYOR (do your own research) mantra gains traction among conspiracist movements (Buzzell et al., 2022), and much of past research has relied on general population sampling, such a reliance on self-report may leave research vulnerable to social desirability bias if participants become aware of the instruments used. As found in this thesis project, people with high conspiracy beliefs tended to self-report favourably, but when exposed to performance-based measures (i.e. SRS task, BADE task), they showed poor decision-making and information assimilation skills. Hence, the findings regarding scientific reasoning of this thesis also have methodological implications for the design of future research studies that wish to accurately capture the cognitive processes underlying conspiracy beliefs.

8.3.4 The significance of a Scientific Reasoning based Intervention Approach to Conspiracy Theory Beliefs

The findings of this thesis project not only demonstrate the significance of scientific reasoning skills as a predictor of reduced conspiracy beliefs, but also suggest that these skills can be improved through intervention. Specifically, the results of Study Five showed that people who were reminded or educated on how to scientifically evaluate CT content reduced their level of CT endorsement post-intervention. This approach differs from previous research, which often focussed on providing logical arguments against the premises of CTs (e.g., Bronstein et al., 2019; Orosz et al., 2016), or using an ‘accuracy-nudge’ approach which redirected attention toward the accuracy of CT content (Pennycook et al., 2020).

Instead, the scientific reasoning approach of Study Five has shown how people analyse information can also be targeted by intervention. Furthermore, this could be considered a more influential method of approach. Given the proposed hierarchical structure of cognitive styles by Gjoneska (2021; Figure 1), if scientific reasoning is considered the most advanced cognitive skillset used when analysing information, and, this approach may improve those skills in the context of CT beliefs, then, the presented intervention may also lead to a more profound and sustainable change in reducing conspiracy beliefs compared to others previously mentioned (e.g., the logical argument or accuracy-nudge approaches). However, it is worth nothing that scientific reasoning could is a more complex cognitive process to develop, and the 'inoculation' approach of this intervention may require more effort and resources comparatively. Moreover, the scientific reasoning intervention still showed a significant learning effect in the experimental group even after controlling for other co-variates of CT beliefs, namely schizotypy and autistic traits. This suggests that the scientific intervention may also be effective in mixed groups that included people considered more vulnerable to CT beliefs.

Although the approach taken in Study Five has its methodological limitations and was not applied to a clinical cohort, these findings could also be useful for research concerned with enhancing the skills of people more at risk of being negatively affected by online content. For example, there is a large body of research that focussed on ways to help people with ASD better process and manage inflammatory information on social media (Gabarron et al., 2023; Lane & Radesky, 2019; Wang et al., 2020). Given that CT content is often spread online, it may be of interest for future research to examine whether this 'scientific nudge' approach of this study could be beneficial in a more clinical context.

Overall, the introduction of scientific reasoning in this thesis project, and the subsequent approach to assess whether these skills are amenable to an intervention that may

reduce conspiracy beliefs, exemplifies a grounded approach that should be more widely adopted in CT research. Based on the contemporary trends in CT research, there has been a greater emphasis on examining the antecedents to CT beliefs, while relatively little attention given to identifying effective interventions to reduce or counter these beliefs (Pilch et al., 2023; van Mulukom et al., 2022; Goreis & Voracek, 2019). The progression toward an intervention approach developed in this thesis project, utilizing scientific appraisal skills, is an example of how this notable gap can be addressed. Moreover, this thesis project has further emphasised that an inoculation approach to address CT beliefs, an approach commonly applied in other related areas (e.g., health communication, public health campaigns against misinformation; Biddlestone et al., 2022; Compton et al., 2021), is one of such methods of intervention that should be considered as the field advances in this direction.

8.4 Strengths and Limitations

The research conducted in this thesis project has a number of strengths. As discussed in Chapter 2, one of the main limitations of the existing CT literature is that few studies have combined the different individual difference approaches, in this case the socio-cognitive approach that focuses on aspects of critical thinking and education, and the psychopathological approach which draws focus to certain atypical patterns of thinking associated with clinical conditions. The integrated approach of this thesis has allowed for a more comprehensive understanding of CT beliefs, particularly in the context of developing an effective method of intervention. By addressing both socio-cognitive and psychopathological factors, the potential implications of this research could also be generalised to a wider range of individuals. This thesis project also has showed convergence of findings across different samples and methodological approaches, replicating many of its novel contributions.

The limitations of this thesis project are detailed in each of the five studies presented, and therefore, are discussed here at a more general level. One of these limitations is the use of

convenience sampling and self-report measures. For example, it is not clear whether all participants could be reliably classified as having autistic and schizotypal traits. This is because it is known that people can either exaggerate or under-report personal traits associated with clinical conditions, particularly if they have previously received a formal diagnosis, or previous formal assessment (Althubaiti et al., 2016; Sandercock et al., 2020). Indeed, research suggests that the prevalence rates of either autistic or schizotypal traits tends to be under reported in convenience sampling (Kwapil & Barrantes-Vidal, 2015; Sandercock et al., 2020). Hence, it is reasonable to suggest that individuals who score high on either autistic or schizotypal tendencies may be those who are willing to disclose them in a research context. This issue is further compounded in convenience sampling, as there is no means to cross-validate these findings against a behavioural assessment (Andrade et al., 2021; Chan et al., 2019; Sandercock et al., 2020;). Therefore, given the complex nature of these traits and the potential influence of bias in self-report, especially in the context of clinical traits, the ability of this thesis project to provide a precise representation of autistic and schizotypal traits using this measurement and sampling approach must be treated with caution. The issue of convenience sampling may also provide reason for the lack of differences found across socio-cultural factors found in other research (i.e., country of residence; Imhoff et al., 2022).

Second, just as it is important to acknowledge the role of self-report bias in the measurement of clinical traits, the use of self-report measures can also lead to demand characteristics when combined with performance-based tasks (i.e. the BADE, Scientific Reasoning Scale). Even when correctly debriefed, it is common in research that participants may try to align their responses on self-report measures with their task performance, in order to appear consistent or meet perceived ‘expectations’ from researchers (McCambridge et al., 2012). Moreover, such demand characteristics can be difficult to avoid in this area of research where measures could be more overtly recognisable to participants. For example, it is possible the negative association found between scientific reasoning performance and conspiracy theory beliefs could be influenced by demand characteristics, as participants may

try to appear consistent with the common belief that conspiracy theories lack scientific credibility. The potential role of demand characteristics is also particularly notable in the intervention approach of Study Five. As previously discussed within Chapter 7, it is possible that participants may have become aware of the experimental design and the aims of the scientific intervention to conspiracy beliefs. Responses could have also been made to be consistent with inferred expectations (e.g. showing reduced endorsement for conspiracy theories in the post intervention).

The methods of statistical analysis used in this thesis project may also have limitations, particularly highlighted by the approach of Study Four. While the majority of research in this project followed a variable-centred approach, which is commonly used in individual differences research, this approach assumes the relationships found between variables are distinct. However, this assumption may not hold in the case of the current thesis project, as previous clinical research has challenged the notion that autistic and schizotypal traits are entirely distinct constructs (Abu-Akel & Bailey, 2000; Salice & Henriksen, 2021). The findings of Study Four, which used a person-centred approach, supported this idea by revealing a significant presence of mixed groups or co-occurrence of schizotypy and autistic traits. Furthermore, Study Four demonstrated that autistic traits may not independently predict CT beliefs. Therefore, it is important to view the conclusions drawn from the other studies in this project (i.e. Study One, Two, Three and Five) in light of the statistical approach used.

A final limitation of this thesis project relates to the use of the Bias Against Disconfirmatory Evidence Task (BADE) in an online setting. The inclusion of performance tasks that address reasoning biases previously applied in a clinical setting has been a novel contribution to CT research (Kuhn et al., 2021; Georgiou et al., 2019: 2021b). In this thesis project, it has been consistently found that individuals with CT beliefs, similar to schizotypy,

are more likely to engage in a bias against disconfirmatory evidence when forming beliefs. However, recent research has demonstrated that established relationships between cognitive biases and erroneous beliefs may be influenced by careless responding, particularly in an online setting (Sulik et al., 2023, in press). For instance, the BADE task requires participants to update their answers when new stimuli are introduced. This could mean that what could be an observed 'bias against disconfirmatory evidence', could indeed be a result of careless responses where participants fail to modify their answers over time. As this research is conducted entirely online, aside from attention check measures, this issue can go undetected, and, in turn, the conclusions drawn from this project are limited by its online approach.

8.5 Future Directions of Research

There are several implications of the findings of this thesis for the future conduct of this line of research. First, this thesis project has highlighted the potential for promoting scientific reasoning skills as an intervention against CT beliefs, even in people with atypical thinking patterns associated with schizotypal or autistic traits. For example, one potential extension of the studies would be to examine whether the scientific reasoning intervention of Study Five can be applied in more clinical contexts. This might include studies conducted only with people who have a formal diagnosis of ASD. Moreover, future work could also investigate other potential conditions that may explain some of the atypical thinking patterns associated with CT beliefs, similar to the novel approach taken in this thesis project with autistic traits.

Just as a valid clinical sample could provide additional insight into the effectiveness of an intervention approach to CT beliefs, as could a sampling method that specifically includes people who are conspiracy theorists. So far, research has inferred people's conspiracy theory beliefs based on their endorsement of self-report items or performance tasks (as in Study Five). However, this does not distinguish between those who merely

endorse certain conspiracy accounts and those who are active conspiracy theorists contributing to online communities or engaging in behaviour that has negative civic and health consequences (e.g., anti-vaccination protests, QAnon political movement). Thus, future research needs to establish a means to either verify and research people who are 'conspiracy theorists', or, potentially conduct research involving online communities relevant to inferred consequences, such as members of online chat forums or active CT-directed collectives (e.g., the Flat Earth Society, 9/11 truthers). Conducting research in a more applied context could examine whether methods of intervention designed in convenience sampling (e.g., Study Five) are applicable to the most relevant cohorts.

In order to further develop upon the current interventions against conspiracy theory beliefs, this area would benefit from a more longitudinal approach. One argument against the findings of Study Five and other intervention approaches to CT beliefs (e.g., Orosz et al., 2016; Jolley & Douglas, 2017a,b; Pennycook et al., 2020) is that changes in "belief" may only reflect changes in the level of endorsement for the presented CT content. Given that conspiracy beliefs can form belief systems (e.g., ideological identity, Enders et al., 2021), it would be necessary to consider whether an intervention approach can alter belief systems outside of an experimental design, and, if changes to said CT beliefs are then generalised to future events. Hence, it could be argued that only under long-term observations can a person's level of conspiracy theory beliefs (not endorsement) be accurately measured.

Furthermore, if conspiracy theory beliefs are to be considered 'erroneous beliefs' resulting from poor reasoning and ideation performance, as partly demonstrated in this thesis project, future research should investigate the broader concepts of how people develop such beliefs. Previous studies have highlighted the phenomenon of 'illusory pattern perception' whereby individuals perceive meaningful patterns or connections in random or unrelated information, resulting in the formation of incongruous ideas (Gligoric et al., 2021; van

Prooijen, Douglas & De Inocencio, 2018). However, these studies were largely conducted in controlled experimental settings (e.g., coin toss outcomes, the modern paintings task). Similar shortcomings could be suggested regarding the layout of both conspiracy assessment tasks presented pre/post intervention in Study Five. Hence, a viable avenue for future research should be to observe how people form conspiratorial ideas and logic in more realistic context, such as online discussions or realistic news consumption. By doing so, researchers may better understand the broader shortcomings that lead to conspiracy theory beliefs, and whether they are being effectively challenged through intervention. One possible approach would be to design performance tasks that may better mirror the information searching behaviours associated with conspiracy theory beliefs, or provide a platform for participants to naturally demonstrate such tendencies that could be recorded and studied.

8.6 Conclusions

This thesis project presented a number of findings that could be considered significant, novel contributions to the research area of conspiracy theory beliefs. The contribution of Autism Spectrum Disorder (ASD) or autistic traits, as a potential antecedent to conspiracy beliefs, develops upon the previous understanding of how atypical thinking patterns related to clinical conditions may result in CT beliefs. Moreover, consistent with the diametrical model of Autism-Psychosis, autistic and schizotypal traits were also found to co-occur in people with high CT beliefs. Autistic traits also represented the potential of a secondary pathway to CT beliefs. This challenges what may be considered the necessary skills needed to debunk such beliefs.

This research also showed that a preference for an analytical thinking style, may indeed be a context dependent protective factor against CT beliefs. In particular, the research suggests the most likely cognitive skills protective against CT belief formation relate to higher order cognitive skills such as logical and scientific appraisal skills. Scientific reasoning skills were shown to be the best predictor of reduced conspiracy beliefs and these could potentially be encouraged using specific interventions that encourage these reasoning methods. The results further highlight the importance of studying neurodiversity within the context of CT beliefs and that there may be particularly borderline clinical groups who are more susceptible to CT than others and who could most strongly benefit from attempts to encourage more balanced appraisals of information relating to important world events.

Overall, this thesis project serves as a testament to the importance of refining our understanding of factors that can predict conspiracy theory (CT) beliefs. By doing so, it not only informs the development of prevention strategies but also emphasizes the crucial role of information evaluation in countering the far-reaching consequences of conspiracy thinking.

From the lay reader that may come across online conspiracy content to the active endorsers and "free thinkers," this work underscores the imperative of nurturing the skills necessary in this new age of information dissemination. Just as the COVID-19 pandemic prompted significant advancements in medical research, it is crucial that we safeguard ourselves against the detrimental effects of the “Infodemic” by promoting the skills people need to effectively curb its spread.

"The greatest danger in times of turbulence is not the turbulence itself, but the ignorance that comes from thinking one knows the answers." - ***Peter Drucker.***

“The paradox of the machines that have made our lives so much brighter, quicker, longer and healthier is that they cannot teach us how to make the best use of them; the information revolution came without an instruction manual.” – ***Pico Iyer.***

"It is the mark of an educated mind to be able to entertain a thought without accepting it." ***- Aristotle.***

8.7 References

Abu-Akel, A., & Bailey, A. L. (2000). The possibility of different forms of theory of mind impairment in psychiatric and developmental disorders. *Psychological medicine*, *30*(3), 735–738.

Althubaiti, A. (2016). Information bias in health research: definition, pitfalls, and adjustment methods. *Journal of multidisciplinary healthcare*, 211-217.

Andrade C. (2021). The Inconvenient Truth About Convenience and Purposive Samples. *Indian journal of psychological medicine*, *43*(1), 86–88. https://doi.org/10.1177/0253717620977000

Balzan, R., Woodward. S., Delfabbro, P., Moritz, S. (2016) Overconfidence across the psychosis continuum: a calibration approach, *Cognitive Neuropsychiatry*, 21(6), pp. 510-524.

Baron-Cohen, S. (2008). Autism, Hypersystemizing, and Truth. Quarterly Journal of Experimental Psychology, 61(1), 64–75. https://doi.org/10.1080/17470210701508749

Baron-Cohen, S. (2017). Editorial Perspective: Neurodiversity–a revolutionary concept for autism and psychiatry. *Journal of Child Psychology and Psychiatry*, *58*(6), 744-747.

Barron, D., Morgan, K., Towell, T., Altemeyer, B., & Swami, V. (2014). Associations between schizotypy and belief in conspiracist ideation. *Personality and Individual Differences, 70*, 156-159. doi:10.1016/j.paid.2014.06.040

Biddlestone, M., Green, R., Cichocka, A., Douglas, K., & Sutton, R. M. (2022, April 8). A systematic review and meta-analytic synthesis of the motives associated with conspiracy beliefs. https://doi.org/10.31234/osf.io/rxjqc

Brewer, N., Lucas, C. A., Georgopoulos, M. A., & Young, R. L. (2022). Facing up to others' emotions: No evidence of autism-related deficits in metacognitive awareness of emotion recognition. *Autism Research*, *15*(8), 1508-1521.

Brewer, N., Lucas, C. A., Lim, A., & Young, R. L. (2022). Detecting dodgy behaviour: The role of autism, autistic traits and theory of mind. *Autism*, 13623613221125564.

Buzzell, A., & Rini, R. (2022). Doing your own research and other impossible acts of epistemic superheroism. *Philosophical Psychology*, 1-25.

Čavojová, V., Šrol, J., & Ballová Mikušková, E. (2022). How scientific reasoning correlates with health-related beliefs and behaviors during the COVID-19 pandemic?. *Journal of health psychology*, *27*(3), 534–547. https://doi.org/10.1177/1359105320962266

Chan, C. C., Bulbena-Cabre, A., Rutter, S., Benavides, C., McClure, M. M., Calabrese, W., Rosell, D. R., Koenigsberg, H. W., Goodman, M., New, A. S., Hazlett, E. A., & Mercedes Perez-Rodriguez, M. (2019). Comparison of self-report and clinician-rated schizotypal traits in schizotypal personality disorder and community controls. *Schizophrenia research*, *209*, 263–268. https://doi.org/10.1016/j.schres.2018.12.050

Compton, J., van der Linden, S., Cook, J., & Basol, M. (2021). Inoculation theory in the post-truth era: Extant findings and new frontiers for contested science, misinformation, and conspiracy theories. *Social and Personality Psychology Compass*, *15*(6), e12602.

Crespi, B., & Badcock, C. (2008). Psychosis and autism as diametrical disorders of the social brain. *The Behavioral and brain sciences*, *31*(3), 241–320. https://doi.org/10.1017/S0140525X08004214

Dagnall, N., Denovan, A., Drinkwater, K., Parker, A., & Clough, P. (2016). Toward a Better Understanding of the Relationship between Belief in the Paranormal and Statistical Bias: The Potential Role of Schizotypy. *Frontiers in Psychology*, *7*, 1045, doi:10.3389/fpsyg.2016.01045

Dinsdale NL, Hurd PL, Wakabayashi A, Elliot M, Crespi BJ (2013) How Are Autism and Schizotypy Related? Evidence from a Non-Clinical Population. PLOS ONE 8(5): e63316, doi: 10.1371/journal.pone.0063316

Drinkwater, K. G., Dagnall, N., Denovan, A., & Williams, C. (2021). Paranormal Belief, Thinking Style and Delusion Formation: A Latent Profile Analysis of Within-Individual Variations in Experience-Based Paranormal Facets. *Frontiers in psychology*, 12, 670959.

Drinkwater, K. G., Dagnall, N., Denovan, A., Parker, A., & Escolà-Gascón, Á. (2022). Paranormal Experience Profiles and Their Association With Variations in Executive Functions: A Latent Profile Analysis. *Frontiers in psychology*, *12*, 778312

Enders, A., Klofstad, C., Stoler, J., & Uscinski, J. E. (2023). How Anti-Social Personality Traits and Anti-Establishment Views Promote Beliefs in Election Fraud, QAnon, and COVID-19 Conspiracy Theories and Misinformation. *American Politics Research*, *51*(2), 247–259. https://doi.org/10.1177/1532673X221139434

Ford, T. C., & Crewther, D. P. (2014). Factor analysis demonstrates a common schizoidal phenotype within autistic and schizotypal tendency: Implications for neuroscientific studies. Frontiers in Psychiatry, 5, Article 117.

Ford, T. C., Nibbs, R., & Crewther, D. P. (2017). Increased glutamate/GABA+ ratio in a shared autistic and schizotypal trait phenotype termed Social Disorganisation. *NeuroImage. Clinical*, 16, 125–131, doi: 10.1016/j.nicl.2017.07.009

Gabarron, E., Skafle, I., Nordahl-Hansen, A., & Wynn, R. (2023). Social media interventions for autistic individuals: Systematic review. *Frontiers in psychiatry*, *14*, 1089452. https://doi.org/10.3389/fpsyt.2023.1089452

Gallagher, S., & Varga, S. (2015). Conceptual issues in autism spectrum disorders. *Current Opinion in Psychiatry*, *28*(2), 127-132.

Georgiou, M., Delfabbro, P. H., & Balzan, R. (2019). Conspiracy beliefs in the general population: The importance of psychopathology, cognitive style and educational attainment, *Personality and Individual Differences*, 151

Georgiou, N., Delfabbro, P., & Balzan, R. (2021). Conspiracy-Beliefs and Receptivity to Disconfirmatory Information: A Study Using the BADE Task. *SAGE Open.*

Gjoneska B. (2021). Conspiratorial Beliefs and Cognitive Styles: An Integrated Look on Analytic Thinking, Critical Thinking, and Scientific Reasoning in Relation to (Dis)trust in Conspiracy Theories. *Frontiers in psychology*, *12*, 736838.

Gligorić, V., da Silva, M. M., Eker, S., van Hoek, N., Nieuwenhuijzen, E., Popova, U., & Zeighami, G. (2021). The usual suspects: How psychological motives and thinking styles predict the endorsement of well-known and COVID-19 conspiracy beliefs. *Applied Cognitive Psychology*, *35*(5), 1171-1181.

Goreis, A., & Voracek, M. (2019). A systematic review and meta-analysis of psychological research on conspiracy beliefs: Field characteristics, measurement instruments, and associations with personality traits. *Frontiers in Psychology*, 10, 205.

Harms, M. B., Martin, A., & Wallace, G. L. (2010). Facial emotion recognition in autism spectrum disorders: a review of behavioral and neuroimaging studies. *Neuropsychology review*, *20*, 290-322.

Hodges, H., Fealko, C., & Soares, N. (2020). Autism spectrum disorder: definition, epidemiology, causes, and clinical evaluation. *Translational pediatrics*, *9*(Suppl 1), S55.

Jellett, R., & Muggleton, J. (2022). Implications of applying “clinically significant impairment” to autism assessment: Commentary on six problems encountered in clinical practice. *Journal of autism and developmental disorders*, *52*(3), 1412-1421.

Jolley, D., & Douglas K.M. (2017) Prevention is better than cure: Addressing anti-vaccine conspiracy theories, *Journal of Applied Social Psychology,* p. 459-469.

Konda, T. M. (2019). Conspiracies of Conspiracies: How Delusions Have Overrun America. University of Chicago Press.

Kuhn, S. A. K., Lieb, R., Freeman, D., Andreou, C., & Zander-Schellenberg, T. (2022). Coronavirus conspiracy beliefs in the German-speaking general population: endorsement rates and links to reasoning biases and paranoia. *Psychological medicine*, *52*(16), 4162-4176.

Kwapil, T. R., & Barrantes-Vidal, N. (2015). Schizotypy: looking back and moving forward. *Schizophrenia bulletin*, *41 Suppl 2*(Suppl 2), S366–S373. https://doi.org/10.1093/schbul/sbu186

Lane, R., & Radesky, J. (2019). Digital Media and Autism Spectrum Disorders: Review of Evidence, Theoretical Concerns, and Opportunities for Intervention. *Journal of developmental and behavioral pediatrics : JDBP*, *40*(5), 364–368. https://doi.org/10.1097/DBP.0000000000000664

Lantian, A., Bagneux, V., Delouvée, S., & Gauvrit, N. (2021) Maybe a Free Thinker but not a Critical One: High Conspiracy Belief is Associated With low Critical Thinking Ability, Preprint available: doi.org/10.31234/osf.io/8qhx4

Lim, A., Young, R. L., & Brewer, N. (2022). Autistic adults may be erroneously perceived as deceptive and lacking credibility. *Journal of Autism and Developmental Disorders*, *52*(2), 490-507.

Lim, A., Young, R. L., & Brewer, N. (2022). The effect of autistic behaviors on evaluations of deception and credibility in everyday social situations. *Applied Cognitive Psychology*, *36*(3), 548-560.

Lozier, L. M., Vanmeter, J. W., & Marsh, A. A. (2014). Impairments in facial affect recognition associated with autism spectrum disorders: a meta-analysis. *Development and psychopathology*, *26*(4pt1), 933-945.

McCambridge, J., De Bruin, M., & Witton, J. (2012). The effects of demand characteristics on research participant behaviours in non-laboratory settings: a systematic review. *PloS one*, *7*(6), e39116.

Nuske, H. J., Vivanti, G., & Dissanayake, C. (2013). Are emotion impairments unique to, universal, or specific in autism spectrum disorder? A comprehensive review. *Cognition & emotion*, *27*(6), 1042-1061.

Orosz, G., Krekó, P., Paskuj, B., Tóth-Király, I., Bőthe, B., & Roland-Lévy, C. (2016). Changing Conspiracy Beliefs through Rationality and Ridiculing. *Frontiers in psychology*, *7*, 1525.

Pegado, F., Hendriks, M., Amelynck, S., Daniels, N., Steyaert, J., Boets, B., & Op de Beeck, H. (2020). Adults with high functioning autism display idiosyncratic behavioral patterns, neural representations and connectivity of the 'Voice Area' while judging the appropriateness of emotional vocal reactions. *Cortex; a journal devoted to the study of the nervous system and behavior*, *125*, 90–108.

Pennycook, G., & Rand, D. G. (2021). The Psychology of Fake News. *Trends in cognitive sciences*, *25*(5), 388–402. https://doi.org/10.1016/j.tics.2021.02.001.

Pennycook, G., & Rand, D. G. (2022). Nudging Social Media toward Accuracy. *The ANNALS of the American Academy of Political and Social Science*, *700*(1), 152–164.

Pennycook, G., Cheyne, J. A., Koehler, D. J., & Fugelsang, J. A. (2019). On the belief that beliefs should change according to evidence: Implications for conspiratorial, moral, paranormal, political, religious, and science beliefs, doi: 10.31234/osf.io/a7k96

Pennycook, G., McPhetres, J., Zhang, Y., Lu, J. G., & Rand, D. G. (2020). Fighting COVID-19 Misinformation on Social Media: Experimental Evidence for a Scalable Accuracy-Nudge Intervention. *Psychological science*, *31*(7), 770–780.

Pennycook, G., Rand, D. G. (2019a). Fighting misinformation on social media using crowdsourced judgments of news source quality. Proceedings of the National Academy of Sciences, USA, 116, 2521–2526. doi:10.1073/pnas.1806781116

Pennycook, G., Rand, D. G. (2019b). Lazy, not biased: Susceptibility to partisan fake news is better explained by lack of reasoning than by motivated reasoning. *Cognition*, 188, 39–50. doi:10.1016/j.cognition.2018.06.011

Pilch, I., Turska-Kawa, A., Wardawy, P., Olszanecka-Marmola, A., & Smołkowska-Jędo, W. (2023). Contemporary trends in psychological research on conspiracy beliefs. A systematic review. *Frontiers in psychology*, *14*, 1075779. https://doi.org/10.3389/fpsyg.2023.1075779

Pytlik, N., Soll, D., & Mehl, S. (2020). Thinking preferences and conspiracy belief: Intuitive thinking and the jumping to conclusions-bias as a basis for the belief in conspiracy theories. *Frontiers in psychiatry*, *11*, 568942.

Salice, A., Henriksen, M.G. (2021) Distrubances of Shared Intentionality in Schizophrenia and Autism, *Frontiers in Psychiatry*, doi.org/10.3389/fpsyt.2020.570597.

Samadi, H., & Samadi, S. A. (2020). Understanding different aspects of caregiving for individuals with autism spectrum disorders (ASDs) a narrative review of the literature. *Brain Sciences*, *10*(8), 557.

Sandercock, R. K., Lamarche, E. M., Klinger, M. R., & Klinger, L. G. (2020). Assessing the convergence of self-report and informant measures for adults with autism spectrum disorder. *Autism*, *24*(8), 2256-2268.

Sulik, J., Ross, R. M., Balzan, R., & McKay, R. (2021, April 26). Delusion-Like Beliefs and Data Quality: Are Classic Cognitive Biases Artefacts of Carelessness?.

Tager-Flusberg, H. (2007). Evaluating the theory-of-mind hypothesis of autism. *Current directions in psychological science*, *16*(6), 311-315.

Tei, S., Fujino, J., Itahashi, T., Aoki, Y., Ohta, H., Kubota, M., ... & Takahashi, H. (2019). Egocentric biases and atypical generosity in autistic individuals. *Autism Research*, *12*(11), 1598-1608.

Uddin, L. Q. (2022). Exceptional Abilities in Autism: Theories and Open Questions. *Current Directions in Psychological Science*, *31*(6), 509-517.

Uljarevic, M., & Hamilton, A. (2013). Recognition of emotions in autism: a formal meta-analysis. *Journal of autism and developmental disorders*, *43*, 1517-1526.

van Mulukom, V., Pummerer, L. J., Alper, S., Bai, H., Čavojová, V., Farias, J., Kay, C. S., Lazarevic, L. B., Lobato, E., Marinthe, G., Pavela Banai, I., Šrol, J., & Žeželj, I. (2022). Antecedents and consequences of COVID-19 conspiracy beliefs: A systematic review. *Social science & medicine (1982)*, *301*, 114912. https://doi.org/10.1016/j.socscimed.2022.114912

Van Prooijen, J. W., Douglas, K. M., & De Inocencio, C. (2018). Connecting the dots: Illusory pattern perception predicts belief in conspiracies and the supernatural. *European journal of social psychology*, *48*(3), 320-335.

van Prooijen, J.W. -. (2017). Why education predicts decreased belief in conspiracy theories. *Applied Cognitive Psychology, 31*(1), 50-58. doi:10.1002/acp.3301

van Prooijen, J.W. -., & Douglas, K. M. (2018). Belief in conspiracy theories: Basic principles of an emerging research domain. *European Journal of Social Psychology,* doi:10.1002/ejsp.2530

Vivanti, G., & Whitehouse, A. (2021). National guideline for the assessment and diagnosis of autism spectrum disorders in Australia. In *Encyclopedia of Autism Spectrum Disorders* (pp. 3070-3072). Cham: Springer International Publishing.

Volkmar, F. R., & Wolf, J. M. (2013). When children with autism become adults. *World Psychiatry*, *12*(1), 79.

Wang, T., Garfield, M., Wisniewski, P., & Page, X. (2020, October). Benefits and challenges for social media users on the autism spectrum. In *Conference Companion Publication of the 2020 on Computer Supported Cooperative Work and Social Computing* (pp. 419-424).

Williams, D. L., Mazefsky, C. A., Walker, J. D., Minshew, N. J., & Goldstein, G. (2014). Associations between conceptual reasoning, problem solving, and adaptive ability in high-functioning autism. *Journal of autism and developmental disorders*, 44(11), 2908–2920, doi: 10.1007/s10803-014-2190-y

Woodward, T.S., Moritz, S., & Chen, E.Y.H., (2006). The contribution of a cognitive bias against disconfirmatory evidence (BADE) to delusions: a study in an Asian sample with first episode schizophrenia spectrum disorders. *Schizophrenia Research*, 83, 297–298.

Appendix A: Chapter Three and Chapter Four Survey Layout

Individual Differences in interpreting Real World-Events

Brief Description of the study: This study is investigating the relationship between differences in personality and people's beliefs about the causes of world-wide events. Do events that occur in the world for the reasons that are commonly reported or are there other explanations? **Your role in the Study:** You will be asked to complete a series of online survey questions where you will be asked to provide answers reflective of your own beliefs. Participation in the study is entirely voluntary; there is no obligation to take part in the study and, if you choose not to participate, there will be no repercussions. You have the right to withdraw at any time. **Inclusion/Exclusion Criteria:** Participants must be English-fluent to comprehend the survey items. **Risks of Participating:** This study is unlikely to pose any risks to your health or wellbeing as a result of participating. However, you may feel some discomfort when asked to reflect upon unusual experiences or how others might view you. **Statement of Privacy:** All data collected during the experiment will be treated in the strictest confidence and stored on password protected computers. The data will be used only for this project and once the data is no longer required it will be destroyed. You will also have the opportunity to receive a summary of the research findings. Results will be aggregated for reporting purposes to preserve anonymity. **Consent:** If you are willing to participate, please indicate this by clicking on the first screen of the experimental application, as instructed by the researcher and follow the prompts. **Contact Details for Questions:** Should you have any complaints or concerns about the manner in which this project is conducted, please contact primarily the student investigator or lead investigator: **Lead Investigator** Dr Paul Delfabbro
Email: paul.delfabbro@adelaide.edu.au **Student Investigator** Neophytos Georgiou Email: neophytos.georgiou@adelaide.edu.au For any questions about the ethical conduct of this research, please contact the Acting Chair of the Human Research Ethics Committee in the School of Psychology, University of Adelaide (Dr. Diana Dorstyn): Diana.Dorstyn@adelaide.edu.au.

I have read the above information and understand the terms of this study:

Note: if you click you 'do not' wish, you will be removed from the survey with no financial compensation.

- ○ Yes I have, I'd like to continue (1)
- ○ Yes, I **do not** wish to continue this study (2)

In order to give consent to all the following study please read and select the following statements:

- ☐ I have read the attached information sheet and agree to take part in the following project. (1)
- ☐ I have had the project, so far as it affects me, fully explained to my satisfaction within the brief description of the study. My consent is given freely. (2)
- ☐ Although I understand the purpose of the research project, I also understand the involvement may not be of any benefit to me. (3)
- ☐ I have been informed that, while information gained during the study may be published, I will not be identified, and my personal results will not be divulged. (4)
- ☐ I understand that I am free to withdraw from the project at any time. (5)
- ☐ I have read and understood the risks of participating within the current project. (6)

In accordance with the previous statements:

Both must be selected to continue.

☐ I have read the terms and conditions of this study and understood my rights and ethical considerations (1)

☐ I permit the researchers of this study to use my produced data for the purposes mentioned. (2)

Page Break

Individual differences in interpreting Real World Events

In this section, we would like you to honestly answer the following demographic questions. All questions must be answered in order to move to the next stage.

Please enter your Prolific ID in the following text box: (Warning: If you do not enter the correct ID, there may be an issue in financial compensation)

_____

What is your age?

- ○ 18-24 (1)
- ○ 25-34 (2)
- ○ 35-44 (3)
- ○ 45-54 (4)
- ○ 55-64 (5)
- ○ 65+ (6)

What is your sex?

- ○ Male (1)
- ○ Female (2)

In which country do you currently reside?

▼ Afghanistan (1) ... Zimbabwe (1357)

What is the highest level of school you have completed or the highest degree you have received?

- ○ Less than high school degree (1)
- ○ High school graduate (high school diploma or equivalent including GED) (2)
- ○ Some college/university but no degree (3)
- ○ Associate degree in college/university (4)
- ○ Bachelor's degree in college/university (5)
- ○ Master's degree (6)
- ○ Doctoral degree (7)
- ○ Professional degree (JD, MD) (8)

Which statement best describes your current employment status as <u>of time of completing this survey</u>?

- ○ Working (paid employee) (1)
- ○ Working (self-employed) (2)
- ○ Not working (temporary layoff from a job) (3)
- ○ Not working (looking for work) (4)
- ○ Not working (retired) (5)
- ○ Not working (disabled) (6)
- ○ Not working (other) (7) _____
- ○ Prefer not to answer (8)

To what extent do you agree with the following statements about yourself:

	Completely Disagree (1)	**Disagree** (2)	**Neither Agree or Disagree** (3)	**Agree** (4)	**Completely Agree** (5)
I don't like situations that are uncertain. (1)	○	○	○	○	○
Even after I've made up my mind about something, I am always eager to consider a different option. (2)	○	○	○	○	○
I feel uncomfortable when I don't understand the reason why an event occurred in my life. (3)	○	○	○	○	○
I dislike questions which could be answered in many different ways. (4)	○	○	○	○	○
When I am confused about an important issue, I feel very upset. (5)	○	○	○	○	○
I feel irritated when one person disagrees with what everyone else in a group believes. (6)	○	○	○	○	○
In most social conflicts, I can easily see which side is right and which is wrong. (7)	○	○	○	○	○
When considering most conflict situations, I can usually see how both sides could be right. (8)	○	○	○	○	○
I like to know what people are thinking all the time. (9)	○	○	○	○	○

I dislike it when a person's statement could mean many different things. (10)	○	○	○	○	○
When thinking about a problem, I consider as many different opinions on the issue as possible. (11)	○	○	○	○	○
It's annoying to listen to someone who cannot seem to make up his or her mind. (12)	○	○	○	○	○
I feel uncomfortable when someone's meaning, or intention is unclear to me. (13)	○	○	○	○	○
I'd rather know bad news than stay in a state of uncertainty. (14)	○	○	○	○	○
I prefer interacting with people whose opinions are very different from my own. (15)	○	○	○	○	○
I always see many possible solutions to problems I face. (16)	○	○	○	○	○
I do not usually consult any different opinions before forming my own view. (17)	○	○	○	○	○

To what extent do you agree with the following statements <u>about yourself</u>:

	Strongly Disagree (1)	**Disagree** (2)	**Neither agree or disagree** (3)	**Agree** (4)	**Strongly Agree** (5)
I am not very good at solving problems that require careful logical analysis. (1)	○	○	○	○	○
Reasoning things out carefully is not one of my strong points. (2)	○	○	○	○	○
I enjoy intellectual challenges. (3)	○	○	○	○	○
I enjoy problems that require hard thinking. (4)	○	○	○	○	○
I enjoy reading things that evoke visual imaginings. (5)	○	○	○	○	○
I can clearly picture or remember some sculpture or natural object (not alive) that I think is very beautiful. (6)	○	○	○	○	○
I enjoy imagining things. (7)	○	○	○	○	○
I don't think it is a good idea to rely on one's intuition for important decisions. (8)	○	○	○	○	○
I often go by my instincts when deciding on a course of action. (9)	○	○	○	○	○
I trust my initial feelings about people. (10)	○	○	○	○	○
Emotions don't really mean much, they come and go. (11)	○	○	○	○	○

When I have a strong emotional experience, the effect stays with me for a long time. (12)	○	○	○	○	○
When I'm sad, it's often a very strong feeling. (13)	○	○	○	○	○

To what extent do you agree with the following statements in regards to yourself:

	Definitely Disagree (1)	**Somewhat Disagree** (2)	**Somewhat Agree** (3)	**Definitely Agree** (4)
I prefer to do things with others rather than on my own. (1)	○	○	○	○
I prefer to do things the same way over and over again. (2)	○	○	○	○
If I try to imagine something, I find it very easy to create a picture in my mind. (3)	○	○	○	○
I frequently get so strongly absorbed in one thing that I lose sight of other things. (4)	○	○	○	○
I often notice small sounds when others do not. (5)	○	○	○	○
I usually notice car number plates or similar strings of information. (6)	○	○	○	○
Other people frequently tell me that what I've said is impolite, even though I think it is polite. (7)	○	○	○	○
When I'm reading a story, I can easily imagine what the characters might look like. (8)	○	○	○	○
I am fascinated by dates. (9)	○	○	○	○
In a social group, I can easily keep track of several different people's conversations. (10)	○	○	○	○
Select "Definitely Disagree". (11)	○	○	○	○
I find social situations easy. (12)	○	○	○	○
I tend to notice details that others do not. (14)	○	○	○	○

I would rather go to a library than to a party. (15)	○	○	○	○
I find making up stories easy. (16)	○	○	○	○
I find myself drawn more strongly to people than to things. (17)	○	○	○	○
I tend to have very strong interests, which I get upset about if I can't pursue. (18)	○	○	○	○
I enjoy social chitchat. (19)	○	○	○	○
When I talk, it isn't always easy for others to get a word in edgewise. (20)	○	○	○	○
I am fascinated by numbers. (21)	○	○	○	○
When I'm reading a story, I find it difficult to work out the characters' intentions. (22)	○	○	○	○
Select "Completely Agree". (23)	○	○	○	○
I don't particularly enjoy reading fiction. (24)	○	○	○	○
I find it hard to make new friends. (25)	○	○	○	○
I notice patterns in things all the time. (26)	○	○	○	○
I would rather go to the theater than to a museum. (27)	○	○	○	○
It does not upset me if my daily routine is disturbed. (28)	○	○	○	○
I frequently find that I don't know how to keep a conversation going. (29)	○	○	○	○
I find it easy to "read between the lines" when someone is	○	○	○	○

talking to me. (30)				
I usually concentrate more on the whole picture, rather than on the small details. (31)	○	○	○	○
I am not very good at remembering phone numbers. (32)	○	○	○	○
I don't usually notice small changes in a situation or a person's appearance. (33)	○	○	○	○
I know how to tell if someone listening to me is getting bored. (34)	○	○	○	○
I find it easy to do more than one thing at once. (35)	○	○	○	○
When I talk on the phone, I'm not sure when it's my turn to speak. (36)	○	○	○	○
I enjoy doing things spontaneously. (37)	○	○	○	○
I am often the last to understand the point of a joke. (38)	○	○	○	○
I find it easy to work out what someone is thinking or feeling just by looking at their face. (39)	○	○	○	○
If there is an interruption, I can switch back to what I was doing very quickly. (40)	○	○	○	○
I am good at social chitchat. (41)	○	○	○	○
People often tell me that I keep going on and on about the same thing. (42)	○	○	○	○
When I was young, I used to enjoy playing games involving pretending with other children. (43)	○	○	○	○

I like to collect information about categories of things (e.g., types of cars, birds, trains, plants). (44)	○	○	○	○
I find it difficult to imagine what it would be like to be someone else. (45)	○	○	○	○
Please Select "Somewhat Disagree". (46)	○	○	○	○
I like to carefully plan any activities I participate in. (47)	○	○	○	○
I enjoy social occasions. (48)	○	○	○	○
I find it difficult to work out people's intentions. (49)	○	○	○	○
New situations make me anxious. (50)	○	○	○	○
I enjoy meeting new people. (51)	○	○	○	○
I am a good diplomat. (52)	○	○	○	○
I am not very good at remembering people's date of birth. (53)	○	○	○	○
I find it very easy to play games with children that involve pretending. (63)	○	○	○	○

Do you ever find yourself researching a specific topic for an extended period of time? (e.g. several hours)

- ○ Never (1)
- ○ Rarely (2)
- ○ Sometimes (3)
- ○ Quite Often (4)
- ○ Always (5)

Do you ever find yourself researching multiple topics, because you feel they are somehow connected?

- ○ Never (1)
- ○ Rarely (2)
- ○ Sometimes (3)
- ○ Quite Often (4)
- ○ Always (5)

Do you ever find yourself trying to find as much evidence as possible to back up your beliefs on a specific topic?

- ○ Never (2)
- ○ Rarely (3)
- ○ Sometimes (4)
- ○ Quite Often (5)
- ○ Always (6)

Do you ever research a specific topic as much as possible, because you feel that the mainstream view on the topic is wrong?

- ○ Never (1)
- ○ Rarely (2)
- ○ Sometimes (3)
- ○ Quite Often (4)
- ○ Always (5)

How often do you actively seek out information about a specific topic you are interested in, on the following media platforms:
The options mean as follows:
Rarely = (Maybe Once a week)
Sometimes = (1-2 times a week)
Often = (3 - 5 times per week)
Very Often = (1 - 2 times per day)
Most of the time = (3 - 4 times per day)
Almost Continuously throughout the day.

	Never (1)	**Rarely** (2)	**Sometimes** (3)	**Often** (4)	**Very Often** (5)	**Most of the time** (6)	**Almost Continuously throughout the day** (7)
TV News Programming (1)	○	○	○	○	○	○	○
Social Media (E.g. Facebook, Twitter) (2)	○	○	○	○	○	○	○
Scientific-Based News Websites (E.g. ScienceDaily, Are Technica, New Scientist, Popular Science, Live Science) (3)	○	○	○	○	○	○	○
Internet forums (E.g. Reddit, Quora, 4Chan) (4)	○	○	○	○	○	○	○
Internet News Sites (E.g. The Guardian, Huffington Post, Google News, Yahoo! News) (5)	○	○	○	○	○	○	○
Other Internet Information Websites (6)	○	○	○	○	○	○	○

To what extent do you agree with the following statements in regards to yourself:

	Completely Disagree (1)	**Somewhat Disagree** (2)	**Neither Agree or Disagree** (3)	**Somewhat Agree** (4)	**Completely Agree** (5)
Throughout my life I have noticed that I rarely feel strong positive or negative emotions. (1)	○	○	○	○	○
I have sometimes felt that strangers were reading my mind. (2)	○	○	○	○	○
My thoughts and behaviours are almost always disorganized. (3)	○	○	○	○	○
In general, it is important for me to have close relationships with other people. (4)	○	○	○	○	○
I often think that I hear people talking only to discover that there was no one there. (5)	○	○	○	○	○
Most of the time I find it is very difficult to get my thoughts in order. (6)	○	○	○	○	○
I have always preferred to be disconnected from the world. (7)	○	○	○	○	○
I have felt that there were messages for me in the way things were arranged, like furniture in a room. (8)	○	○	○	○	○
I often have difficulty following what someone is saying to me. (42)	○	○	○	○	○
If given the choice, I would	○	○	○	○	○

much rather be with another person than alone. (10)					
I believe that dreams have magical properties. (11)	○	○	○	○	○
I often feel so mixed up that I have difficulty functioning. (12)	○	○	○	○	○
Throughout my life, very few things have been exciting or interesting to me. (13)	○	○	○	○	○
I sometimes wonder if there is a small group of people who can control everyone else's behaviour. (14)	○	○	○	○	○
My thoughts are so hazy and unclear that I wish that I could just reach up and put them into place. (43)	○	○	○	○	○
Having close friends is not as important as people say. (44)	○	○	○	○	○
have had the momentary feeling that someone's place has been taken by a look-alike. (17)	○	○	○	○	○
My thoughts and behaviours feel random and unfocused. (45)	○	○	○	○	○
Generally, I do not have many thoughts or emotions. (19)	○	○	○	○	○
There are times when it feels like someone is touching me when no one is actually there. (20)	○	○	○	○	○

No matter how hard I try, I can't organize my thoughts. (21)	○	○	○	○	○
Throughout my life, I have had little interest in dating or being in a romantic relationship. (22)	○	○	○	○	○
I have had experiences with seeing the future, ESP or a sixth sense. (23)	○	○	○	○	○
I find that I am very often confused about what is going on around me. (24)	○	○	○	○	○
Most of the time I feel a desire to be connected with other people. (25)	○	○	○	○	○
I often worry that other people are out to get me. (26)	○	○	○	○	○
People find my conversations to be confusing or hard to follow. (27)	○	○	○	○	○
There are just not many things that I have ever really enjoyed doing. (28)	○	○	○	○	○
Some people can make me aware of them just by thinking about me. (29)	○	○	○	○	○
My thoughts are almost always hard to follow.	○	○	○	○	○
I generally am not interested in being emotionally close with others. (31)	○	○	○	○	○
I believe that there are secret signs in the world if you just	○	○	○	○	○

know how to look for them. (32)					
I often have difficulty organizing what I am supposed to be doing. (46)	○	○	○	○	○
My emotions have almost always seemed flat regardless of what is going on around me. (34)	○	○	○	○	○
I often worry that someone or something is controlling my behaviour. (35)	○	○	○	○	○
I have trouble following conversations with others. (36)	○	○	○	○	○
Spending time with close friends and family is important to me. (37)	○	○	○	○	○
At times I have wondered if my body is really my own. (38)	○	○	○	○	○

To what extent do you agree that the following statements are true?

	Definitely not true (1)	**Somewhat not true** (2)	**Neither True or False** (3)	**Somewhat True** (4)	**Definitely True** (5)
The government is involved in the murder of innocent citizens and/or well-known public figures and keeps this a secret. (1)	○	○	○	○	○
The government permits or perpetrates acts of terrorism on its own soil, disguising its involvement. (2)	○	○	○	○	○
The Government uses people as patsies to hide its involvement in criminal activities. (3)	○	○	○	○	○
The power held by heads of state is second to that of small, unknown groups who really control world politics. (4)	○	○	○	○	○
A small secret groups of people is responsible for making all major world decisions, such as going to war. (5)	○	○	○	○	○
Certain significant events have been the result of the activity of a small group who secretly manipulate world events. (6)	○	○	○	○	○
Secret organisations communicate with extra-terrestrials but keep this fact from the public.	○	○	○	○	○
Evidence of alien contact is being kept from the public. (8)	○	○	○	○	○
Some UFO sightings and rumours are	○	○	○	○	○

planned or staged in order to distract the public from real alien contact. (9)					
The spread of certain viruses and/or diseases is the result of deliberate, concealed efforts of some organizations.(10)	○	○	○	○	○
Technology with mind-control capacities is used on people without their knowledge.(11)	○	○	○	○	○
Experiments involving new drugs or technologies are routinely carried out on the public without their knowledge or consent. (12)	○	○	○	○	○
Groups of scientists manipulate, fabricate, or suppress evidence in order to deceive the public. (13)	○	○	○	○	○
New and advanced technology which would harm current industry is being suppressed. (14)	○	○	○	○	○
A lot of important information is deliberately concealed from the public out of self-interest. (15)	○	○	○	○	○

To what extent do you agree that the following statements are true?

	Completely False (1)	**Mostly False** (2)	**Somewhat False** (3)	**Slightly False** (4)	**Neither True or False** (5)	**Slightly True** (6)	**Somewhat True** (7)	**Mostly True** (8)	**Completely True** (9)
A powerful and secretive group, known as the New World Order, are planning to eventually rule the world through an autonomous world government, which would replace sovereign government. (1)	○	○	○	○	○	○	○	○	○
SARS (Severe Acute Respiratory Syndrome) was produced under laboratory conditions as a biological weapon. (2)	○	○	○	○	○	○	○	○	○
The US government had foreknowledge about the Japanese attack on Pearl Harbour but allowed the attack to take place so as to be able to enter the Second World War. (3)	○	○	○	○	○	○	○	○	○
US agencies intentionally created the AIDS epidemic and administered it to Black and gay men in the 1970s. (4)	○	○	○	○	○	○	○	○	○
The assassination of Martin Luther King, Jr., was the result of an	○	○	○	○	○	○	○	○	○

organised conspiracy by US government agencies such as the CIA and FBI. (5)									
The Apollo moon landings never happened and were staged in a Hollywood film studio. (6)	○	○	○	○	○	○	○	○	○
Area 51 in Nevada, US, is a secretive military base that contains hidden alien spacecraft and/or alien bodies. (7)	○	○	○	○	○	○	○	○	○
The US government allowed the 9/11 attacks to take place so that it would have an excuse to achieve foreign (e.g., wars in Afghanistan and Iraq) and domestic (e.g., attacks on civil liberties) goals that had been determined prior to the attacks. (8)	○	○	○	○	○	○	○	○	○
The assassination of John F. Kennedy was not committed by the lone gunman, Lee Harvey Oswald, but was rather a detailed, organised conspiracy to kill the President. (9)	○	○	○	○	○	○	○	○	○
In July 1947, the US military recovered the	○	○	○	○	○	○	○	○	○

wreckage of an alien craft from Roswell, New Mexico, and covered up the fact. (10)									
Princess Diana's death was not an accident, but rather an organised assassination by members of the British royal family who disliked her. (11)	○	○	○	○	○	○	○	○	○
The Oklahoma City bombers, Timothy McVeigh and Terry Nichols, did not act alone, but rather received assistance from neo-Nazi groups. (12)	○	○	○	○	○	○	○	○	○
The Coca Cola company intentionally changed to an inferior formula with the intent of driving up demand for their classic product, later reintroducing it for their financial gain. (13)	○	○	○	○	○	○	○	○	○
Special interest groups are suppressing, or have suppressed in the past, technologies that could provide energy at reduced cost or reduced pollution output. (14)	○	○	○	○	○	○	○	○	○

Thank you for completing the survey!

The team would like to just thank you for helping with our research project under what are some extrordinary cirucmstances, if you would like to know further about the research once it has completed, please leave an email address in the below text box.

Also, if you'd like to leave anything of note or suggestions to the researchers, please also provide some feedback in the text box below!

Kind Regards,

The University of Adelaide Research Team

Appendix B – Survey Items and Scoring used in Chapter Three and Chapter Four

BELIEF IN CONSPIRACY THEORIES INVENTORY

All items are rated on a 9-point scale, ranging from 1 (Completely false) to 9 (Completely true). Higher scores on this scale reflect greater endorsement of a range of real-world conspiracy theories. BCTI items are reported in Table 4.

1. A powerful and secretive group, known as the New World Order, are planning to eventually rule the world through an autonomous world government, which would replace sovereign government.

2. SARS (Severe Acute Respiratory Syndrome) was produced under laboratory conditions as a biological weapon.

3. The US government had foreknowledge about the Japanese attack on Pearl Harbour but allowed the attack to take place so as to be able to enter the Second World War.

4. US agencies intentionally created the AIDS epidemic and administered it to Black and gay men in the 1970s.

5. The assassination of Martin Luther King, Jr., was the result of an organised conspiracy by US government agencies such as the CIA and FBI.

6. The Apollo moon landings never happened and were staged in a Hollywood film studio.

7. Area 51 in Nevada, US, is a secretive military base that contains hidden alien spacecraft and/or alien bodies.

8. The US government allowed the 9/11 attacks to take place so that it would have an excuse to achieve foreign (e.g., wars in Afghanistan and Iraq) and domestic (e.g., attacks on civil liberties) goals that had been determined prior to the attacks.

9. The assassination of John F. Kennedy was not committed by the lone gunman, Lee Harvey Oswald, but was rather a detailed, organised conspiracy to kill the President.

10. In July 1947, the US military recovered the wreckage of an alien craft from Roswell, New Mexico, and covered up the fact.

11. Princess Diana's death was not an accident, but rather an organised assassination by members of the British royal family who disliked her.

12. The Oklahoma City bombers, Timothy McVeigh and Terry Nichols, did not act alone, but rather received assistance from neo-Nazi groups.

13. The Coca Cola company intentionally changed to an inferior formula with the intent of driving up demand for their classic product, later reintroducing it for their financial gain.

14. Special interest groups are suppressing, or have suppressed in the past, technologies that could provide energy at reduced cost or reduced pollution output.

15. Government agencies in the UK are involved in the distribution of illegal drugs to ethnic minorities.

GENERIC CONSPIRACIST BELIEFS SCALE

Items were rated on a 5-point scale, ranging from 1 *(Definitely not true)* to 5 *(Definitely true)*. Higher scores on this measure reflect greater generic conspiracist ideation.

1. The government is involved in the murder of innocent citizens and/or well-known public figures and keeps this a secret.

2. The government permits or perpetrates acts of terrorism on its own soil, disguising its involvement.

3. The Government uses people as patsies to hide its involvement in criminal activities.

4. The power held by heads of state is second to that of small, unknown groups who really control world politics.

5. A small secret groups of people is responsible for making all major world decisions, such as going to war.

6. Certain significant events have been the result of the activity of a small group who secretly manipulate world events.

7. Secret organisations communicate with extra-terrestrials but keep this fact from the public.

8. Evidence of alien contact is being kept from the public.

9. Some UFO sightings and rumours are planned or staged in order to distract the public from real alien contact.

10. The spread of certain viruses and/or diseases is the result of deliberate, concealed efforts of some organisations.

11. Technology with mind-control capacities is used on people without their knowledge.

12. Experiments involving new drugs or technologies are routinely carried out on the public without their knowledge or consent.

13. Groups of scientists manipulate, fabricate, or suppress evidence in order to deceive the public.

14. New and advanced technology which would harm current industry is being suppressed.

15. A lot of important information is deliberately concealed from the public out of self-interest.

SCHIZOTYPAL PERSONALITY QUESTIONNAIRE

The new updated version (Cohen et al., 2010), is a 32-item self-report scale on a five-point ordinal response format (“strongly disagree”-” neutral”-” strongly agree”) on which higher scores indicate greater schizotypy. This allows the measurement of cognitive-perceptual (CP), interpersonal (IP) and disorganized symptoms of schizotypal personality disorder (DO).

1) Do you sometimes feel that people are talking about you?
2) Do you sometimes feel that other people are watching you?
3) When shopping, do you get the feeling that other people are taking notice of you?
4) I often feel that others have it in for me.
5) Do you sometimes get concerned that friends or co-workers are not really loyal or trustworthy?
6) Do you often have to keep an eye out to stop people from taking advantage of you?
7) Do you feel that you cannot get “close” to people?
8) I find it hard to be emotionally close to other people.
9) Do you feel that there is no one you are really close to outside of your immediate family, or people you can confide in or talk to about a personal problem?
10) I tend to keep my feelings to myself.
11) I rarely laugh and smile.
12) I am not good at experiencing my true feelings by the way I talk and look.
13) Other people see me as slightly eccentric (odd).
14) I am an odd, unusual person.
15) I have some eccentric (odd) habits.
16) People sometimes comment on my unusual mannerisms and habits.
17) Do you often feel nervous when you are in a group of unfamiliar people?
18) I get anxious when meeting people for the first time.
19) I feel very uncomfortable in social situations involving unfamiliar people.
20) I sometimes avoid going to places where there will be many people because I will get anxious.
21) Do you believe in telepathy (mind-reading)?
22) Do you believe in clairvoyance (psychic forces, fortune telling)?
23) Have you had experiences with astrology, seeing the future, UFO’s, ESP, or a sixth sense?
24) Have you ever felt that you are communicating with another person telepathically (by mind-reading)?
25) I sometimes jump quickly from one topic to another when speaking.
26) Do you tend to wander off the topic when having a conversation?
27) I often ramble on too much when speaking.
28) I sometimes forget what I am trying to say.
29) I often hear a voice speaking my thoughts aloud.
30) When you look at a person or yourself in a mirror, have you ever seen the face right before your eyes?
31) Are your thoughts sometimes so strong that you can almost hear them?
32) Do every things seem unusually large or small?

42-ITEM RATIONAL/EXPERIENTIAL MULTIMODAL INVENTORY

The REIM contains 12 items that measure an analytic thinking style (a tendency to solve problems through understanding of logical principles and the evaluation of evidence, and 30

items that measure an experiential thinking style. The latter consists of three 10-item subscales, which are Intuition (tendency to solve problems intuitively, Emotionality (a preference for intense and frequent strong affect) and finally Imagination (A tendency to engage in, and appreciate, imagination). All items are rated on a 5-point scale (1 = Strongly disagree, 5 = Strongly Agree).

Rational Scale (12 Items)

1. I enjoy problems that require hard thinking.
2. I am not very good in solving problems that require careful logic analysis. **(Reversed)**
3. I enjoy intellectual challenges.
4. I prefer complex to simple problems.
5. I don't like to have to do a lot of thinking. **(Reversed)**
6. Reasoning things out carefully is not of my strong points. **(Reversed)**
7. I am not a very analytical thinker. **(Reversed)**
8. I try to avoid situations that require thinking in depth about something. **(Reversed)**
9. I am much better at figuring things out logically than most people.
10. I have a logical mind.
11. Using Logic usually works well for me in figuring out problems in my life.
12. Knowing the answer without understanding the reasoning behind it is good enough for me. **(Reversed)**

Experiential Scale (30 Items)

13. I enjoy reading things that evoke visual images.
14. I enjoy imagining things.
15. I can clearly picture or remember some sculpture or natural object (not alive) that I think is very beautiful.
16. I Identify strongly with characters in movies or books I read.
17. I tend to describe things by using images or metaphors, or creative comparisons.
18. Art is really important to me.
19. Sometimes I like to just sit back and watch things happen.
20. I have favourite poems and paintings that mean a lot to me.
21. When I travel or drive anywhere, I always watch the landscape and scenery.
22. I almost never think in visual images. **(Reversed)**
23. My emotions don't make much difference in my life. **(Reversed)**
24. Emotions don't really mean much: they come and go. **(Reversed)**
25. When I have strong emotional experience, the effect stays with me for a long time.

26. When I'm sad, it's often a very strong feeling.

27. Things that make me feel emotional don't seem to affect other people as much.

28. Everyday experiences often evoke strong feelings in me.

29. I'd rather be upset sometimes and happy sometimes, than always feel calm.

30. I don't react emotionally to scary movies or books as much as most people do. **(Reversed)**

31. My anger is often very intense.

32. When I'm happy, the feeling is usually more like contentment than like exhilaration or excitement. **(Reversed)**

33. I like to rely on my intuitive impressions.

34. I often go by my instincts when deciding on a course of action.

35. I don't think it is a good idea to rely on one's intuition for important decisions, **(Reversed)**

36. I trust my initial feelings about people.

37. I tend to use my heart as a guide for my actions.

38. I enjoy learning by doing something, instead of figuring it out first.

39. I can often tell how people feel without them having to say anything.

40. I generally don't depend on my feelings to help me make decisions. **(Reverse Scores)**

41. For me, descriptions of actual people's experiences are more convincing than discussions about "facts."

42. I'm not a very spontaneous person. **(Reverse Scored)**

AUTISM-SPECTRUM QUOTIENT

1. I prefer to do things with others rather than on my own.
2. I prefer to do things the same way over and over again.
3. If I try to imagine something, I find it very easy to create a picture in my mind.
4. I frequently get so strongly absorbed in one thing that I lose sight of other things.
5. I often notice small sounds when others do not.
6. I usually notice car number plates or similar strings of information.
7. Other people frequently tell me that what I've said is impolite, even though I think it is polite.
8. When I'm reading a story, I can easily imagine what the characters might look like.
9. I am fascinated by dates.
10. In a social group, I can easily keep track of several different people's conversations.
11. I find social situations easy.
12. I tend to notice details that others do not.
13. I would rather go to a library than to a party.
14. I find making up stories easy.
15. I find myself drawn more strongly to people than to things.
16. I tend to have very strong interests, which I get upset about if I can't pursue.
17. I enjoy social chitchat.
18. When I talk, it isn't always easy for others to get a word in edgewise.
19. I am fascinated by numbers.
20. When I'm reading a story, I find it difficult to work out the characters' intentions.
21. I don't particularly enjoy reading fiction.
22. I find it hard to make new friends.
23. I notice patterns in things all the time.
24. I would rather go to the theater than to a museum.
25. It does not upset me if my daily routine is disturbed.
26. I frequently find that I don't know how to keep a conversation going.
27. I find it easy to "read between the lines" when someone is talking to me.
28. I usually concentrate more on the whole picture, rather than on the small details.
29. I am not very good at remembering phone numbers.
30. I don't usually notice small changes in a situation or a person's appearance.
31. I know how to tell if someone listening to me is getting bored.

32. I find it easy to do more than one thing at once.
33. When I talk on the phone, I'm not sure when it's my turn to speak.
34. I enjoy doing things spontaneously.
35. I am often the last to understand the point of a joke.
36. I find it easy to work out what someone is thinking or feeling just by looking at their face.
37. If there is an interruption, I can switch back to what I was doing very quickly.
38. I am good at social chitchat.
39. People often tell me that I keep going on and on about the same thing.
40. When I was young, I used to enjoy playing games involving pretending with other children.
41. I like to collect information about categories of things (e.g., types of cars, birds, trains, plants).
42. I find it difficult to imagine what it would be like to be someone else.
43. I like to carefully plan any activities I participate in.
44. I enjoy social occasions.
45. I find it difficult to work out people's intentions.
46. New situations make me anxious.
47. I enjoy meeting new people.
48. I am a good diplomat.
49. I am not very good at remembering people's date of birth.
50. I find it very easy to play games with children that involve pretending.

NEED FOR COGNITIVE CLOSURE

1. strongly disagree 2. moderately disagree 3. slightly disagree 4. slightly agree 5. moderately agree, 6..strongly agree

1. 1.I think that having clear rules and order at work is essential for success.
2. 2.Even after I've made up my mind about something, I am always eager to consider a different opinion. **(Reversed)**
3. 3.I don't like situations that are uncertain.
4. 4.I dislike questions which could be answered in many different ways.
5. 5.I like to have friends who are unpredictable. **(Reversed)**
6. 6.I find that a well ordered life with regular hours suits my temperament.
7. 7.I enjoy the uncertainty of going into a new situation without knowing what might happen. (Reversed)
8. 8.When dining out, I like to go to places where I have been before so that I know what to expect.
9. 9.I feel uncomfortable when I don't understand the reason why an event occurred in my life.

10. 10. I feel irritated when one person disagrees with what everyone else in a group believes.

11. I hate to change my plans at the last minute.
12. I would describe myself as indecisive. **(Reversed)**
13. When I go shopping, I have difficulty deciding exactly what it is I want. **(Reversed)**
14. When faced with a problem I usually see the one best solution very quickly

15. When I am confused about an important issue, I feel very upset.
16. I tend to put off making important decisions until the last possible moment. **(Reversed)**

17. I usually make important decisions quickly and confidently.
18. I have never been late for an appointment or work.
19. I think it is fun to change my plans at the last moment. **(Reversed)**

20. My personal space is usually messy and disorganized. **(Reversed)**

21. In most social conflicts, I can easily see which side is right and which is wrong.
22. I have never known someone I did not like.
23. I tend to struggle with most decisions. **(Reversed)**
24. I believe orderliness and organization are among the most important characteristics of a good student.
25. When considering most conflict situations, I can usually see how both sides could be right. **(Reversed)**
26. I don't like to be with people who are capable of unexpected actions.

27. I prefer to socialize with familiar friends because I know what to expect from them.
28. I think that I would learn best in a class that lacks clearly stated objectives and requirements. **(Reversed)**
29. When thinking about a problem, I consider as many different opinions on the issue as possible. **(Reversed)**
30. I don't like to go into a situation without knowing what I can expect from it.
31. I like to know what people are thinking all the time.
32. I dislike it when a person's statement could mean many different things.

33. It's annoying to listen to someone who cannot seem to make up his or her mind.

34. I find that establishing a consistent routine enables me to enjoy life more.
35. I enjoy having a clear and structured mode of life.
36. I prefer interacting with people whose opinions are very different from my own. **(Reversed)**

37. I like to have a plan for everything and a place for everything.

38. I feel uncomfortable when someone's meaning or intention is unclear to me.
39. I believe that one should never engage in leisure activities.
40. When trying to solve a problem I often see so many possible options that it's confusing. **(Reversed)**

41. I always see many possible solutions to problems I face. (**Reversed)**
42. I'd rather know bad news than stay in a state of uncertainty.
43. I feel that there is no such thing as an honest mistake.
44. I do not usually consult many different options before forming my own view.
45. I dislike unpredictable situations.

46. I have never hurt another person's feelings.
47. I dislike the routine aspects of my work (studies). **(Reversed)**

How to Score:

1. **Reverse-score items** 2, 5, 7, 12, 13, 16, 19, 20, 23, 25, 28, 29, 36, 40, 41, and 47.

2. Sum items 18, 22, 39, 43, and 46 to form a lie score.
3. Remove the subject if the lie score is greater than 15.
4. Sum all items except for the above listed lie items to calculate the need for closure score.

5. Use the top and bottom quartiles to determine high and low need for closure subjects.

6. If factors are required, use the following scoring system:

Order: 1, 6, 11, 20, 24, 28, 34, 35, 37, 47 Predictability: 5, 7, 8, 19, 26, 27, 30, 45
Decisiveness: 12, 13, 14, 16, 17, 23, 40, Ambiguity: 3, 9, 15, 21, 31, 32, 33, 38, 2 Closed Mindedness: 2, 4, 10, 25, 29, 36, 41, 44

Appendix C: Survey and Study Flow of Chapter Five and Chapter Six

Individual Differences in interpreting Real World-Events

Brief Description of the study: This study is investigating the relationship between differences in personality and people's beliefs about the causes of world-wide events. Do events that occur in the world for the reasons that are commonly reported or are there other explanations? **Your role in the Study:** You will be asked to complete a series of online survey questions where you will be asked to provide answers reflective of your own beliefs. Participation in the study is entirely voluntary; there is no obligation to take part in the study and, if you choose not to participate, there will be no repercussions. You have the right to withdraw at any time. **Inclusion/Exclusion Criteria:** Participants must be English-fluent to comprehend the survey items. **Risks of Participating:** This study is unlikely to pose any risks to your health or wellbeing as a result of participating. However, you may feel some discomfort when asked to reflect upon unusual experiences or how others might view you. **Statement of Privacy:** All data collected during the experiment will be treated in the strictest confidence and stored on password protected computers. The data will be used for this project, and any potential comparison study that may eventuate from this project. However, once the data is no longer required it will be destroyed. You will also have the opportunity to receive a summary of the research findings. Results will be aggregated for reporting purposes to preserve anonymity. **Consent:** If you are willing to participate, please indicate this by clicking on the first screen of the experimental application, as instructed by the researcher and follow the prompts. **Contact Details for Questions:** Should you have any complaints or concerns about the manner in which this project is conducted, please contact primarily the student investigator or lead investigator: **Lead Investigator** Dr Paul Delfabbro Email: paul.delfabbro@adelaide.edu.au **Student Investigator** Neophytos Georgiou Email: neophytos.georgiou@adelaide.edu.au For any questions about the ethical conduct of this research, please contact the Acting Chair of the Human Research Ethics Committee in the School of Psychology, University of Adelaide (Dr. Diana Dorstyn): Diana.Dorstyn@adelaide.edu.au.

I have read the above information and understand the terms of this study:

Note: if you click you 'do not' wish, you will be removed from the survey with no financial compensation.

- ○ Yes I have, I'd like to continue (1)
- ○ Yes, I **do not** wish to continue this study (2)

In order to give consent to all the following study please read and select the following statements:

- ☐ I have read the attached information sheet and agree to take part in the following project. (1)
- ☐ I have had the project, so far as it affects me, fully explained to my satisfaction within the brief description of the study. My consent is given freely. (2)
- ☐ Although I understand the purpose of the research project, I also understand the involvement may not be of any benefit to me. (3)
- ☐ I have been informed that, while information gained during the study may be published, I will not be identified, and my personal results will not be divulged. (4)
- ☐ I understand that I am free to withdraw from the project at any time. (5)
- ☐ I have read and understood the risks of participating within the current project. (6)

In accordance with the previous statements:

Both must be selected to continue.

☐ I have read the terms and conditions of this study and understood my rights and ethical considerations (1)

☐ I permit the researchers of this study to use my produced data for the purposes mentioned. (2)

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Please enter your Prolific in the following text box: (Warning: If you do not enter the correct ID, there may be an issue in financial compensation)

_____

What is your age?

○ 18-24 (1)

○ 25-34 (2)

○ 35-44 (3)

○ 45-54 (4)

○ 55-64 (5)

○ 65+ (6)

What is your sex?

○ Male (1)

○ Female (2)

○ Other not stated above (4)

In which country do you currently reside?

▼ Afghanistan (1) ... Zimbabwe (1357)

What is the highest level of school you have completed or the highest degree you have received?

- ○ Less than high school degree (1)
- ○ High school graduate (high school diploma or equivalent including GED) (2)
- ○ Some college/university but no degree (3)
- ○ Associate degree in college/university (4)
- ○ Bachelor's degree in college/university (5)
- ○ Master's degree (6)
- ○ Doctoral degree (7)
- ○ Professional degree (JD, MD) (8)

Which statement best describes your current employment status as <u>of time of completing this survey</u>?

- ○ Working (paid employee) (1)
- ○ Working (self-employed) (2)
- ○ Not working (temporary layoff from a job) (3)
- ○ Not working (looking for work) (4)
- ○ Not working (retired) (5)
- ○ Not working (disabled) (6)
- ○ Not working (other) (7) _____
- ○ Prefer not to answer (8)

Have you previously received a formal diagnosis of a mental health disorder?

(e.g. By a doctor, psychologist)

- ○ No (1)
- ○ Yes (2)

If you answered YES to the previous question, please share what diagnosis, or multiple diagnoses you have received:

Note: If you feel uncomfortable to do so, please write 'prefer not to say'

_____

_____

_____

_____

_____

Page Break

Individual Differences in interpreting Real World Events

In this section, we would like you to honestly answer the following questions. All questions must be answered in order to move to the next stage.

Important:
In the following task, you will be asked to read each scenario, and decide from the given information whether the correct answer is True or False.

Each question is separate from any scenarios presented, and should be considered as isolated questions. Please complete each question to the best of your ability.

In a taste test, a researcher puts Brand A coffee in a cup with white tape on it and Brand B coffee in an identical cup with black tape on it. A lab assistant gives tasters one of the cups, while the researcher watches their facial expressions.

True or **False**? The lab assistant should not watch the cups being filled.

- ○ **True**
- ○ **False**
- ○ **Don't Know**

This section will contain many questions.

True or **False**? You read this statement.

- ○ **True**
- ○ **False**
- ○ **Don't Know**

A researcher finds that American states with larger parks have fewer endangered species.

True or **False**? This data shows that increasing the size of American state parks will reduce the number of endangered species.

- ◯ **True**
- ◯ **False**
- ◯ **Don't Know**

A researcher has subjects put together a jigsaw puzzle either in a cold room with a loud radio or in a warm room with no radio. Subjects solve the puzzle more quickly in the warm room with no radio.

True or **False**? The scientist cannot tell if the radio caused subjects to solve the puzzle more slowly.

- ◯ **True**
- ◯ **False**
- ◯ **Don't Know**

A researcher that designed this study would like to verify that you are paying attention to the questions. They have requested you answer the following question false in order to prove this.

True or **False**? What was the answer requested by the researcher.

- ◯ **True**
- ◯ **False**
- ◯ **Don't Know**

An education researcher wants to measure the general math ability of a sample of high-performing math students. All the students have taken classes in geometry and pre-calculus.

True or **False**? The education researcher can measure general math ability by giving the students a geometry test.

- ○ **True**
- ○ **False**
- ○ **Don't Know**

Two scientists test an anti-acne cream on teenagers with acne. Scientist A wants to give the creamto all the teenagers in the study. Scientist B wants to give the cream to half the teenagers and give a cream without anti-acne ingredients to the other half.

True or **False**? Both ways of testing the cream are equally good.

- ○ **True**
- ○ **False**
- ○ **Don't Know**

A researcher has a group of subjects play a competitive game. Each subject's goal is to make money by buying and selling tokens. Subjects are paid a flat fee for participating in the experiment.

True or **False**? The researcher can confidently state that the behavior in the experiment reflects real-life buying and selling behavior

- ○ **True**
- ○ **False**
- ○ **Don't Know**

A randomly selected sample of Americans is surveyed about disease A before and after a 6-month media campaign about the disease. Mid-way through the media campaign, a famous celebrity dies of Disease A. The survey data indicate that knowledge of Disease A is higher after the campaign.

True or **False**? The media campaign may not have increased knowledge of Disease A.

- ○ **True**
- ○ **False**
- ○ **Don't Know**

Subjects in an experiment must press a button whenever a blue dot flashes on their computer screen. At first, the task is easy for subjects. But as they continue to perform the task, they make more and more errors.

True or **False**? The blue dot must flash more quickly as the task progresses

- ○ **True**
- ○ **False**
- ○ **Don't Know**

Researchers want to see whether a health intervention helps school children to lose weight. School children are sorted into either an intervention or control group.

True or **False**? The researchers should assign the overweight children to the intervention group.

- ○ **True**
- ○ **False**
- ○ **Don't Know**

Subjects doing the survey right now are potentially getting tired of paying attention. The researcher would again like you to answer True in order to prove that you are taking this survey seriously.

True or **False**? What answer did the researcher request in the statement above?

- ◯ **True**
- ◯ **False**
- ◯ **Don't Know**

A researcher develops a new method for measuring the surface tension of liquids.This method is more consistent than the old method.

True or **False**? The new method must also be more accurate than the old method.

- ◯ **True**
- ◯ **False**
- ◯ **Don't Know**

Two researchers are developing a survey to measure consumers' feelings about customer service. Researcher A wants customers to rate their agreement with the statement "I am satisfied with customer service" on a 5-point scale, where 1 = *strongly agree* and 5 = *strongly disagree*. Researcher B wants customers to rate customer service on a 5-point scale, where 1 = *not dissatisfied at all* and 5 = *highly dissatisfied*.

True or **False**? These questions are equally good for measuring how consumers feel about customer service.

- ◯ **True**
- ◯ **False**
- ◯ **Don't Know**

Page Break

Individual Differences in interpreting Real World Events

In the following task you will be presented with a scenario consisting of three sentences. Each sentence will be presented one at a time.

Here is an example of a sentence you may see below;

"John is angry at his sister."

Below the sentence presented will be four options. These four options are different conclusions you could draw from the sentence(s) presented, we will refer to them as **interpretations.**

After each sentence you will be asked to rate **how likely** each of the four interpretations of the scenario is from 0 to 100. For example, rating an interpretation as 0 = completely implausible, whilst rating an interpretation 100 = Completely plausible.

Going back to the example, above "John is angry at his sister" these are what the **four interpretations** could look like;

After each new sentence is provided, you will be asked to revise your rating for each of the four interpretations based on the new information. For example, would you change your answer to each interpretaiton above, if the second sentence after "John is angry at his sister.", was "John couldn't find his lunch box in the fridge".

Please consider each of the four options independently of each other. This means that you can rate all the possible options as high or low. This means you can also able to rate options as equally likely.

Now let's check if you understand the task.

Which of these is true?

- ○ The total for ALL ratings have to add up to 100% (e.g., Interpretation 1 = 40%; Interpretation 2 = 20%; Interpretation 3 = 20%; Interpretation 4 = 20%). (1)
- ○ The total for ALL ratings can go over 100% (e.g., Interpretation 1 = 70%; Interpretation 2 = 50%; Interpretation 3 = 0%; Interpretation 4 = 20%). (2)

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Individual Differences in interpreting Real World Events

The instructions will repeatedly be listed below in case you need them.

In the following task you will be presented with a scenario consisting of three sentences. Each sentence will be presented one at a time. After each sentence you will be asked to rate **how likely** each of the four interpretations of the scenario is from 0 to 100. For example, rating an interpretation as 0 = completely implausible, whilst rating an interpretation 100 = Completely plausible.

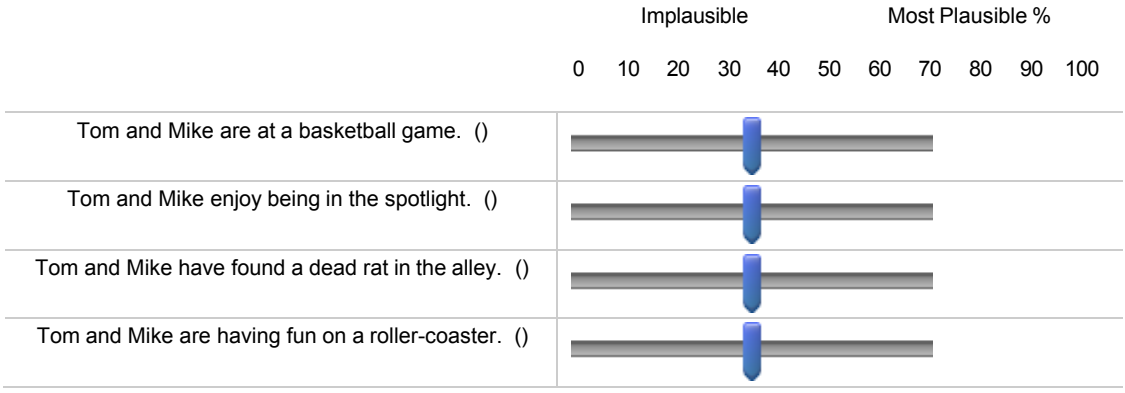
After each new sentence is provided, you will be asked to revise your rating for each of the four interpretations based on the new information.

Please consider each of the four options independently of each other. This means that you can rate all the possible options as high or low. This means you can also able to rate options as equally likely.

By using the adjustable bars below, please rate the percentage of likelihood of the four different interpretations of the scenario below.

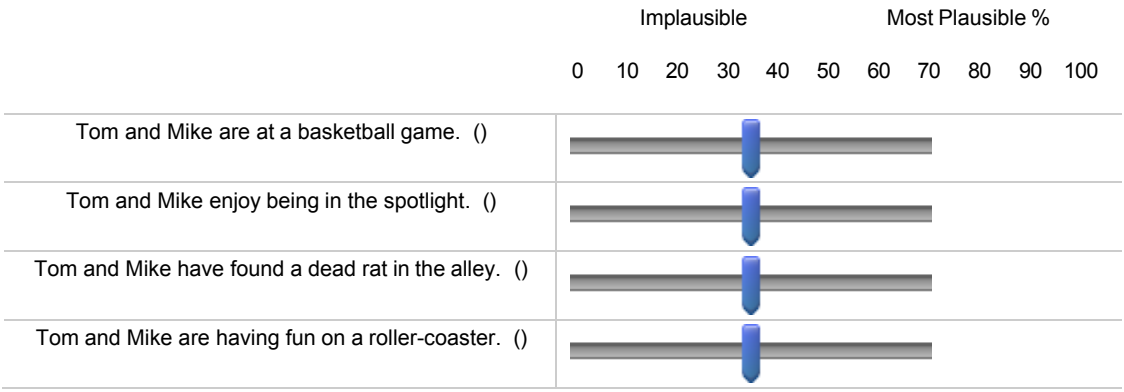
Remember, 0 = completely implausible, and 100 = completely plausible.

Tom and Mike are screaming.



Tom and Mike are screaming.

Tom and Mike feel nauseous.



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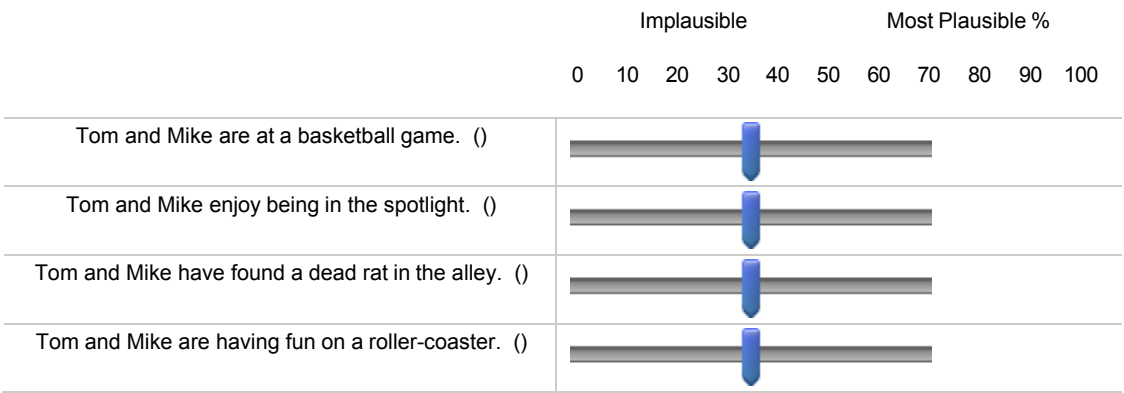
Tom and Mike are screaming.

Tom and Mike feel nauseous.

Tom and Mike ate too much cotton candy today.



Page Break

Individual Differences in interpreting Real World Events

This is the same task to which you had done 4 scenarios earlier, here are the next 4**. The instructions are below once again as a refresher :)**

In the following task you will be presented with a scenario consisting of three sentences. Each sentence will be presented one at a time. After each sentence you will be asked to rate **how likely** each of the four interpretations of the scenario is from 0 to 100. For example, rating an interpretation as 0 = completely implausible, whilst rating an interpretation 100 = Completely plausible.

After each new sentence is provided, you will be asked to revise your rating for each of the four interpretations based on the new information.

Please consider each of the four options independently of each other. This means that you can rate all the possible options as high or low. This means you can also able to rate options as equally likely.

By using the adjustable bars below, please rate the percentage of likeihood of the four different interpretations of the scenario below.

Remember, 0 = completely implausible, and 100 = completely plausible.

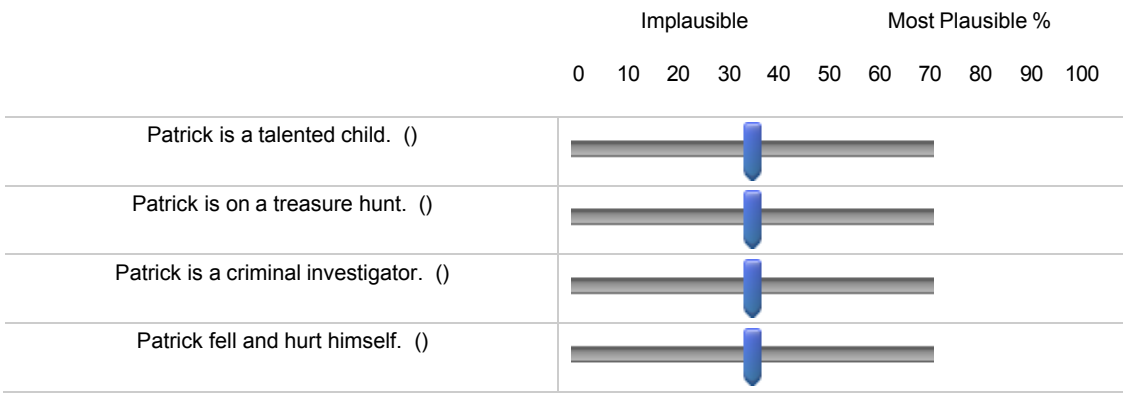
Patrick has found the plans he needs to solve.

	Implausible / Most Plausible %
	0 10 20 30 40 50 60 70 80 90 100
Patrick is a talented child. ()	
Patrick is on a treasure hunt. ()	
Patrick is a criminal investigator. ()	
Patrick fell and hurt himself. ()	

Page Break

Patrick has found the plans he needs to solve.

Patrick must put the pieces together.

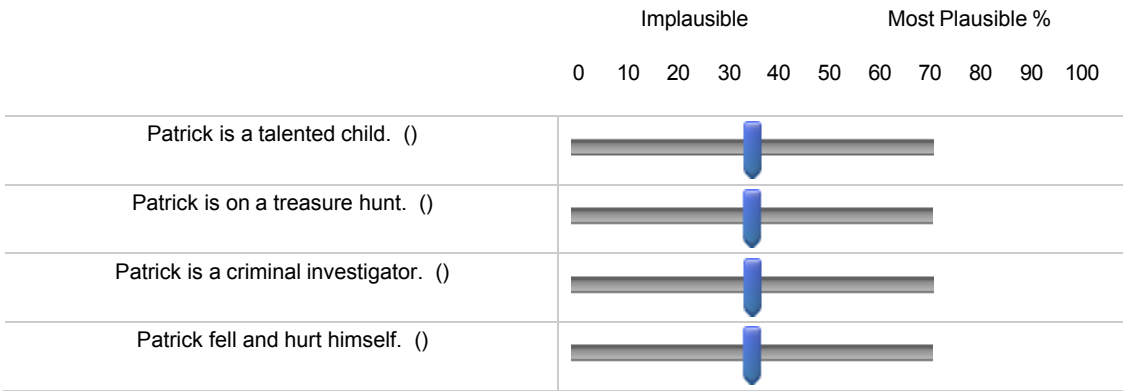


Page Break

Patrick has found the plans he needs to solve.

Patrick must put the pieces together.

Patrick has built many toy airplanes before this one.



Page Break

Individual Differences in interpreting Real World Events

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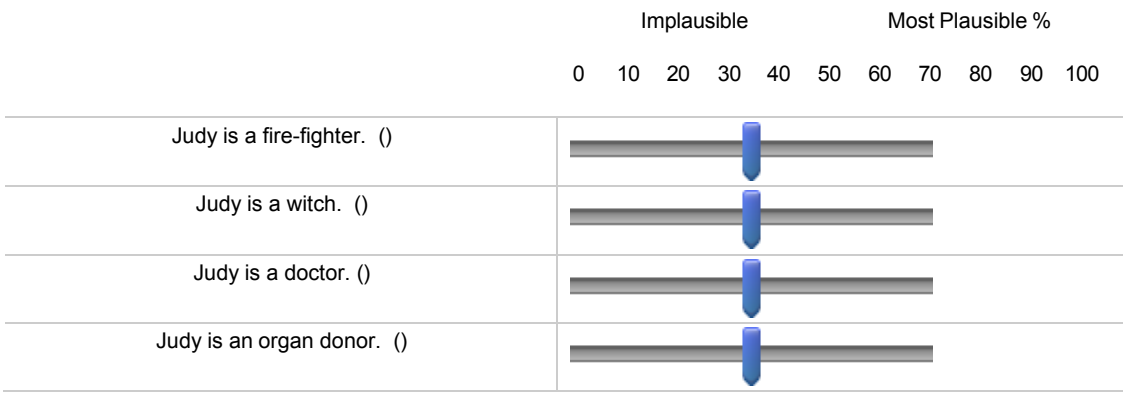
Judy saved the little girl's life.



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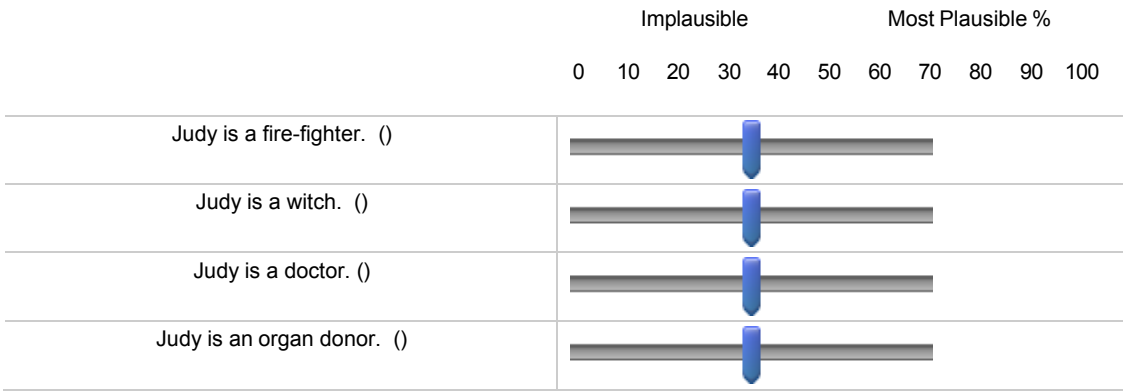
Judy saved the little girl's life.

Judy's family supported Judy's decision to help the little girl.

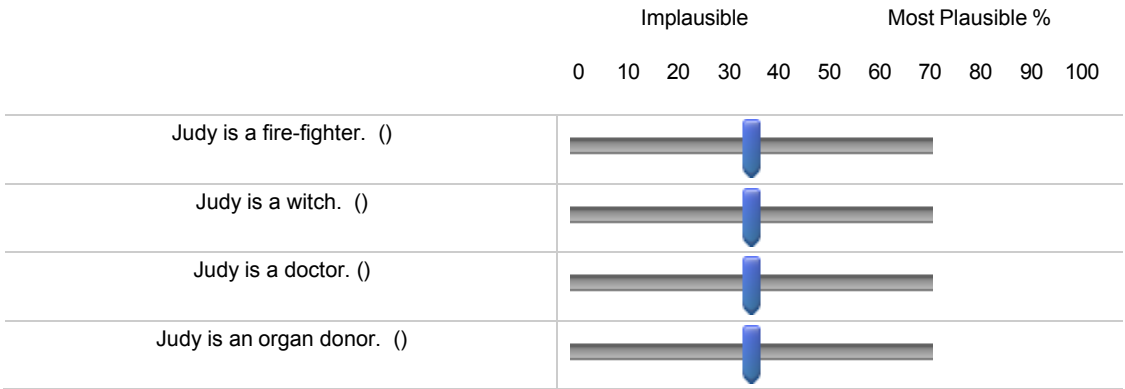


Page Break

Judy saved the little girl's life.

Judy's family supported Judy's decision to help the little girl.

Luckily, Judy is the same blood-type as the little girl.



Page Break

Individual Differences in interpreting Real World Events

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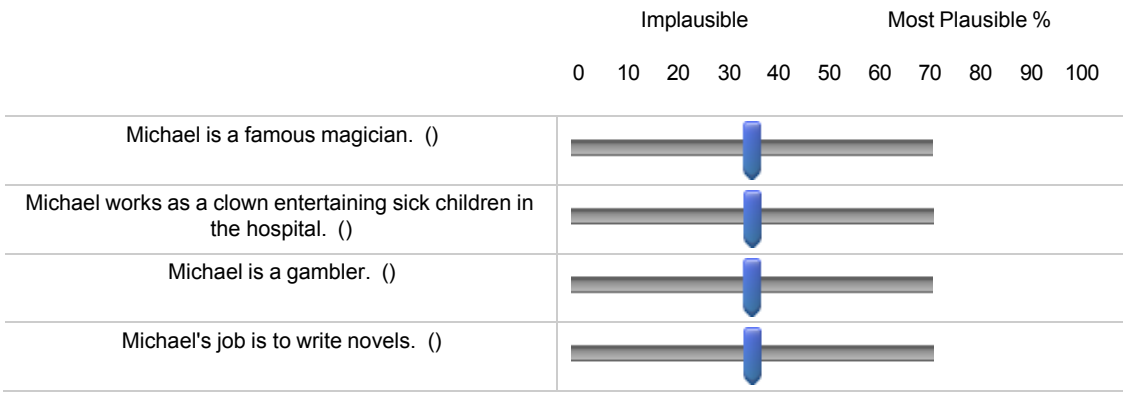
Remember, 0 = completely implausible, and 100 = completely plausible.

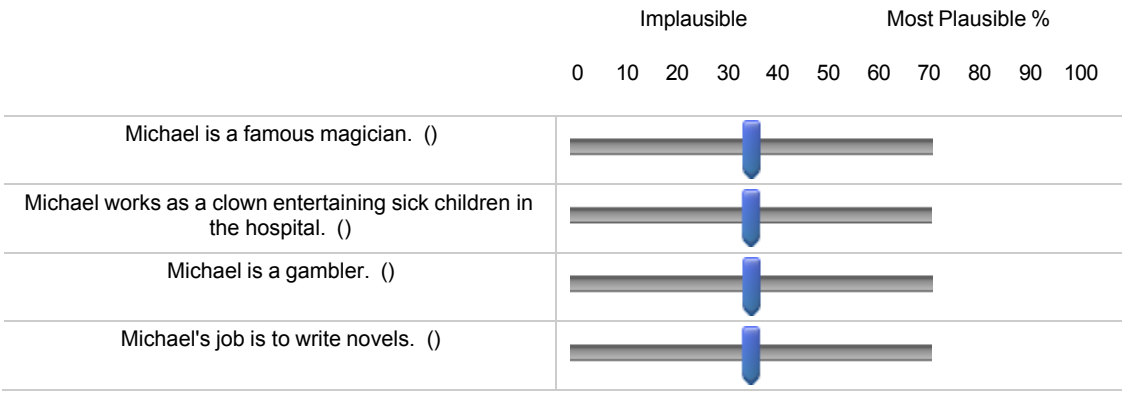
Michael's job is to entertain people.



Page Break

Michael's job is to entertain people.

Michael is a little shy sometimes.

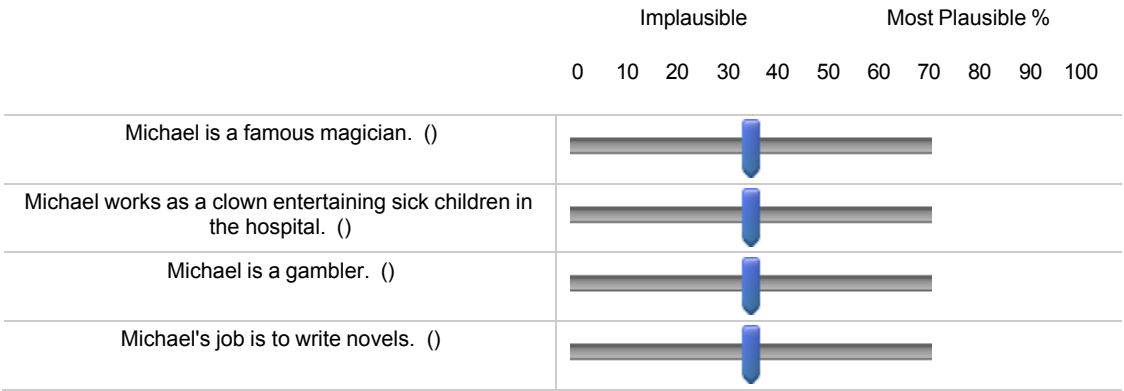


Page Break

Michael's job is to entertain people.

Michael is a little shy sometimes.

Michael sits in front of a computer writing all day long.



Page Break

Individual Differences in Interpreting Real World-Events

In this section, we would like you to honestly answer the following questions. All questions must be answered in order to move to the next stage.

Please rate your agreement or disagreement with each statement below regarding yourself, on a scale of 1 to 7

(1 = Completely Disagree, all the way to 7 = Completely Agree):

	Strongly disagree (1)	Disagree (2)	Somewhat disagree (3)	Neither agree nor disagree (4)	Somewhat agree (5)	Agree (6)	Strongly agree (7)
I frequently express my social and/or political views on social networking sites. (1)	○	○	○	○	○	○	○
I have used social networking sites to make informative posts about a social and/or political cause. (2)	○	○	○	○	○	○	○
I frequently comment on social and/or political posts on social networking sites. (3)	○	○	○	○	○	○	○
I rarely participate in conversations about social and/or political issues on social networking sites. (4)	○	○	○	○	○	○	○
I frequently post about social and/or political topics on social networking sites. (5)	○	○	○	○	○	○	○
I frequently “like” social and/or political posts on social networking	○	○	○	○	○	○	○

sites. (6)							
I often read social and/or political posts on social net-working sites. (7)	○	○	○	○	○	○	○
I seldom comment on social and/or political posts on social networking sites. (8)	○	○	○	○	○	○	○
I often “share” or “retweet” social and/or political posts on social networking sites. (9)	○	○	○	○	○	○	○
I rarely “like”, “favorite”, or “save”, social or political posts from social networking sites. (10)	○	○	○	○	○	○	○
I often update my status on social media sites with my views on current social and/or political issues. (11)	○	○	○	○	○	○	○
I rarely initiate conversations about social and/or political issues on social networking sites. (12)	○	○	○	○	○	○	○
I have joined or followed social and/or political groups on social networking sites. (13)	○	○	○	○	○	○	○
I have made a financial contribution	○	○	○	○	○	○	○

to a social or political campaign because of content from a social networking site. (14)							
Posts on social networking sites about social and/or political issues would not influence my decision to contribute financially to a campaign or cause. (15)	○	○	○	○	○	○	○
I rarely use my social media accounts to show support for social and/or political causes. (16)	○	○	○	○	○	○	○
I “follow “or regularly check profiles or pages that frequently post social and/or political content. (17)	○	○	○	○	○	○	○
I often support social or political campaigns by sharing information on social networking sites. (18)	○	○	○	○	○	○	○
I do not “follow” or “add” people/pages that frequently post social and/or political content. (19)	○	○	○	○	○	○	○
I often participate in conversations about social	○	○	○	○	○	○	○

and/or political issues on social networking sites. (20)							
I often initiate conversations about social and/or political issues on social networking sites. (21)	○	○	○	○	○	○	○

Please rate how strongly <u>you</u> agree with the statements below;

	Strongly Disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
I have a strong commitment to social justice. (1)	○	○	○	○	○
Climate change is an important issue to me. (2)	○	○	○	○	○
Diversity is an important issue for me. (3)	○	○	○	○	○
I believe strongly in ecologically sustainable living. (4)	○	○	○	○	○
I believe strongly in the rights of disadvantaged people. (5)	○	○	○	○	○
I like to make a stand in relation to discrimination against people based on their race, gender or sexuality. (6)	○	○	○	○	○
I support Black Lives Matter. (7)	○	○	○	○	○

Page Break

Individual Differences in interpreting Real World Events

The instructions will repeatedly be listed below in case you need them.

This is the same task to which you had done 4 scenarios earlier, here are the next 4.

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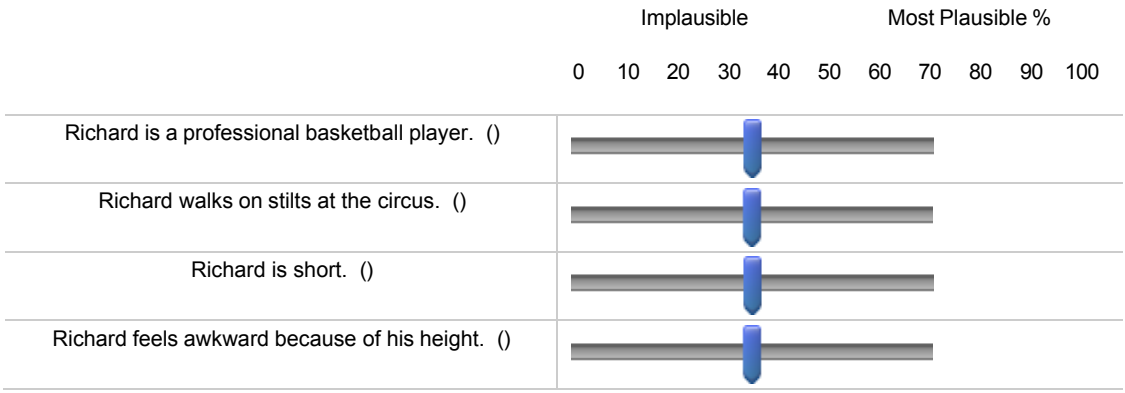
By using the adjustable bars below, please rate the percentage of likelihood of the four different interpretations of the scenario below.

Remember, 0 = completely implausible, and 100 = completely plausible.

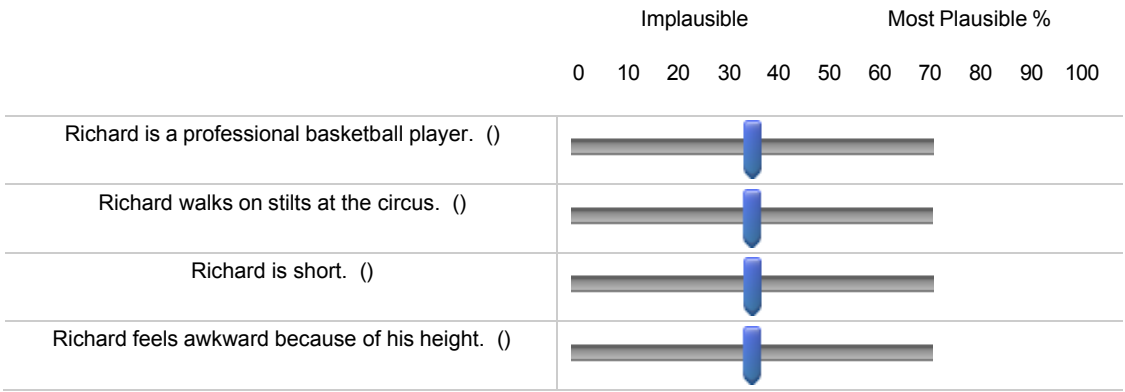
Richard is very tall.



Page Break

Richard is very tall.

Richard is mainly interested in sports.

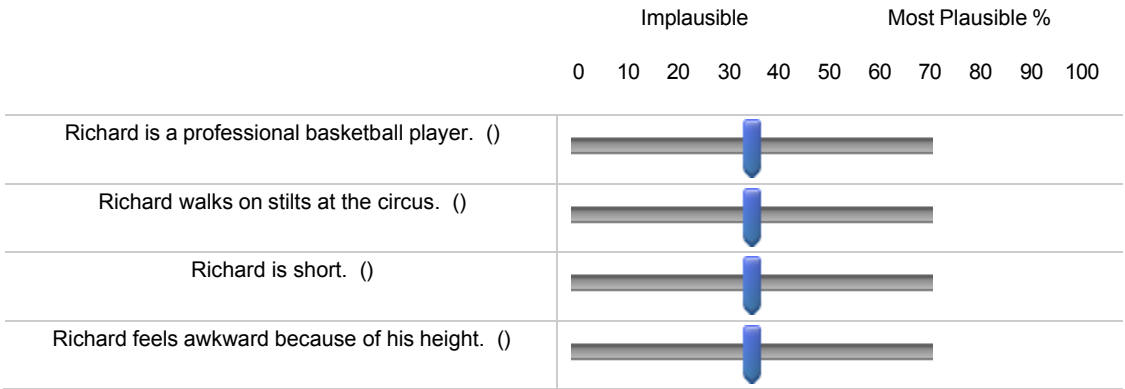


Page Break

Richard is very tall.

Richard is mainly interested in sports.

Richard has recently signed a contract to join a team.



Page Break

Individual Differences in interpreting Real World Events

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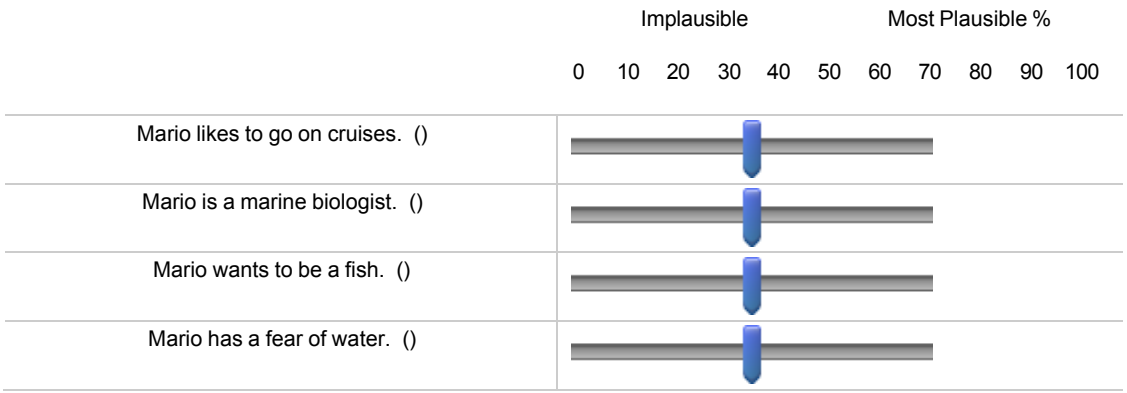
Mario is concerned about the water.



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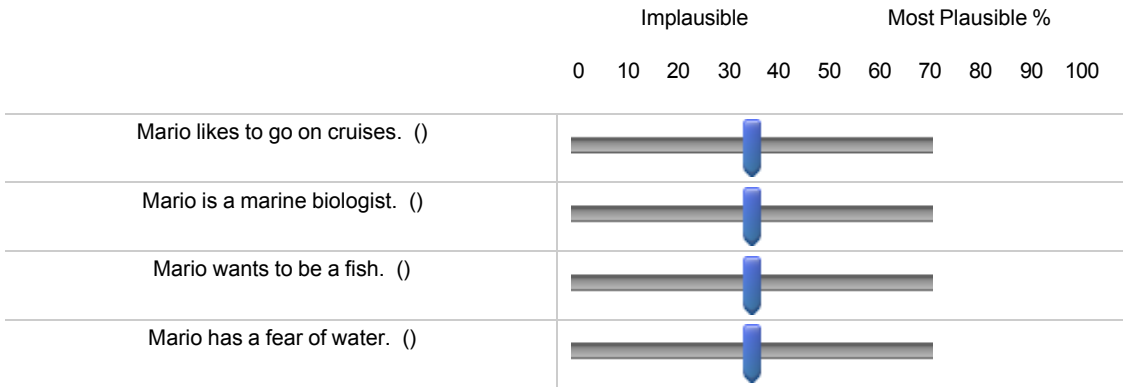
Mario is concerned about the water.

Mario has experienced rough seas before.

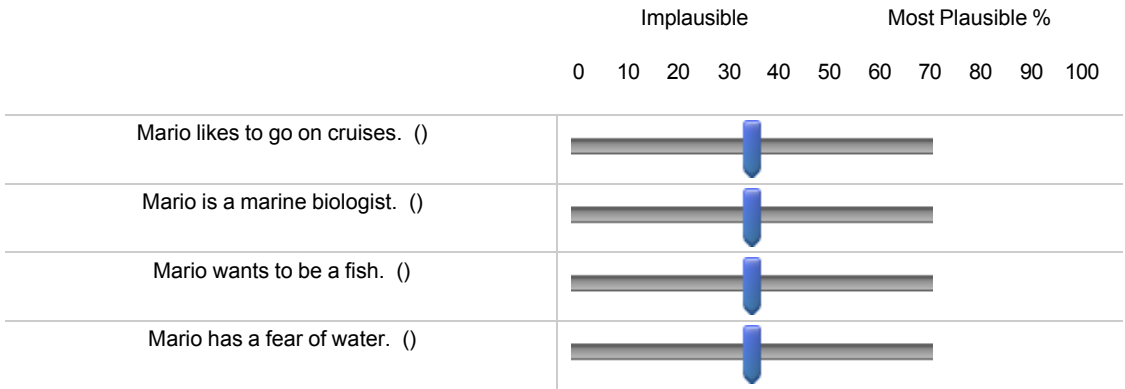


Page Break

Mario is concerned about the water.

Mario has experienced rough seas before.

Mario always enjoys the food and activities.



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Individual Differences in interpreting Real World Events

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By using the adjustable bars below, please rate the percentage of likelihood of the four different interpretations of the scenario below.

Remember, 0 = completely implausible, and 100 = completely plausible.

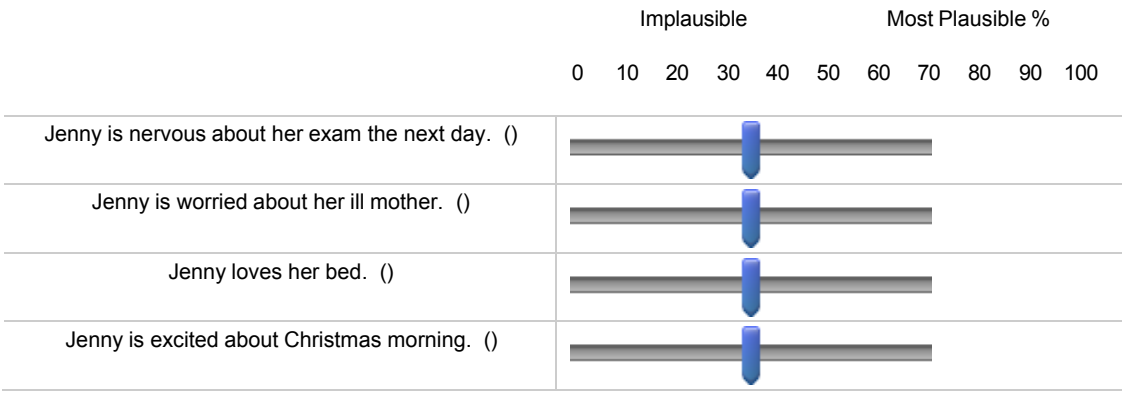
Jenny can't fall asleep.

	Implausible 0 10 20 30 40 50 60 70 80 90 100 Most Plausible %
Jenny is nervous about her exam the next day. ()	
Jenny is worried about her ill mother. ()	
Jenny loves her bed. ()	
Jenny is excited about Christmas morning. ()	

Page Break

Jenny can’t fall asleep.

Jenny can't wait until it is finally morning.

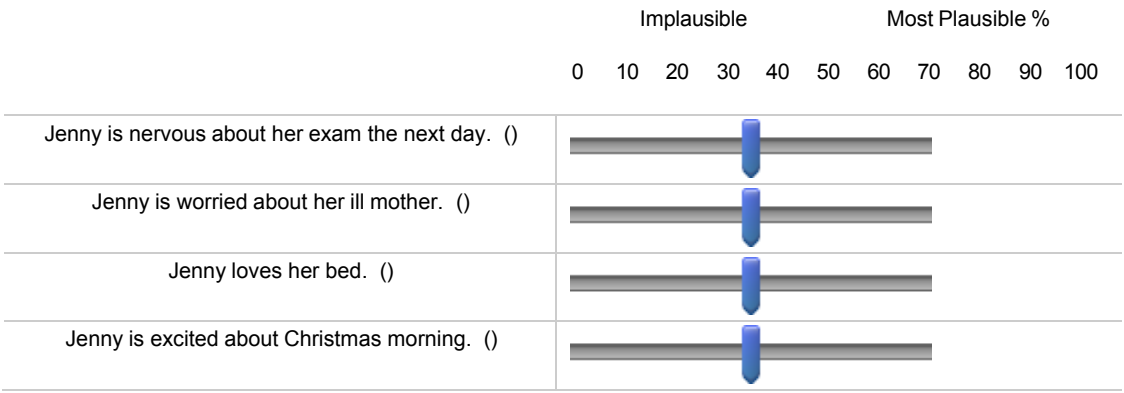


Page Break

Jenny can’t fall asleep.

Jenny can't wait until it is finally morning.

Jenny wonders how many presents she will find under the tree.



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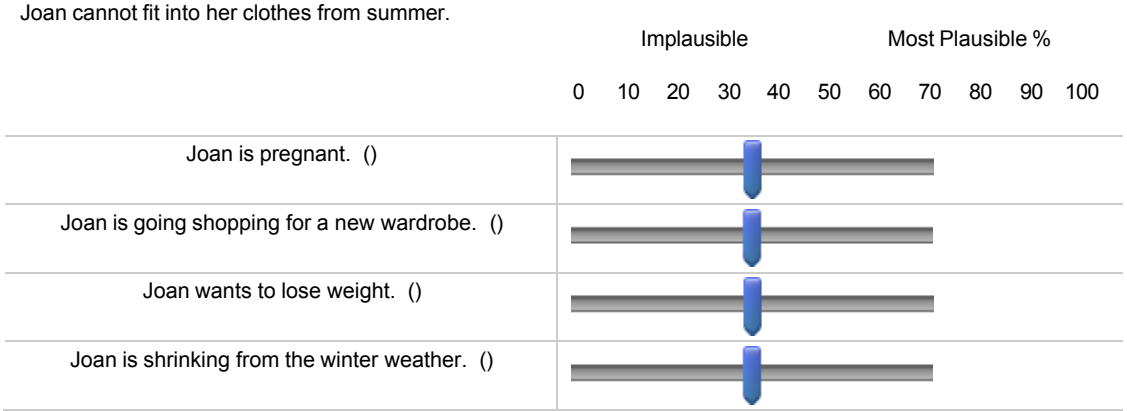
Remember, 0 = completely implausible, and 100 = completely plausible.

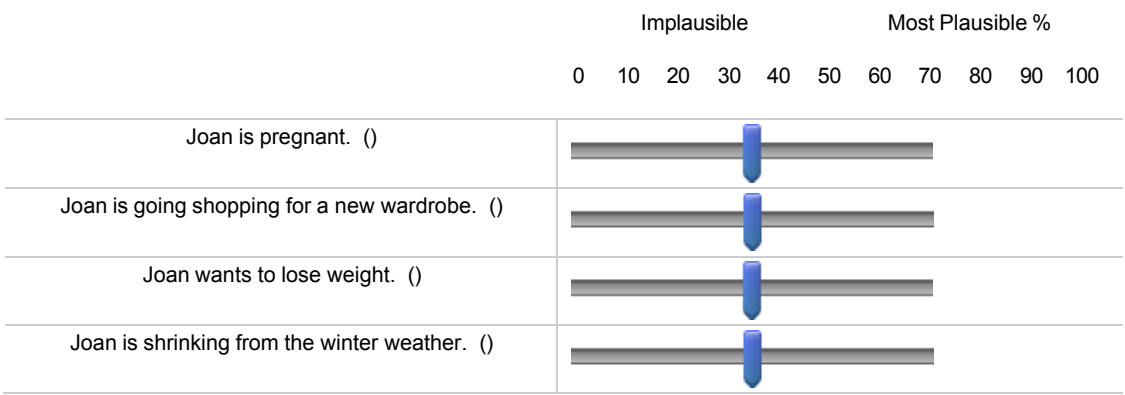
Joan cannot fit into her clothes from summer.



Page Break

Joan cannot fit into her clothes from summer.

Joan's family wants to help her.

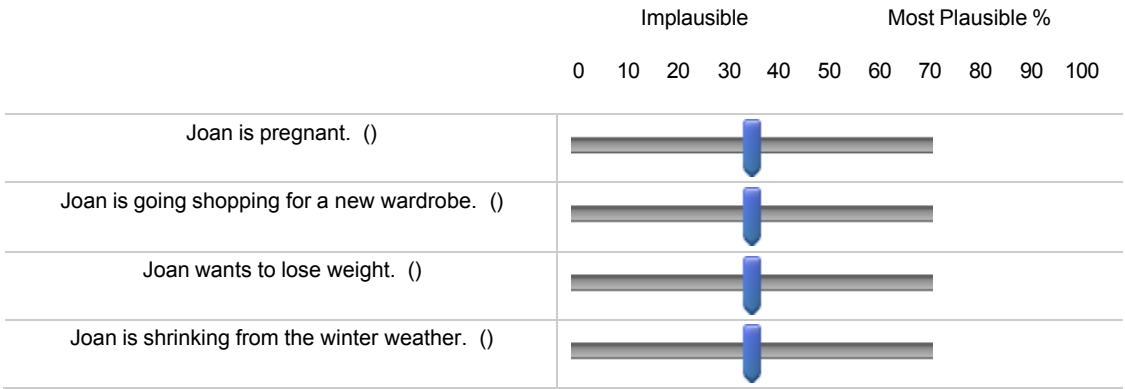


Page Break

Joan cannot fit into her clothes from summer.

Joan's family wants to help her.

Joan is very excited to see her new baby.



Individual Differences in Interpreting Real World-Events

In this section, we would like you to honestly answer the following questions. All questions must be answered in order to move to the next stage.

Do you ever find yourself researching a specific topic for an extended period of time? (e.g. several hours)

- ○ Never (1)
- ○ Rarely (2)
- ○ Sometimes (3)
- ○ Quite Often (4)
- ○ Always (5)

Do you ever find yourself researching multiple topics, because you feel they are somehow connected?

- ○ Never (1)
- ○ Rarely (2)
- ○ Sometimes (3)
- ○ Quite Often (4)
- ○ Always (5)

Do you ever find yourself trying to find as much evidence as possible to back up your beliefs on a specific topic?

- ○ Never (2)
- ○ Rarely (3)
- ○ Sometimes (4)
- ○ Quite Often (5)
- ○ Always (6)

Do you ever research a specific topic as much as possible, because you feel that the mainstream view on the topic is wrong?

- ○ Never (1)
- ○ Rarely (2)
- ○ Sometimes (3)
- ○ Quite Often (4)
- ○ Always (5)

How often do you actively seek out information about a specific topic you are interested in, on the following media platforms:

The options mean as follows:

Rarely = (Maybe Once a week)
Sometimes = (1-2 times a week)
Often = (3 - 5 times per week)
Very Often = (1 - 2 times per day)
Most of the time = (3 - 4 times per day)
Almost Continuously throughout the day.

	Never (1)	**Rarely** (2)	**Sometimes** (3)	**Often** (4)	**Very Often** (5)	**Most of the time** (6)	**Almost Continuously throughout the day** (7)
TV News Programming (1)	○	○	○	○	○	○	○
Social Media (E.g. Facebook, Twitter) (2)	○	○	○	○	○	○	○
Scientific-Based News Websites (E.g. ScienceDaily, Are Technica, New Scientist, Popular Science, Live Science) (3)	○	○	○	○	○	○	○
Internet forums (E.g. Reddit, Quora, 4Chan) (4)	○	○	○	○	○	○	○
Internet News Sites (E.g. The Guardian, Huffington Post, Google News, Yahoo! News) (5)	○	○	○	○	○	○	○
Other Internet Information Websites (6)	○	○	○	○	○	○	○

To what extent do you agree with the following statements about yourself:

	Definitely Disagree (1)	**Slightly Disagree** (2)	**Slightly Agree** (3)	**Definitely Agree** (4)
I often notice small sounds when others do not. (1)	○	○	○	○
I usually concentrate more on the whole picture, rather than the small details. (2)	○	○	○	○
I find it easy to do more than one thing at once. (3)	○	○	○	○
If there is an interruption, I can switch back to what I was doing very quickly. (4)	○	○	○	○
I find it easy to 'read between the lines' when someone is talking to me. (5)	○	○	○	○
I know how to tell if someone is listening to me is getting bored. (6)	○	○	○	○
When I'm reading a story I find it difficult to work out the characters' intentions. (7)	○	○	○	○
I like to collect information about categories of things (e.g. types of car, types of bird, types of train, types of plant, etc.) (8)	○	○	○	○
I find it easy to work out what someone is tihnking or feeling just by looking at their face. (9)	○	○	○	○
I find it difficult to work out people's intentions. (10)	○	○	○	○

Page Break

Please rate your agreement or disagreement with each statement below regarding yourself, on a scale of 1 to 7 (1 = Completely Disagree, all the way to 7 = Completely Agree):

	Completely Disagree (1)	Mostly Disagree (2)	Somewhat Disagree (3)	Neutral (4)	Somewhat Agree (5)	Mostly Agree (6)	Completely Agree (7)
Allowing oneself to be convinced by an opposing argument is a sign of good character. (1)	○	○	○	○	○	○	○
People should take into consideration evidence that goes against their beliefs. (2)	○	○	○	○	○	○	○
People should revise their beliefs in response to new information or evidence(3)	○	○	○	○	○	○	○
Changing your mind is a sign of weakness.(4)	○	○	○	○	○	○	○
Intuition is the best guide in making decisions. (5)	○	○	○	○	○	○	○
It is important to persevere in your beliefs even when evidence is brought to bear against them. (6)	○	○	○	○	○	○	○
One should disregard evidence that conflicts with one's established beliefs. (7)	○	○	○	○	○	○	○

To what extent do you agree with the following statements about yourself:

	Strongly Disagree (1)	Disagree (2)	Neither Disagree or Agree (3)	Agree (4)	Strongly Agree (5)
I enjoy problems that require hard thinking. (1)	○	○	○	○	○
I am not very good in solving problems that require careful logic analysis.(2)	○	○	○	○	○
I enjoy intellectual challenges. (3)	○	○	○	○	○
I prefer complex to simple problems. (4)	○	○	○	○	○
I don't like to have to do a lot of thinking (5)	○	○	○	○	○
Reasoning things out carefully is not of my strong points. (6)	○	○	○	○	○
I am not a very analytical thinker. (7)	○	○	○	○	○
I try to avoid situations that require thinking in depth about something. (8)	○	○	○	○	○
I am much better at figuring things out logically than most people. (9)	○	○	○	○	○
I have a logical mind. (10)	○	○	○	○	○
Using logic usually works well for me in figuring out problems in my life. (11)	○	○	○	○	○
Knowing the answer without understanding the reasoning behind it is good enough for me.	○	○	○	○	○

Individual Differences in interpreting Real World Events

In this section, we would like you to honestly answer the following questions. All questions must be answered in order to move to the next stage.

To what extent do you agree with the following statements in regards to yourself:

	Completely Disagree (1)	**Somewhat Disagree** (2)	**Neither Agree or Disagree** (3)	**Somewhat Agree** (4)	**Completely Agree** (5)
Throughout my life I have noticed that I rarely feel strong positive or negative emotions. (1)	○	○	○	○	○
I have sometimes felt that strangers were reading my mind. (2)	○	○	○	○	○
My thoughts and behaviours are almost always disorganized. (3)	○	○	○	○	○
In general, it is important for me to have close relationships with other people. (4)	○	○	○	○	○
I often think that I hear people talking only to discover that there was no one there. (5)	○	○	○	○	○
Most of the time I find it is very difficult to get my thoughts in order. (6)	○	○	○	○	○
I have always preferred to be disconnected from the world. (7)	○	○	○	○	○
I have felt that there were messages for me in the way things were arranged, like furniture in a room. (8)	○	○	○	○	○
I often have difficulty following what	○	○	○	○	○

someone is saying to me. (42)					
If given the choice, I would much rather be with another person than alone. (10)	○	○	○	○	○
I believe that dreams have magical properties. (11)	○	○	○	○	○
I often feel so mixed up that I have difficulty functioning. (12)	○	○	○	○	○
Throughout my life, very few things have been exciting or interesting to me. (13)	○	○	○	○	○
I sometimes wonder if there is a small group of people who can control everyone else's behaviour. (14)	○	○	○	○	○
My thoughts are so hazy and unclear that I wish that I could just reach up and put them into place. (43)	○	○	○	○	○
Having close friends is not as important as people say. (44)	○	○	○	○	○
have had the momentary feeling that someone's place has been taken by a look-alike. (17)	○	○	○	○	○
My thoughts and behaviours feel random and unfocused. (45)	○	○	○	○	○
Generally, I do not have many thoughts or emotions. (19)	○	○	○	○	○

There are times when it feels like someone is touching me when no one is actually there. (20)	○	○	○	○	○
No matter how hard I try, I can't organize my thoughts. (21)	○	○	○	○	○
Throughout my life, I have had little interest in dating or being in a romantic relationship. (22)	○	○	○	○	○
I have had experiences with seeing the future, ESP or a sixth sense. (23)	○	○	○	○	○
I find that I am very often confused about what is going on around me. (24)	○	○	○	○	○
Most of the time I feel a desire to be connected with other people. (25)	○	○	○	○	○
I often worry that other people are out to get me. (26)	○	○	○	○	○
People find my conversations to be confusing or hard to follow. (27)	○	○	○	○	○
There are just not many things that I have ever really enjoyed doing. (28)	○	○	○	○	○
Some people can make me aware of them just by thinking about me. (29)	○	○	○	○	○
My thoughts are almost always hard to follow. (30)	○	○	○	○	○

I generally am not interested in being emotionally close with others. (31)	○	○	○	○	○
I believe that there are secret signs in the world if you just know how to look for them. (32)	○	○	○	○	○
I often have difficulty organizing what I am supposed to be doing. (46)	○	○	○	○	○
My emotions have almost always seemed flat regardless of what is going on around me. (34)	○	○	○	○	○
I often worry that someone or something is controlling my behaviour. (35)	○	○	○	○	○
I have trouble following conversations with others. (36)	○	○	○	○	○
Spending time with close friends and family is important to me. (37)	○	○	○	○	○
At times I have wondered if my body is really my own. (38)	○	○	○	○	○

To what extent do you agree that the following statements are true?

Note: For example, if you were to believe parts of the statement to be true but not entirely - that could be 'somewhat agree'.
To state that you 'neither agree or disagree' is because you see an even amount of information presented for it to be both true or false (50/50), not because you have not considered or thought about the statement previously.

If you are unsure about a statement, please select what your 'gut feeling' or intuitive response is.

	Strongly Disagree (1)	Disagree (2)	Somewhat Disagree (3)	Neither Agree or Disagree (4)	Somewhat Agree (5)	Agree (6)	Strongly Agree (7)
The COVID-19 virus was accidently released from a Chinese military lab. (1)	○	○	○	○	○	○	○
The COVID-19 virus was a secret biological weapon. (2)	○	○	○	○	○	○	○
A vaccine for COVID-19 has existed for some time, but it is being withheld. (3)	○	○	○	○	○	○	○
COVID-19 has been exaggerated to facilitate significant changes in the world's social order. (4)	○	○	○	○	○	○	○
The COVID-19 outbreak was caused by people eating bats. (5)	○	○	○	○	○	○	○
COVID-19 was patented for a vaccine in 2015, but then infected people instead. (6)	○	○	○	○	○	○	○
COVID-19 has been known about by big pharmaceutical companies and Bill Gates for at least 2 years. (7)	○	○	○	○	○	○	○
There was a mass burning of bodies in	○	○	○	○	○	○	○

Wuhan during the crisis. (8)							
Millions died in China, but it is being covered up. (9)	○	○	○	○	○	○	○

To what extent do you agree that the following statements are true?

Note:

For example, if you were to believe parts of the statement to be true but not entirely - that could be 'somewhat true'.
To state that you 'neither true or false' is because you see an even amount of information presented for it to be both true or false (50/50), not because you have not considered or thought about the statement previously.

If you are unsure about a statement, please select what your 'gut feeling' or intuitive response is.

	Definitely not true (1)	**Somewhat not true** (2)	**Neither True or False** (3)	**Somewhat True** (4)	**Definitely True** (5)
The government is involved in the murder of innocent citizens and/or well-known public figures and keeps this a secret. (1)	○	○	○	○	○
The government permits or perpetrates acts of terrorism on its own soil, disguising its involvement. (2)	○	○	○	○	○
The Government uses people as patsies to hide its involvement in criminal activities. (3)	○	○	○	○	○
The power held by heads of state is second to that of small, unknown groups who really control world politics. (4)	○	○	○	○	○
A small secret groups of people is responsible for making all major world decisions, such as going to war. (5)	○	○	○	○	○
Certain significant events have been the result of the activity of a small group who secretly manipulate world events. (6)	○	○	○	○	○

Secret organisations communicate with extra-terrestrials but keep this fact from the public. (7)	○	○	○	○	○
Evidence of alien contact is being kept from the public. (8)	○	○	○	○	○
Some UFO sightings and rumours are planned or staged in order to distract the public from real alien contact. (9)	○	○	○	○	○
The spread of certain viruses and/or diseases is the result of deliberate, concealed efforts of some organisations. (10)	○	○	○	○	○
Technology with mind-control capacities is used on people without their knowledge. (11)	○	○	○	○	○
Experiments involving new drugs or technologies are routinely carried out on the public without their knowledge or consent. (12)	○	○	○	○	○
Groups of scientists manipulate, fabricate, or suppress evidence in order to deceive the public. (13)	○	○	○	○	○
New and advanced technology which would harm current industry is being suppressed. (14)	○	○	○	○	○

A lot of important information is deliberately concealed from the public out of self-interest. (15)	○	○	○	○	○

Thank you for completing the survey!

The team would like to just thank you for helping with our research project under what are some extraordinary circumstances.

If you would like to know further about the research once it has completed, please leave an email address in the below text box.

Also, if you'd like to leave anything of note or suggestions to the researchers, please also provide some feedback in the text box below!

Kind Regards,

The University of Adelaide Research Team

Once again, **Please enter your Prolific ID in the text box below:**

_____

Any feedback or comments please leave them here!

_____

Appendix D – Survey Items and Scoring used in Chapter Five and Chapter Six

INFORMATION SEEKING BEHAVIOUR ITEMS (Georgiou, Delfabbro & Balzan, 2020)

Each question was measured on a scale from 1 (Never) to 5 (Always), with users scoring 4 or 5 across all items considered to indicate a highly focused interest in a topic.

Do you ever find yourself researching a specific topic for an extended period of time? (E.g. several hours)

Do you ever find yourself researching multiple topics, because you feel they are somehow connected?

Do you ever find yourself trying to find as much evidence as possible to back up your beliefs on a specific topic?

Do you ever research a specific topic as much as possible, because you feel that the mainstream view on the topic is wrong?

Rational and Experiential Multimodal Inventory (REIm)

The REIM contains 12 items that measure an analytic thinking style (a tendency to solve problems through understanding of logical principles and the evaluation of evidence, and 30 items that measure an experiential thinking style. The latter consists of three 10-item subscales, which are Intuition (tendency to solve problems intuitively, Emotionality (a preference for intense and frequent strong affect) and finally Imagination (A tendency to engage in, and appreciate, imagination). All items are rated on a 5-point scale (1 = Strongly disagree, 5 = Strongly Agree).

Rational Scale (12 Items)

1) I enjoy problems that require hard thinking.
2) I am not very good in solving problems that require careful logic analysis. **(Reversed)**
3) I enjoy intellectual challenges.
4) I prefer complex to simple problems.
5) I don't like to have to do a lot of thinking. **(Reversed)**
6) Reasoning things out carefully is not of my strong points. **(Reversed)**
7) I am not a very analytical thinker. **(Reversed)**
8) I try to avoid situations that require thinking in depth about something. **(Reversed)**
9) I am much better at figuring things out logically than most people.
10) I have a logical mind.
11) Using Logic usually works well for me in figuring out problems in my life.
12) Knowing the answer without understanding the reasoning behind it is good enough for me. **(Reversed)**

Actively Open Minded Scale (Haran, Ritov & Mellers, 2013)

Please rate your agreement or disagreement with each statement on a 1 to 7 scale, where 1 = Completely Disagree, 4 = Neutral, and 7 = Completely Agree. (LAST 4 should be reverse coded).

1. Allowing oneself to be convinced by an opposing argument is a sign of good character.
2. People should take into consideration evidence that goes against their beliefs.
3. People should revise their beliefs in response to new information or evidence.
4. Changing your mind is a sign of weakness.
5. Intuition is the best guide in making decisions.
6. It is important to persevere in your beliefs even when evidence is brought to bear against them.
7. One should disregard evidence that conflicts with one's established beliefs.

SPECIFIC INFORMATION-SEEKING

Participants were asked how often they gather information online about a specific topic of their interest, and to what sources they use to do so. This was in order to gauge the consistency and intensity of their behaviour regarding a specific interest.

The options mean as follows:
Rarely = (Maybe Once a week)
Sometimes = (1-2 times a week)
Often = (3 - 5 times per week)
Very Often = (1 - 2 times per day)
Most of the time = (3 - 4 times per day)
Almost Continuously throughout the day.
Items: A list of different outlets (e.g. TV News, Social Media, Internet Forums etc.).

The Actively Open Minded Scale (Stanovich & West, 2007) – 10-item short form

All questions. Answers on 5-point scale from "Completely disagree" to "Completely agree". Items 3, 5, 7, and 8 are reversed. This is the current recommended version (Nov. 2018). It is more reliable and valid than previous versions.

- Willingness to be convinced by opposing arguments is a sign of good character.
- People should take into consideration evidence that goes against conclusions they favour.
- **Being undecided or unsure is the result of muddled thinking. (3)**
- People should revise their conclusions in response to relevant new information.
- **Changing your mind is a sign of weakness. (5)**
- People should search actively for reasons why they might be wrong.
- **It is OK to ignore evidence against your established beliefs. (7)**
- **It is important to be loyal to your beliefs even when evidence is brought to bear against them. (8)**
- There is nothing wrong with being undecided about many issues.
- When faced with a puzzling question, we should try to consider more than one possible answer before reaching a conclusion.

AUTISM SPECTRUM QUOTIENT – SHORT FORM (AQ-10)

SCORING: Only 1 point can be scored for each question. Score 1 point for definitely or slightly agree on each of items 1, 7, 8, and 10. Score 1 point for definitely or slightly disagree on each of items 2, 3, 4, 5, 6, and 9. If the individual

	Please tick one option per question only:	**Definitely Agree**	**Slightly Agree**	**Slightly Disagree**	**Definitely Disagree**
1	I often notice small sounds when others do not				
2	I usually concentrate more on the whole picture, rather than the small details				
3	I find it easy to do more than one thing at once				
4	If there is an interruption, I can switch back to what I was doing very quickly				
5	I find it easy to 'read between the lines' when someone is talking to me				
6	I know how to tell if someone listening to me is getting bored				
7	When I'm reading a story I find it difficult to work out the characters' intentions				
8	I like to collect information about categories of things (e.g. types of car, types of bird, types of train, types of plant etc.)				
9	I find it easy to work out what someone is thinking or feeling just by looking at their face				
10	I find it difficult to work out people's intentions				

MULTIDIMENSIONAL SCHIZOTYPY SCALE - BREIF (MSS – B)

The following items inquire about a broad range of attitudes, experiences, and beliefs that people have. Please answer each item in the way that best describes you. Please note that there are no right or wrong

1	**N01**	Throughout my life I have noticed that I rarely feel strong positive or negative emotions.
2	**P01**	I have sometimes felt that strangers were reading my mind.
3	**D01**	My thoughts and behaviours are almost always disorganized.
4	**N02**	In general, it is important for me to have close relationships with other people.
5	**P02**	I often think that I hear people talking only to discover that there was no one there.
6	**D02**	Most of the time I find it is very difficult to get my thoughts in order.
7	**N03**	I have always preferred to be disconnected from the world.
8	**P03**	I have felt that there were messages for me in the way things were arranged like furniture in a room.
9	**D03**	I often have difficulty following what someone is saying to me.
10	**N04**	If given the choice, I would much rather be with another person than alone.
11	**P04**	I believe that dreams have magical properties.
12	**D04**	I often feel so mixed up that I have difficulty functioning.
13	**N05**	Throughout my life, very few things have been exciting or interesting to me.
14	**P05**	I sometimes wonder if there is a small group of people who can control everyone else's behavior.
15	**D05**	My thoughts are so hazy and unclear that I wish that I could just reach up and put them into place.
16	**N06**	Having close friends is not as important as people say.
17	**P06**	I have had the momentary feeling that someone's place has been taken by a look-alike.
18	**D06**	My thoughts and behaviours feel random and unfocused.
19	**N07**	Generally I do not have many thoughts or emotions.
20	**P07**	There are times when it feels like someone is touching me when no one is actually there.
21	**D07**	No matter how hard I try, I can't organize my thoughts.
22	**N08**	Throughout my life, I have had little interest in dating or being in a romantic relationship.
23	**P08**	I have had experiences with seeing the future, ESP or a sixth sense.
24	**D08**	I find that I am very often confused about what is going on around me.
25	**N09**	Most of the time I feel a desire to be connected with other people.
26	**P09**	I often worry that other people are out to get me.
27	**D09**	People find my conversations to be confusing or hard to follow.
28	**N10**	There are just not many things that I have ever really enjoyed doing.
29	**P10**	Some people can make me aware of them just by thinking about me.
30	**D10**	My thoughts are almost always hard to follow.
31	**N11**	I generally am not interested in being emotionally close with others.
32	**P11**	I believe that there are secret signs in the world if you just know how to look for them.

GENERIC CONSPIRACIST BELIEFS SCALE

Items were rated on a 5-point scale, ranging from 1 *(Definitely not true)* to 5 *(Definitely true)*. Higher scores on this measure reflect greater generic conspiracist ideation.

1. The government is involved in the murder of innocent citizens and/or well-known public figures and keeps this a secret.

2. The government permits or perpetrates acts of terrorism on its own soil, disguising its involvement.

3. The Government uses people as patsies to hide its involvement in criminal activities.

4. The power held by heads of state is second to that of small, unknown groups who really control world politics.

5. A small secret groups of people is responsible for making all major world decisions, such as going to war.

6. Certain significant events have been the result of the activity of a small group who secretly manipulate world events.

7. Secret organisations communicate with extra-terrestrials but keep this fact from the public.

8. Evidence of alien contact is being kept from the public.

9. Some UFO sightings and rumours are planned or staged in order to distract the public from real alien contact.

10. The spread of certain viruses and/or diseases is the result of deliberate, concealed efforts of some organisations.

11. Technology with mind-control capacities is used on people without their knowledge.

12. Experiments involving new drugs or technologies are routinely carried out on the public without their knowledge or consent.

13. Groups of scientists manipulate, fabricate, or suppress evidence in order to deceive the public.

14. New and advanced technology which would harm current industry is being suppressed.

15. A lot of important information is deliberately concealed from the public out of self-interest.

COVID-19 CONSPIRACY SCALE (GEORGIOU, DELFABBRO & BALZAN, 2020)

1. The COVID-19 virus was accidently released from a Chinese military lab

2. The COVID-19 virus was a secret biological weapon

3. A vaccine for COVID-19 has existed for some time, but it is being withheld

4. COVID-19 has been exaggerated to facilitate significant changes in the world's social order

5. The COVID-19 outbreak was caused by people eating bats.

6. COVID-19 was patented for a vaccine in 2015, but then infected people instead.

7. COVID-19 has been known about by big pharmaceutical companies and Bill Gates for at least 2 years.

8. There was a mass burning of bodies in Wuhan during the crisis.

9. Millions died in China, but it is being covered up.

The BADE 16-item set (Woodward et al., 2007)

Figure K1. **Practice Items**

Practice 1	
Danielle is very unreliable.	Danielle often forgets her homework. NL
Danielle does not like criticism.	Danielle is a poor mother. EL
Danielle was rude to her boss.	Danielle is not a very good cook. A
	Danielle has been fired from her job. T
Practice 2	
Cindy is dancing.	Cindy is at a party. NL
Cindy is wearing a small dress.	Cindy is high on drugs at a rave. EL
The men clap and whistle when Cindy dances.	Cindy is a member of a famous pop group. A
	Cindy is a stripper. T

Trial 1	
Natasha doesn't know that she's talking to her mother.	Natasha is at a Halloween costume party. NL
Natasha is confused and disoriented.	Natasha was adopted at birth. EL
Natasha did not wear her helmet when she went biking.	Natasha is very shy. A
	Natasha has lost her memory after being hit by a car. T
Trial 2	
Andrea has made some new friends.	Andrea has just started going to university. NL
Andrea's new friends control every single aspect of her life.	Andrea is a kind and caring person. EL
Andrea has very suddenly cut off all contact with her family.	Andrea loves to be photographed. A
	Andrea has joined a cult. T
Trial 3	
Nicholas is driving his car very fast.	Nicholas is running late for work. NL
Nicholas did not stop at the red light.	Nicholas' wife is in labour. EL
Nicholas injured a little girl with his car.	Nicholas hates going for walks. A
	Nicholas is a hit and run offender. T
Trial 4	
Tom and Mike are screaming.	Tom and Mike are at a basketball game. NL
Tom and Mike feel nauseous.	Tom and Mike have found a dead body in the alley. EL
Tom and Mike ate too much cotton candy today.	Tom and Mike enjoy being in the spotlight. A
	Tom and Mike are having fun on a roller-coaster. T
Trial 5	
Jenny can't fall asleep.	Jenny is nervous about her exam the next day. NL
Jenny can't wait until it is finally morning.	Jenny is worried about her ill mother. EL
Jenny wonders how many presents she will find under the tree.	Jenny loves her bed. A
	Jenny is excited about Christmas morning. T
Trial 6	
The man is an experienced public speaker.	The man is a politician. NL
The same people come to hear the man speak every week.	The man is a gay-rights activist. EL
The man wears long robes.	The man is shy. A
	The man is a priest. T
Trial 7	
Richard sometimes wears make-up.	Richard is a drag queen. NL
Richard spends most of his time in the theatre.	Richard is self conscious about his scars. EL
Richard went to acting school.	Richard wishes he had a wife. A
	Richard is an actor. T

Trial 8	
Stella answers the phone at work.	Stella is a secretary. NL
Stella is a powerful woman.	Stella is a 911 phone call operator. EL
Stella went to law school.	Stella is a baby-sitter. A
	Stella is a lawyer. T
Trial 9	
Ted is surprised.	Ted needs to be cared for. T
Ted's suitcase is packed.	Ted's wife is taking him on a holiday. NL
Ted is very ill and cannot live at home anymore.	Ted is being evicted for having too many parties. EL
	Ted is fast asleep. A
Trial 10	
Dan is very lucky.	Dan got married. T
Dan has always wanted this to happen.	Dan got tickets to see his favourite band. NL
Dan will always remember the day he proposed to her.	Dan just won the lottery. EL
	Dan slipped and fell on his banana peel. A
Trial 11	
Fred got a very high grade on his exam.	Fred is very dishonest. T
He doesn't usually do well in school.	Fred is a hard working student. NL
The teacher caught him copying from another student.	Fred is really intelligent. EL
	Fred is a frog. A
Trial 12	
Amy encourages the children to exercise.	Amy is a dog. T
Amy is very protective of the children.	Amy is a gym teacher. NL
At home, Amy barks loudly whenever the doorbell rings.	Amy is a very active mother. EL
	Amy is not a very caring person. A
Trial 13 - FILLER	
Stan is on his knees.	Stan is praying. NL
Stan is crying.	Stan is about to propose to his fiancee. EL
Stan's wife has packed her bags.	Stan wishes he was a magic dwarf. A
	Stan can't find his purse. F
Trial 14 - FILLER	
Joan cannot fit into her clothes from summer.	Joan is pregnant. T
Joan's family wants to help her.	Joan is going shopping for a new wardrobe. NL
Joan is very excited to see her new baby.	Joan wants to lose weight. EL
	Joan is shrinking from the winter weather. A
Trial 15 - FILLER	
Alice is anxious to get on the bus.	Alice is running away from home. T
Alice had no time to pack.	Alice is going on a vacation. NL
Alice is very afraid of her cruel step-father.	Alice is going away to college. EL
	Alice likes to wave at people. A
Trial 16 - FILLER	
Gord has reached the peak.	Gord is a mountain climber. T
He will record this date in his journal.	Gord has a best-selling novel. NL
Gord is physically exhausted and needs to return to the base.	Gord has a bad temper. EL
	Gord is an ice-cream on a long stick. A

The Scientific Reasoning Scale

APPENDIX A: SCIENTIFIC REASONING SCALE ITEMS AND ITEM DIFFICULTIES

Concept	Test item	Correct answer	Study 2 % correct	Study 3 % correct
Blind/double blind	In a taste test, a researcher puts Brand A coffee in a cup with white tape on it and Brand B coffee in an identical cup with black tape on it. A lab assistant gives tasters one of the cups, while the researcher watches their facial expressions. True or False? The lab assistant should not watch the cups being filled.	True	53	61
Causality	A researcher finds that American states with larger parks have fewer endangered species. True or False? These data show that increasing the size of American state parks will reduce the number of endangered species.	False	54	58
Confounding variables	A researcher has subjects put together a jigsaw puzzle either in a cold room with a loud radio or in a warm room with no radio. Subjects solve the puzzle more quickly in the warm room with no radio. True or False? The scientist cannot tell if the radio caused subjects to solve the puzzle more slowly.	True	76	79
Construct validity	An education researcher wants to measure the general math ability of a sample of high-performing math students. All the students have taken classes in geometry and pre-calculus. True or False? The education researcher can measure general math ability by giving the students a geometry test.	False	56	61
Control group	Two scientists test an anti-acne cream on teenagers with acne. Scientist A wants to give the cream to all the teenagers in the study. Scientist B wants to give the cream to half the teenagers and give a cream without anti-acne ingredients to the other half. True or False? Both ways of testing the cream are equally good.	False	76	77
Ecological validity	A researcher has a group of subjects play a competitive game. Each subject's goal is to make money by buying and selling tokens. Subjects are paid a flat fee for participating in the experiment. True or False? The researcher can confidently state that the behavior in the experiment reflects real-life buying and selling behavior.	False	68	67
History	A randomly selected sample of Americans is surveyed about disease A before and after a 6-month media campaign about the disease. Mid-way through the media campaign, a famous celebrity dies of Disease A. The survey data indicate that knowledge of Disease A is higher after the campaign. True or False? The media campaign may not have increased knowledge of Disease A.	True	69	72
Maturation	Subjects in an experiment must press a button whenever a blue dot flashes on their computer screen. At first, the task is easy for subjects. But as they continue to perform the task, they make more and more errors. True or False? The blue dot must flash more quickly as the task progresses.	False	66	68
Random assignment to condition	Researchers want to see whether a health intervention helps school children to lose weight. School children are sorted into either an intervention or control group. True or False? The researchers should assign the overweight children to the intervention group.	False	64	65
Reliability	A researcher develops a new method for measuring the surface tension of liquids. This method is more consistent than the old method. True or False? The new method must also be more accurate than the old method.	False	49	51
Response bias	Two researchers are developing a survey to measure consumers' feelings about customer service. Researcher A wants customers to rate their agreement with the statement "I am satisfied with customer service" on a 5-point scale, where 1 = *strongly agree* and 5 = *strongly disagree*. Researcher B wants customers to rate customer service on a 5-point scale, where 1 = *not dissatisfied at all* and 5 = *highly dissatisfied*. True or False? These questions are equally good for measuring how consumers feel about customer service.	False	35	45

Appendix E: Survey Design for Chapter Seven

Individual Differences in interpreting Media and World Events

Brief Description of this study: This study is investigating people's beliefs about different world events and the news we receive everyday. Do events that occur in the world for the reasons that are commonly reported or are there other explanations?
Your role in the study: In the first part of this study, you will be asked to complete a series of online survey questions where you will be asked to provide answers reflective of your own beliefs. You will also then be asked to listen to a journalist's piece and review some of its content.For this you may need headphones to complete the tasks.

Participation in the study is entirely voluntary; there is no obligation to take part in the study and, if you choose not to participate, there will be no repercussions. You have the right to withdraw at any time.

Inclusion/Exclusion Criteria: Participants must be English-fluent to comprehend the survey items.

Risks of Participating: This study is unlikely to pose any risks to your health or wellbeing as a result of participating. However, you may feel some discomfort when asked to reflect upon unusual experiences or how others might view you.

Statement of Privacy: All data collected during the experiment will be treated in the strictest confidence and stored on password protected computers. The data will be used for this project, and any potential comparison study that may eventuate from this project. However, once the data is no longer required it will be destroyed. You will also have the opportunity to receive a summary of the research findings. Results will be aggregated for reporting purposes to preserve anonymity.

Consent: If you are willing to participate, please indicate this by clicking on the first screen of the experimental application, as instructed by the researcher and follow the prompts.

Contact Details for Questions: Should you have any complaints or concerns about the manner in which this project is conducted, please contact primarily the student investigator or lead investigator:

Lead Investigator Professor Paul Delfabbro Email: paul.delfabbro@adelaide.edu.au
Student Investigator Neophytos Georgiou Email: neophytos.georgiou@adelaide.edu.au For any questions about the ethical conduct of this research, please contact the Acting Chair of the Human Research Ethics Committee in the School of Psychology, University of Adelaide (Dr. Diana Dorstyn): Diana.Dorstyn@adelaide.edu.au.

Once you have read the information above, please confirm...

"I have read the above information and understand the terms of this study and wish to continue."

Note: if you click you 'do not' wish, you will be removed from the survey with no financial compensation.

- ○ Yes I have, I'd like to continue (1)
- ○ Yes, I **do not** wish to continue this study (2)

In order to give consent to all the of the following, please read and select the statements below:

- ☐ I have read the attached information sheet and agree to take part in the following project. (1)
- ☐ I have had the project, so far as it affects me, fully explained to my satisfaction within the brief description of the study. My consent is given freely. (2)
- ☐ Although I understand the purpose of the research project, I also understand the involvement may not be of any benefit to me. (3)
- ☐ I have been informed that, while information gained during the study may be published, I will not be identified, and my personal results will not be divulged. (4)
- ☐ I understand that I am free to withdraw from the project at any time. (5)
- ☐ I have read and understood the risks of participating within the current project. (6)

In accordance with the previous statements:

Both must be selected to continue.

- ☐ I have read the terms and conditions of this study and understood my rights and ethical considerations (1)
- ☐ I permit the researchers of this study to use my produced data for the purposes mentioned. (2)

Individual Differences in interpreting Media and World Events

In this section, we would like you to answer some general demographic questions about yourself, thank you.

Please enter your Prolific in the following text box: (Warning: If you do not enter the correct ID, there may be an issue in financial compensation)

_____

What is your age?

- ○ 18-24 (1)
- ○ 25-34 (2)
- ○ 35-44 (3)
- ○ 45-54 (4)
- ○ 55-64 (5)
- ○ 65+ (6)

What is your sex?

- ○ Male (1)
- ○ Female (2)
- ○ Other not stated above (4)

In which country do you currently reside?

▼ Afghanistan (1) ... Zimbabwe (1357)

What is the highest level of school you have completed or the highest degree you have received?

- ○ Less than high school degree (1)
- ○ High school graduate (high school diploma or equivalent including GED) (2)
- ○ Some college/university but no degree (3)
- ○ Associate degree in college/university (4)
- ○ Bachelor's degree in college/university (5)
- ○ Master's degree (6)
- ○ Doctoral degree (7)
- ○ Professional degree (JD, MD) (8)

Which statement best describes your current employment status as <u>of time of completing this survey</u>?

- ○ Working (paid employee) (1)
- ○ Working (self-employed) (2)
- ○ Not working (temporary layoff from a job) (3)
- ○ Not working (looking for work) (4)
- ○ Not working (retired) (5)
- ○ Not working (disabled) (6)
- ○ Not working (other) (7) _____

- ○ Prefer not to answer (8)

Have you previously received a formal diagnosis of a mental health disorder?

(e.g. By a doctor, psychologist)

- ○ No (1)
- ○ Yes (2)

If you answered YES to the previous question, please share what diagnosis, or multiple diagnoses you have received:

Note: If you feel uncomfortable to do so, please write 'prefer not to say'

_____

_____

_____

_____

Individual Differences in interpreting Media and World Events

In this section, we would like you to honestly answer the following questions. All questions must be answered in order to move to the next stage, thank you.

Important:
In the following task, you will be asked to read each scenario, and decide from the given information whether the correct answer is True or False. Each question is separate from any scenarios presented, and should be considered as isolated questions.
Please complete each question to the best of your ability.

Question 1

In a taste test, a researcher puts Brand A coffee in a cup with white tape on it and Brand B coffee in an identical cup with black tape on it. A lab assistant gives tasters one of the cups, while the researcher watches their facial expressions.

True or **False**? The lab assistant should not watch the cups being filled.

- ○ **True**
- ○ **False**
- ○ **Don't Know**

Question 2

A researcher finds that American states with larger parks have fewer endangered species.

True or **False**? This data shows that increasing the size of American state parks will reduce the number of endangered species.

- ○ **True**
- ○ **False**
- ○ **Don't Know**

Question 3

A researcher has subjects put together a jigsaw puzzle either in a cold room with a loud radio or in a warm room with no radio. Subjects solve the puzzle more quickly in the warm

room with no radio.

True or **False**? The scientist cannot tell if the radio caused subjects to solve the puzzle more slowly.

- ○ **True**
- ○ **False**
- ○ **Don't Know**

Question 4

A researcher that designed this study would like to verify that you are paying attention to the questions. They have requested you answer the following question false in order to prove this.

True or **False**? What was the answer requested by the researcher.

- ○ **True**
- ○ **False**
- ○ **Don't Know**

Question 5

An education researcher wants to measure the general math ability of a sample of high-performing math students. All the students have taken classes in geometry and pre-calculus.

True or **False**? The education researcher can measure general math ability by giving the students a geometry test.

- ○ **True**
- ○ **False**
- ○ **Don't Know**

Question 6

Two scientists test an anti-acne cream on teenagers with acne. Scientist A wants to give the cream to all the teenagers in the study. Scientist B wants to give the cream to half the teenagers and give a cream without anti-acne ingredients to the other half.

True or **False**? Both ways of testing the cream are equally good.

- ○ **True**
- ○ **False**
- ○ **Don't Know**

Question 7

A researcher has a group of subjects play a competitive game. Each subject's goal is to make money by buying and selling tokens. Subjects are paid a flat fee for participating in the experiment.

True or **False**? The researcher can confidently state that the behavior in the experiment reflects real-life buying and selling behavior

- ○ **True**
- ○ **False**
- ○ **Don't Know**

Question 8

A randomly selected sample of Americans is surveyed about disease A before and after a 6-month media campaign about the disease. Mid-way through the media campaign, a famous celebrity dies of Disease A. The survey data indicate that knowledge of Disease A is higher after the campaign.

True or **False**? The media campaign may not have increased knowledge of Disease A.

- ○ **True**
- ○ **False**
- ○ **Don't Know**

Question 9

Subjects in an experiment must press a button whenever a blue dot flashes on

their computer screen. At first, the task is easy for subjects. But as they continue to perform the task, they make more and more errors.

True or **False**? The blue dot must flash more quickly as the task progresses

- ○ **True**
- ○ **False**
- ○ **Don't Know**

Question 10

Researchers want to see whether a health intervention helps school children to lose weight. School children are sorted into either an intervention or control group.

True or **False**? The researchers should assign the overweight children to the intervention group.

- ○ **True**
- ○ **False**
- ○ **Don't Know**

Question 11

Subjects doing the survey right now are potentially getting tired of paying attention. The researcher would again like you to answer True in order to prove that you are taking this survey seriously.

True or **False**? What answer did the researcher request in the statement above?

- ○ **True**
- ○ **False**
- ○ **Don't Know**

Question 12

A researcher develops a new method for measuring the surface tension of liquids.This method is more consistent than the old method.

True or **False**? The new method must also be more accurate than the old method.

- ○ **True**
- ○ **False**
- ○ **Don't Know**

Question 13

Two researchers are developing a survey to measure consumers' feelings about customer service. Researcher A wants customers to rate their agreement with the statement "I am satisfied with customer service" on a 5-point scale, where 1 = *strongly agree* and 5 = *strongly disagree*. Researcher B wants customers to rate customer service on a 5-point scale, where 1 = *not dissatisfied at all* and 5 = *highly dissatisfied*.

True or **False**? These questions are equally good for measuring how consumers feel about customer service.

- ○ **True**
- ○ **False**
- ○ **Don't Know**

Individual Differences in interpreting Media and World Events

In this section, we would like you to honestly answer the following questions. All questions must be answered in order to move to the next stage.

To what extent do you agree with the following statements about yourself:

	Definitely Disagree (1)	**Slightly Disagree** (2)	**Slightly Agree** (3)	**Definitely Agree** (4)
I often notice small sounds when others do not. (1)	○	○	○	○
I usually concentrate more on the whole picture, rather than the small details. (2)	○	○	○	○
I find it easy to do more than one thing at once. (3)	○	○	○	○
If there is an interruption, I can switch back to what I was doing very quickly. (4)	○	○	○	○
I find it easy to 'read between the lines' when someone is talking to me. (5)	○	○	○	○
I know how to tell if someone is listening to me is getting bored. (6)	○	○	○	○
When I'm reading a story I find it difficult to work out the characters' intentions. (7)	○	○	○	○
I like to collect information about categories	○	○	○	○

of things (e.g. types of car, types of bird, types of train, types of plant, etc.) (8)				
I find it easy to work out what someone is tihnking or feeling just by looking at their face. (9)	○	○	○	○
I find it difficult to work out people's intentions. (10)	○	○	○	○

To what extent do you agree with the following statements <u>about yourself</u>:

	Strongly Disagree (1)	**Disagree** (2)	**Neither Disagree or Agree** (3)	**Agree** (4)	**Strongly Agree** (5)
I enjoy problems that require hard thinking. (1)	○	○	○	○	○
I am not very good in solving problems that require careful logic analysis. (2)	○	○	○	○	○
I enjoy intellectual challenges. (3)	○	○	○	○	○
I prefer complex to simple problems. (4)	○	○	○	○	○
I don't like to have to do a lot of thinking (5)	○	○	○	○	○
Reasoning things out carefully is not of my strong points. (6)	○	○	○	○	○
I am not a very analytical thinker. (7)	○	○	○	○	○
I try to avoid situations that require thinking in depth about something. (8)	○	○	○	○	○
I am much better at figuring things out logically than most	○	○	○	○	○

people. (9)					
I have a logical mind. (10)	○	○	○	○	○
Using logic usually works well for me in figuring out problems in my life. (11)	○	○	○	○	○
Knowing the answer without understanding the reasoning behind it is good enough for me. (12)	○	○	○	○	○

To what extent do you agree with the following statements in regards to yourself:

	Completely Disagree (1)	**Somewhat Disagree** (2)	**Neither Agree or Disagree** (3)	**Somewhat Agree** (4)	**Completely Agree** (5)
Throughout my life I have noticed that I rarely feel strong positive or negative emotions. (1)	○	○	○	○	○
I have sometimes felt that strangers were reading my mind. (2)	○	○	○	○	○
My thoughts and behaviours are almost always disorganized. (3)	○	○	○	○	○
In general, it is important for me to have close relationships with other people. (4)	○	○	○	○	○
I often think that I hear people talking only to discover that there was no one there. (5)	○	○	○	○	○
Most of the time I find it is very difficult to get my thoughts in order. (6)	○	○	○	○	○
I have always preferred to be disconnected from the	○	○	○	○	○

world. (7)					
I have felt that there were messages for me in the way things were arranged, like furniture in a room. (8)	○	○	○	○	○
I often have difficulty following what someone is saying to me. (42)	○	○	○	○	○
If given the choice, I would much rather be with another person than alone. (10)	○	○	○	○	○
I believe that dreams have magical properties. (11)	○	○	○	○	○
I often feel so mixed up that I have difficulty functioning. (12)	○	○	○	○	○
Throughout my life, very few things have been exciting or interesting to me. (13)	○	○	○	○	○
I sometimes wonder if there is a small group of people who can control everyone	○	○	○	○	○

else's behaviour. (14)					
My thoughts are so hazy and unclear that I wish that I could just reach up and put them into place. (43)	○	○	○	○	○
Having close friends is not as important as people say. (44)	○	○	○	○	○
have had the momentary feeling that someone's place has been taken by a look-alike. (17)	○	○	○	○	○
My thoughts and behaviours feel random and unfocused. (45)	○	○	○	○	○
Generally, I do not have many thoughts or emotions. (19)	○	○	○	○	○
There are times when it feels like someone is touching me when no one is actually there. (20)	○	○	○	○	○
No matter how hard I try, I can't organize my	○	○	○	○	○

thoughts. (21)					
Throughout my life, I have had little interest in dating or being in a romantic relationship. (22)	○	○	○	○	○
I have had experiences with seeing the future, ESP or a sixth sense. (23)	○	○	○	○	○
I find that I am very often confused about what is going on around me. (24)	○	○	○	○	○
Most of the time I feel a desire to be connected with other people. (25)	○	○	○	○	○
I often worry that other people are out to get me. (26)	○	○	○	○	○
People find my conversations to be confusing or hard to follow. (27)	○	○	○	○	○
There are just not many things that I have ever really enjoyed doing. (28)	○	○	○	○	○

Some people can make me aware of them just by thinking about me. (29)	○	○	○	○	○
My thoughts are almost always hard to follow. (30)	○	○	○	○	○
I generally am not interested in being emotionally close with others. (31)	○	○	○	○	○
I believe that there are secret signs in the world if you just know how to look for them. (32)	○	○	○	○	○
I often have difficulty organizing what I am supposed to be doing. (46)	○	○	○	○	○
My emotions have almost always seemed flat regardless of what is going on around me. (34)	○	○	○	○	○
I often worry that someone or something is controlling my behaviour. (35)	○	○	○	○	○
I have trouble following conversations with others.	○	○	○	○	○

(36)					
Spending time with close friends and family is important to me. (37)	○	○	○	○	○
At times I have wondered if my body is really my own. (38)	○	○	○	○	○

Individual Differences in interpreting Media and World Events

Thank you for completing the questions presented up until now, your contribution is valuable to us and we thank you. We will now ask you to complete the final task of this section of the study, the instructions are below.

The Journalist Task Instructions:

In the following task, you will **listen** to an article written by an anonymous journalist. This journalist publishes their work online to a public audience. The article you will read will either be presented to you to read, or be read to you. Whether you are asked to read, or listen to this article, this task should take you between 10 - 15 minutes (be advised in some instances it may take longer). Once you have been presented the article, there will be some questions to answer regarding your views on the article. Once completed, this will conclude the first part of the study. It is very important that you pay attention throughout this task. **If you do not have access to headphones, or your device does not have sound, we have provided a written form of the article below as an alternative.**

Before we begin....

Which of the following do you need to do to complete the following task:

- [ ] Pay attention to the article. (1)
- [ ] Answer with honesty. (2)
- [ ] Consider my own thoughts on the topic and whether i believe what the journalist has reported. (3)
- [ ] I will be asked to either read the article myself, or listen to a recording of it being read. (4)

Individual Differences in interpreting Media and World Events

Now that you have had a chance to either read, or hear the journal article. We would now like you to answer a few questions.

In the following task, you will be shown a statement, 6 statements in total.

After each statement, you will need to select the answers that best reflect your thoughts and beliefs, thank you.

Statement 1

The global elites have manipulated COVID death rates to be purposefully higher in minority people, in order to suppress the influence of minority populations (e.g. African Americans).

To what extent do you agree with this statement?

- ○ **Strongly Disagree** (1)
- ○ **Somewhat Disagree** (2)
- ○ **Neither agree nor disagree** (3)
- ○ **Somewhat agree** (4)
- ○ **Strongly agree** (5)

The information in Statement 1 is...

- ○ **Highly Ficticious** (1)
- ○ **Mostly Ficticious** (2)
- ○ **Somewhat Ficticious** (3)
- ○ **Somewhat Credible** (4)
- ○ **Mostly Credible** (5)
- ○ **Highly Credible** (6)

Statement 2

Bill Gates knew of the existence of the COVID-19 virus well before it was released in Wuhan, China. This is evident by his well-publicized conference presentation at a Ted Convention 5 years prior to the pandemic.

To what extent do you agree with this statement?

- ○ **Strongly Disagree** (1)
- ○ **Somewhat Disagree** (2)
- ○ **Neither agree nor disagree** (3)
- ○ **Somewhat agree** (4)
- ○ **Strongly agree** (5)

The information in Statement 2 is...

- ○ **Highly Ficticious** (1)
- ○ **Mostly Ficticious** (2)
- ○ **Somewhat Ficticious** (3)
- ○ **Somewhat Credible** (4)
- ○ **Mostly Credible** (5)
- ○ **Highly Credible** (6)

Statement 3

The vaccines created against COVID-19 been subject to only limited testing and which have many side-effects that are not being reported.

To what extent do you agree with this statement?

- ○ **Strongly Disagree** (1)
- ○ **Somewhat Disagree** (2)
- ○ **Neither agree nor disagree** (3)
- ○ **Somewhat agree** (4)
- ○ **Strongly agree** (5)

The information in Statement 3 is...

- ○ **Highly Ficticious** (1)
- ○ **Mostly Ficticious** (2)
- ○ **Somewhat Ficticious** (3)
- ○ **Somewhat Credible** (4)
- ○ **Mostly Credible** (5)
- ○ **Highly Credible** (6)

Statement 4

Prior to their discovery, the global elite used condensation trails of passenger aircraft to release chemical neural toxins into the air that were used as a form of mind control. These toxins are the cause for the growing rate of respiratory illness in otherwise healthy individuals around the world.

To what extent do you agree with this statement?

- ○ **Strongly Disagree** (1)
- ○ **Somewhat Disagree** (2)
- ○ **Neither agree nor disagree** (3)
- ○ **Somewhat agree** (4)
- ○ **Strongly agree** (5)

The information in Statement 4 is...

- ○ **Highly Ficticious** (1)
- ○ **Mostly Ficticious** (2)
- ○ **Somewhat Ficticious** (3)
- ○ **Somewhat Credible** (4)
- ○ **Mostly Credible** (5)
- ○ **Highly Credible** (6)

Statement 5

On April 13th 2020, in the Bolivian of *K'ara K'ara* and *Yapacani*, local news outlets exposed that the rise in COVID-19 cases in the area occurred at the same time as the installation of multiple cell towers. Once those towers had been pulled down, the number of cases per day had begun to dramatically decrease leading to civil unrest. This is example of many, that through the Bill and Melinda Gates foundation, COVID-19 was able to reach developing countries through 5G, that otherwise were unlikely to experience the pandemic.

To what extent do you agree with this statement?

- ○ **Strongly Disagree** (1)
- ○ **Somewhat Disagree** (2)
- ○ **Neither agree nor disagree** (3)
- ○ **Somewhat agree** (4)
- ○ **Strongly agree** (5)

The information in statement 5 is...

- ○ **Highly Ficticious** (1)
- ○ **Mostly Ficticious** (2)
- ○ **Somewhat Ficticious** (3)
- ○ **Somewhat Credible** (4)
- ○ **Mostly Credible** (5)
- ○ **Highly Credible** (6)

Statement 6

The vaccines for COVID-19 created by large pharmaceutical companies such as Pfizer and AstraZeneca, have been created to insert nanotechnology into the bloodstream, creating a digital imprint unique to every person. This means a Global Civil Registry can be created, where every person's location and actions can be tracked.

To what extent do you agree with this statement?

- ○ **Strongly Disagree** (1)
- ○ **Somewhat Disagree** (2)
- ○ **Neither agree nor disagree** (3)
- ○ **Somewhat agree** (4)
- ○ **Strongly agree** (5)

The information in Statement 6 is...

- ○ **Highly Ficticious** (1)
- ○ **Mostly Ficticious** (2)
- ○ **Somewhat Ficticious** (3)
- ○ **Somewhat Credible** (4)
- ○ **Mostly Credible** (5)
- ○ **Highly Credible** (6)

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That concludes Part 1 of this Study!

Move on to Part 2!

Please provide your Prolific ID once again, thank you.

_____

At this point of the study, If you would like to provide any feedback, you can write a comment here. (Do not answer questions here)

_____

_____

_____

Individual Differences in interpreting Media and World Events - Part 2

If you had any issues with the audio in the previous video, here is the script once again for your convenience.

A response to the journalist's article "Operation of the world" by a fellow writer

The whole article is not logical and not consistent on multiple occasions. There are also many scientifically flawed statements within this article. To suggest that COVID-19 death rates are purposefully higher in minority people than in majority groups to eliminate minority populations is incorrect. Several studies have found that across the world, death rates are instead, related to factors such as socio-economic status, health education and vaccination rates. Individuals who have lower socio-economic status (SES), are less likely to seek adequate health care due to cost, and, in turn, are less likely to adequately manage chronic conditions (e.g. respiratory, heart disease), to which death rates are significantly higher in those with chronic health conditions.

Also, the types of employment for those with low SES is important. Low SES jobs are more likely to include face to face interactions (e.g. customer service) or requires physical labour where people are likely to interact with many individuals throughout the day. This means it's much more likely for people with low SES jobs to catch COVID-19 and spread it to others. Hence, this theory written by the journalist has an issue known as **confounding variables**. A confounding variable is an "extra" variable that you didn't account for, that could be the reason for a result. This is an important concept to consider when evaluating any theory.

Along with the several instances where the journalist has not considered confounding variables, there are other issues with this text. Often, the arguments put forth have issues of **false causation**. This is where the wrong event, is believed to be the cause of another. For example, the journalists' suggestion that the Bolivian towns of *K'ara K'ara* and *Yapacani* had a rise in COVID-19 cases as a result of the installation of multiple cell towers is entirely false. For one, the rise in COVID-19 cases on April 13th was the result of the global rates of infection rapidly growing in what is commonly referred to as the 'Global First Wave'.

This means COVID-19 case rates were dramatically increasing everywhere, as is the nature of a pandemic. Hence, the rate of infection is dependent on the amount of people it can spread to during that time. The number of cases per day began to dramatically decrease because less and less people were able to be infected. Also, Bolivia has not even established a '5G' network, the communication towers that were torn down only had the functional capability to connect telephone lines between villages.

Another great example of the journalist using false causation is the entire narrative surrounding Bill Gates shown to the reader. It is illogical to suggest that Bill Gates knew of the existence of COVID-19 and assisted in its spread, when his TED presentation in 2015 very clearly explained to the public the dangers of a future pandemic and suggested several ways to which authorities could prevent one from occurring. In fact, Bill Gates has been one of the leading individuals of the past century in reducing the incidence of several diseases through the 'Bill & Melinda Gates Foundation' which have famously eradicated Polio disease in third world countries entirely.

Further, the non-for-profit charity has provided medical technology to developing countries that is otherwise freely available in the western world, saving millions of lives. Bill Gates knew of the possible danger of a pandemic and attempted to warn the public to prevent one from happening, the complete opposite of what the journalist has suggested. Same can be said regarding Anthony Fauci, the journalist provides no evidence of his involvement.

This leads to the main issue with the journalist's article "the operation of the world", in that often the content is scientifically incorrect and impossible. The 'condensation trails' or 'chemtrails' argument, has been proven on multiple occasions by scientists to be physically impossible with no clear evidence ever provided otherwise. The suggestion that the growing rates of respiratory illness is evidence of the chemtrails existence is again an argument with both **confounding variables** and **false causation.** Rates of respiratory illness have increased over the years due to factors such as tobacco smoke and rising levels of pollution.

The journalist also does not provide entirely clear accounts of what is or is not supported by evidence, mostly providing speculative information. For example, the journalist suggests that COVID-19 vaccines had 'limited testing' and are designed for other interests. When in order for a vaccine to be approved, there is a rigorous '3-Phase' trial system, where hundreds of millions of vaccines are used, costing companies billions in development. Just as one instance, the Phase 3 trial of the Pfizer vaccine involved a sample of 50,000 volunteers in 2020 prior to even being considered complete. All of this information is not cover and results are made available to the public for free.

~ End of Additional Information

End of Block: Rational Condition

Start of Block: Control Condition

Individual Differences in interpreting Media and World Events - Part 2

If you had any issues with the audio in the previous video, here is the script once again for your convenience.

Additional Information to article "Operation of the World"

Coronavirus disease (COVID-19) is an infectious disease caused by the SARS-CoV-2 virus. Most people infected with the virus will experience mild to moderate respiratory illness and recover without requiring special treatment. However, some will become seriously ill and require medical attention. Older people and those with underlying medical conditions like cardiovascular disease, diabetes, chronic respiratory disease, or cancer are more likely to develop serious illness. Anyone can get sick with COVID-19 and become seriously ill or die at any age.

The best way to prevent and slow down transmission is to be well informed about the disease and how the virus spreads. Protect yourself and others from infection by staying at least 1 metre apart from others, wearing a properly fitted mask, and washing your hands or using an alcohol-based rub frequently. Get vaccinated when it's your turn and follow local guidance.

The virus can spread from an infected person's mouth or nose in small liquid particles when they cough, sneeze, speak, sing or breathe. These particles range from larger respiratory droplets to smaller aerosols. It is important to practice respiratory etiquette, for example by coughing into a flexed elbow, and to stay home and self-isolate until you recover if you feel unwell.

To prevent infection and to slow transmission of COVID-19, do the following:

Get vaccinated when a vaccine is available to you. Stay at least 1 metre apart from others, even if they don't appear to be sick. Wear a properly fitted mask when physical distancing is not possible or when in poorly ventilated settings. Choose open, well-ventilated spaces over closed ones. Open a window if indoors. Wash your hands regularly with soap and water or clean them with alcohol-based hand rub. Cover your mouth and nose when coughing or sneezing. If you feel unwell, stay home and self-isolate until you recover.

COVID-19 affects different people in different ways. Most infected people will develop mild to moderate illness and recover without hospitalization.

Most common symptoms: fever cough tiredness loss of taste or smell.

Less common symptoms: sore throat headache aches and pains diarrhoea a rash on skin, or discolouration of fingers or toes red or irritated eyes.

Serious symptoms: difficulty breathing or shortness of breath loss of speech or mobility, or confusion chest pain. Seek immediate medical attention if you have serious

symptoms. Always call before visiting your doctor or health facility. People with mild symptoms who are otherwise healthy should manage their symptoms at home. On average it takes 5–6 days from when someone is infected with the virus for symptoms to show, however it can take up to 14 days.

~ End of Additional Information

Individual Differences in interpreting Media and World Events

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Task Instructions:

In the following task, you will be presented excerpts from various different articles from online news websites or blogs. Following the excerpt are questions for you to answer.

Some questions will ask you to rate on a 6-point scale how credible the information is presented to you, ranging from 1 (Highly Fictitious) to 6 (Highly Credible).

Some quesitons will also ask you to rate on a 6-point scale how likely the point raised is true from 1 (Highly Unlikely) to 6 (Highly Likely).

Click below when you are ready to begin:

○ Yes, I am ready to begin. (1)

Individual Differences in interpreting Media and World Events

Read the excerpt, then, answer the questions. Thank you.

Excerpt from Journal Article

"The American Heart Association (AHA) recommends that everyone eats fish (particularly fatty, coldwater fish) at least twice a week. Salmon, mackerel, herring, sardines, lake trout and tuna are especially high in omega-3 fatty acids. While foods are your best bet for omega-3s in your diet, fish oil supplements are also available for those who do not like fish. The heart-healthy benefits of regular doses of fish oil supplements are unclear, so talk to your doctor to see if they are right for you. The AHA says taking up to 3 grams of fish oil daily in supplement form is considered safe. Don't take more than that unless you discuss it with your doctor first."

True or False, coldwater fish, such as lake trout and tuna are the better source of omega-3 fatty acids.

- ○ **True** (1)
- ○ **False** (2)

The information presented in this excerpt is...

- ○ **Highly Ficticious** (1)
- ○ **Mostly Ficticious** (2)
- ○ **Somewhat Ficticious** (3)
- ○ **Somewhat Credible** (4)
- ○ **Mostly Credible** (5)
- ○ **Highly Credible** (6)

Based on the information presented in this excerpt, how likely are you to consder including Coldwater fish into your diet?

- ○ **Not Likely at All** (1)
- ○ **Very Unlikely** (2)
- ○ **Somewhat Unlikely** (3)
- ○ **Somewhat Likely** (4)
- ○ **Very Likely** (5)
- ○ **Highly Likely** (7)

Read the excerpt, then, answer the questions.

Thank you.

Excerpt from Journal Article

"There are many health risks that we may be unaware of that can cause harm to our children. Some of those risks are right in front of us, in our own kitchen. For several decades the government has been putting fluoride concentrate in our water without our consent, which is said to prevent tooth decay. However, those made aware know that fluoridated water also has resulted in a decrease in our children's IQ scores. One study in the peer reviewed journal *JAMA Pediatrics*, found that mothers who had consumed fluoridated tap water while they were pregnant tended to give birth to children who ended up having slightly lower IQ scores by ages 3 to 4. This important piece of research is evidence that action must be taken to stop our drinking water undergoing fluoridation."

True or False, the text suggests the government originally put fluoride in our water in order to prevent tooth decay?

- ○ **True** (1)
- ○ **False** (2)

The information presented in this excerpt is...

- ○ **Highly Ficticious** (1)
- ○ **Mostly Ficticious** (2)
- ○ **Somewhat Ficticious** (3)
- ○ **Somewhat Credible** (4)
- ○ **Mostly Credible** (5)
- ○ **Highly Credible** (6)

Based on the information presented, how likely is it that fluoride may affect children's IQ scores?

- ○ **Not Likely at All** (1)
- ○ **Very Unlikely** (2)
- ○ **Somewhat Unlikely** (3)
- ○ **Somewhat Likely** (4)
- ○ **Very Likely** (5)
- ○ **Highly Likely** (7)

Individual Differences in interpreting Media and World Events

Read the excerpt, then, answer the questions.

Thank you.

Excerpt from Journal Article

"There are many reasons to be cautious of pharmaceutical interventions that have not been rigorously tested for potential side effects. For example, in 1954, the drug Thalidomide was introduced by CIBA, a Swiss pharmaceutical company into the UK primarily as a treatment for morning sickness during pregnancy. However, following its widespread use in Japan, Australia, and Europe, practitioners noticed links between mothers who had taken thalidomide and the presence of congenital mutations in their children. Following, research by Dr Widukind Lenze and Dr William McBride affirmed this observation, and findings were further backed by several cases across the world, and according to the World Health Organization, several studies reported 10,000 children are thought to have been born with phocomelia because of Thalidomide use in mothers. These abnormalities were not observed in the US, as the U.S. Food and Drug Administration did not approve or license the use of Thalidomide. Since, the Thalidomide Trust, a non-for-profit organization, has been established to aid those affected."

Based on the information presented, how likely is it that Thalidomide is related to severe side effects during pregnancy such as congenital disease?

- **Not Likely at All** (1)
- **Very Unlikely** (2)
- **Somewhat Unlikely** (3)
- **Somewhat Likely** (4)
- **Very Likely** (5)
- **Highly Likely** (7)

The information presented in this excerpt is...

- **Highly Ficticious** (1)
- **Mostly Ficticious** (2)
- **Somewhat Ficticious** (3)
- **Somewhat Credible** (4)
- **Mostly Credible** (5)
- **Highly Credible** (6)

True or False, Thalidomide was first introduced in the UK primarily for treatment of morning sickness?

- **True** (1)
- **False** (2)

Individual Differences in interpreting Media and World Events

Read the excerpt, then, answer the questions.

Thank you.

Excerpt from Journal Article

"Of all the different nutrients recommend in our diet, the one that is potentially the most beneficial is Zinc. A meta-analysis published in 2017 found those who took zinc supplement of 80 to 92 milligrams (mg) each day at the beginning of colds saw a reduction in the length of their cold by 33 percent. A Zinc deficiency prevents the activation of T-lymphocytes, and stops the function of macrophage cells, which can trigger cytokine production. Also, early and outpatient treatment from the Front Line COVID-19 Critical Care Alliance, contains zinc, as does the protocol recommended and prescribed by Dr. Vladmir Zelenko. It was found that those in outpatient treatment had severely low levels of zinc, meaning that those who were zinc deficient were far more likely to experience more severe symptoms of COVID-19. However, the importance of Zinc does not receive a lot of publicity because of the supplements relative low cost to purchase."

Based on the information provided, how likely is it that Zinc is an effective supplement in reducing the severity of COVID-19 symptoms?

- ○ **Not Likely at All** (1)
- ○ **Very Unlikely** (2)
- ○ **Somewhat Unlikely** (3)
- ○ **Somewhat Likely** (4)
- ○ **Very Likely** (5)
- ○ **Highly Likely** (7)

What is the name of the researcher used in this text?

- ○ **Dr Hank Scorpio** (1)
- ○ **Dr Vladmir Zelenko** (2)
- ○ **Dr Zinc Vladmenko** (3)

The information presented in this excerpt is...

- ○ **Highly Ficticious** (1)
- ○ **Mostly Ficticious** (2)
- ○ **Somewhat Ficticious** (3)
- ○ **Somewhat Credible** (4)
- ○ **Mostly Credible** (5)
- ○ **Highly Credible** (6)

Individual Differences in interpreting Media and World Events

Read the excerpt, then, answer the questions.

Thank you.

Excerpt from Journal Article

"Recent scientific media has not been entirely transparent with information regarding the most advanced medical technology. In the last 40 years, next to no deaths have been as a result of Measles in modern western society, yet, most children around the world are mandated to receive the Measles, Mumps and Rubella (MMR) vaccine as an infant. In fact, one brave piece of research pioneered by Andrew Wakefield, demonstrated that the MMR vaccine may predispose children to behavioral regressions and pervasive developmental disorders. For example, since the introduction of the MMR vaccine, more cases of autism among children have been reported per year, and this number has increased every year this vaccine has been widely administered.

Based on the information provided, how likely is it that the MMR vaccine is related to developmental social disorders (such as Autism) within children who receive it?

- ○ **Not Likely at All** (1)
- ○ **Very Unlikely** (2)
- ○ **Somewhat Unlikely** (3)
- ○ **Somewhat Likely** (4)
- ○ **Very Likely** (5)
- ○ **Highly Likely** (7)

What is the name of the researcher used in this text?

- ○ **Andrew Garfield** (1)
- ○ **Andrew Wakefield** (2)
- ○ **Gerry Wakefield** (3)

The information presented in this excerpt is...

- ○ **Highly Ficticious** (1)
- ○ **Mostly Ficticious** (2)
- ○ **Somewhat Ficticious** (3)
- ○ **Somewhat Credible** (4)
- ○ **Mostly Credible** (5)
- ○ **Highly Credible** (6)

Individual Differences in interpreting Media and World Events

Read the excerpt, then, answer the questions.

Thank you.

Excerpt from Journal Article

"It is important that we teach our children about the effects of climate change, and most importantly, our impact on the earth. According to the Intergovernmental Panel of Climate Change, Polar ice caps are melting as global warming causes climate change. We lose Arctic Sea ice at a rate of almost 13% per decade, and over the past 30 years, the oldest and thickest ice in the arctic has declined by a stunning 95%. If emissions continue to rise unchecked, the Arctic could be ice-free in the summer by 2040. But what happens in the Arctic does not stay in the Arctic. Sea ice loss has far-reaching effects around the world. But something can be done about climate change. Limiting the increase in global temperature is our best chance of securing a safer future for all, preventing even some damaging consequences than we've already seen. By keeping the rise to 1.5 C (2.7 F) we can prevent the worst effects of climate change. But, helping communities and wildlife adapt to changes already underway in the meantime is essential."

What are we losing at a rate of 13% per decade?

- ○ **The Arctic Sea** (1)
- ○ **The Antic Sea** (2)
- ○ **The Black Sea** (3)

The information presented in this excerpt is...

- ○ **Highly Ficticious** (1)
- ○ **Mostly Ficticious** (2)
- ○ **Somewhat Ficticious** (3)
- ○ **Somewhat Credible** (4)
- ○ **Mostly Credible** (5)
- ○ **Highly Credible** (6)

Based on the information provided by this journalist, how likely is it that we are currently experiencing Climate Change?

- ○ **Not Likely at All** (1)
- ○ **Very Unlikely** (2)
- ○ **Somewhat Unlikely** (3)
- ○ **Somewhat Likely** (4)
- ○ **Very Likely** (5)
- ○ **Highly Likely** (7)

Individual Differences in interpreting Media and World Events

Read the excerpt, then, answer the questions.

Thank you.

Excerpt from Journal Article

"Billions of dollars of funding have been put into many ways to treat and prevent cancer across the world. However, a lot of this research is funded and continued in order to hide the best remedies and cures from us. This is a ploy western countries have been using for years, just look at the prohibition of Cannabis over the past century as the best example. Specifically, Cannabis oil that can be extracted from a cannabis plant, has been shown to have several abilities, such as: destroy or shrink cancerous tumours, cure diabetes, ulcers, arthritis, migraines, and infections along with many other diseases. Cannabis oil has also been FDA approved to reduce cancer treatment-related side effects such as nausea and vomiting. However, they have concealed the fact that not only does Cannabis oil help cure cancer, but it fights of the toxic effects of false treatments such as chemotherapy. This is not the only example unfortunately. The product Laetrile, a purified form of amygdalin that is extracted from natural apricot seeds, nuts and plants, when broken down in the stomach becomes a potent agent that kills cancer cells while leaving normal tissue unharmed. However, again due to its relatively low cost and easy of creation, it is not made available to the public."

Based on the information provided by this journalist, how likely is it that there are more natural remedies that can be used to fight cancer, not currently allowed as they conflict with the financial interests of governing bodies?

- ○ **Not Likely at All** (1)
- ○ **Very Unlikely** (2)
- ○ **Somewhat Unlikely** (3)
- ○ **Somewhat Likely** (4)
- ○ **Very Likely** (5)
- ○ **Highly Likely** (7)

What is Laetrile made from?

- ○ **Peach seeds** (1)
- ○ **Apricot Seeds** (2)
- ○ **Chia Seeds** (3)

The information presented in this excerpt is...

- ○ **Highly Ficticious** (1)
- ○ **Mostly Ficticious** (2)
- ○ **Somewhat Ficticious** (3)
- ○ **Somewhat Credible** (4)
- ○ **Mostly Credible** (5)
- ○ **Highly Credible** (6)

Individual Differences in interpreting Media and World Events

Thank you for your participation so far. We will now move to the final task of the study.

Instructions:
In the following task you will be presented with a scenario consisting of three sentences.

Based on the three sentences presented, you must rate **how likely** each of the four interpretations below are to be true from 0 to 100. For example, rating an interpretation as 0 = completely implausible, whilst rating an interpretation 100 = Completely plausible.

Please consider each of the four options independently of each other. This means that you can rate all the possible options as high or low. This means you can also able to rate options as equally likely.

Here is an example below;

"John is angry at his sister."

“John couldn’t find his lunch box in the fridge”

“John noticed his sister eating a sandwich at the table.”

Below the three sentences presented will be four options. These four options are different conclusions you could draw from the sentence(s) presented, we will refer to them as **interpretations.**

You will be asked to rate **how likely** each of the four interpretations of the scenario is from 0 to 100. For example, rating an interpretation as 0 = completely implausible, whilst rating an interpretation 100 = Completely plausible.

Going back to the example, these are what the **four interpretations** could look like;

Which of the following is true regarding this task:

- ☐ **Each Interpretation should be rated independent of each other.** (1)
- ☐ **I must answer these questions honestly.** (2)
- ☐ **My answers will be based on the three sentences presented.** (3)

Now let's check if you understand the task.

Which of these is true?

- ○ The total for ALL ratings have to add up to 100% (e.g., Interpretation 1 = 40%; Interpretation 2 = 20%; Interpretation 3 = 20%; Interpretation 4 = 20%). (1)
- ○ The total for ALL ratings can go over 100% (e.g., Interpretation 1 = 70%; Interpretation 2 = 50%; Interpretation 3 = 0%; Interpretation 4 = 20%). (2)

Individual Differences in interpreting Media and World Events

Instructions:

In the following task you will be presented with a scenario consisting of three sentences. Based on the three sentences presented, you must rate **how likely** each of the four interpretations below are to be true from 0 to 100. For example, rating an interpretation as 0 = completely implausible, whilst rating an interpretation 100 = Completely plausible.

Please consider each of the four options independently of each other. This means that you can rate all the possible options as high or low. This means you can also able to rate options as equally likely.

Tom and Mike are screaming.

Tom and Mike feel nauseous.

Tom and Mike ate too much cotton candy today.

	Implausible Most Plausible % 0 10 20 30 40 50 60 70 80 90 100
Tom and Mike are at a basketball game. ()	
Tom and Mike enjoy being in the spotlight. ()	
Tom and Mike have found a dead rat in the alley. ()	
Tom and Mike are having fun on a roller-coaster. ()	

Patrick has found the plans he needs to solve.

Patrick must put the pieces together.

Patrick has built many toy airplanes before this one.

	Implausible Most Plausible % 0 10 20 30 40 50 60 70 80 90 100
Patrick is a talented child. ()	
Patrick is on a treasure hunt. ()	
Patrick is a criminal investigator. ()	
Patrick fell and hurt himself. ()	

Individual Differences in interpreting Media and World Events

Instructions:

In the following task you will be presented with a scenario consisting of three sentences. Based on the three sentences presented, you must rate **how likely** each of the four interpretations below are to be true from 0 to 100. For example, rating an interpretation as 0 = completely implausible, whilst rating an interpretation 100 = Completely plausible.

Please consider each of the four options independently of each other. This means that you can rate all the possible options as high or low. This means you can also able to rate options as equally likely.

Judy saved the little girl's life.

J**udy's family supported Judy's decision to help the little girl.**

Luckily, Judy is the same blood-type as the little girl.

	0 10 20 30 40 50 60 70 80 90 100
Judy is a fire-fighter. ()	
Judy is a witch. ()	
Judy is a doctor. ()	
Judy is an organ donor. ()	

Instructions:

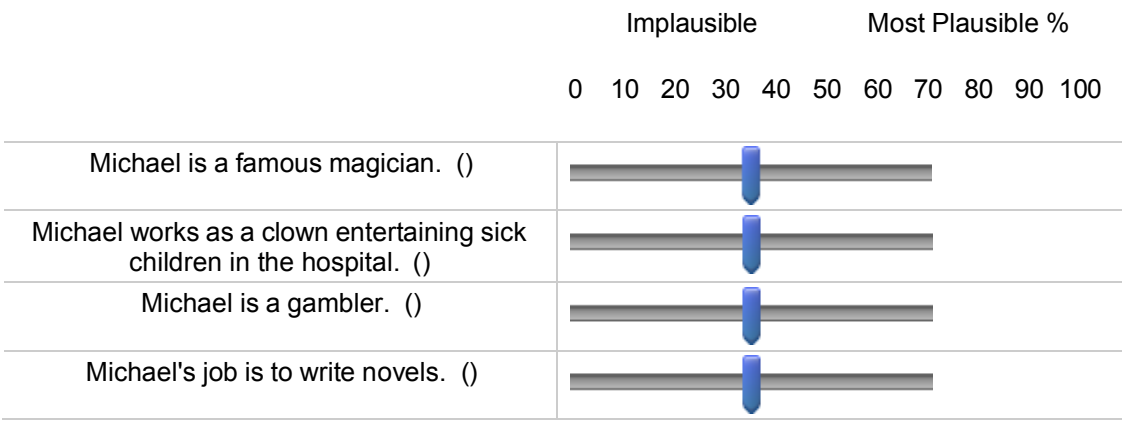
In the following task you will be presented with a scenario consisting of three sentences. Based on the three sentences presented, you must rate **how likely** each of the four interpretations below are to be true from 0 to 100. For example, rating an interpretation as 0 = completely implausible, whilst rating an interpretation 100 = Completely plausible.

Please consider each of the four options independently of each other. This means that you can rate all the possible options as high or low. This means you can also able to rate options as equally likely.

Michael's job is to entertain people.

Michael is a little shy sometimes.

Michael sits in front of a computer writing all day long.



Individual Differences in interpreting Media and World Events
Instructions:

In the following task you will be presented with a scenario consisting of three sentences. Based on the three sentences presented, you must rate **how likely** each of the four interpretations below are to be true from 0 to 100. For example, rating an interpretation as 0 = completely implausible, whilst rating an interpretation 100 = Completely plausible.

Please consider each of the four options independently of each other. This means that you can rate all the possible options as high or low. This means you can also able to rate options as equally likely.

Richard is very tall.

Richard is mainly interested in sports.

Richard has recently signed a contract to join a team.

	Implausible ... Most Plausible % (0 10 20 30 40 50 60 70 80 90 100)
Richard is a professional basketball player. ()	
Richard walks on stilts at the circus. ()	
Richard is short. ()	
Richard feels awkward because of his height. ()	

Individual Differences in interpreting Media and World Events - Part 2

Instructions:
In the first part of our study we asked you watch a presentation with some follow up questions. To start the second part of our study, we will show you the written script of that video once again to reacquaint you with its content. Then, we will also present you with some additional information.

Unlike the first time the article was presented, you will not be asked to complete any questions regarding the article itself. Once you have familiarized yourself with the article once again, we can proceed with the remainder of our study.

Which of the following task is true?

- [ ] I am being shown the journal article from Part 1 again just as a reminder of its content. (4)
- [ ] I will not be asked to answer any questions regarding the journal article, or any new additional information. (5)

Page Break

Individual Differences in interpreting Media and World Events - Part 2

Reminder: This is just to refresh your memory of the article, if you feel you are well acquainted with its content you can move on by clicking the arrow at the bottom of the page, thank you.

"The operation of the world"
By xxx , xxx Bulletin

For several centuries, the world has been ruled by a powerful global elite who have worked secretly behind the scenes to ensure that world events work in their favour. These people have strong connections with governments all over the world and usually have ties to banking and major corporations that benefit from the engineering of crises or their outcomes (e.g., wars). In fact, such crises often only occur because of the big finance that is behind them. Crises provide opportunities to convince governments to invest in new products and services that benefit the financial interests of these elite groups. In the past, this often included products such as arms or new forms of technology, whereas this now can extend to green or renewable technology and new pharmacological treatments including vaccines and drugs.

Not only do global elites want to benefit financially from major crises, but they also want to exert control and power within the world. They want to install governments that are amenable to their interests; make appointments to key national and international bodies that support their views; and, encourage the development of a centralised or 'world government' (or equivalent) that reduces the sovereignty of nation states. These centralised structures would force each nation to comply with certain principles or guidelines so as to foster the interests of the global elites at an international level.

An important element of this new world order is to encourage people to comply with the mandates of the global elites. This is achieved by creating fear in the world about impending crises such as climate change or global warming and exaggerating the severity of the problems. The purpose is to control people's decisions, their views and attitudes and their behaviour to create a more socialist world where governments control more and more of people's lives. An important part of this process is to keep people misinformed about the true nature of the global agenda; to reduce their capacity for rebellion by taking away their weapons and ability to protect themselves; and to introduce surveillance and censorship to ensure that only certain views remain in the mainstream media. Much of this has been facilitated by big technology companies who benefit from the globalist agenda. The global elites are, however, hypocrites. While they are espousing the need for green economic agendas, social inclusion and diversity and government responsibility, they are behind the scenes still involved in industries that exploit child labour; which encourage inequality; and, which exploit poor countries. Many senior people in global corporations have questionable morals and can be found to be engaged in depraved activities that may include child abuse, trafficking, perverse rituals, and violence against women.

The COVID pandemic

The COVID pandemic is one of the strongest examples of this global agenda put into operation. The Wuhan virus emerged from China in late 2019 and is highly likely to have

emerged from a laboratory mishap in which staff working at the Wuhan facility failed to take adequate precautions. COVID-19 arose from a broader program of research involving the modification of viruses to make them more dangerous to humans and may have been part of a broader biological weapons program. Research in this facility was known to the US because it co-founded some of the research. Anthony Fauci was an active participant in this research and knew of the dangers well before it became known to the public. China deliberately allowed the virus to spread around the world and this was known to many powerful figures in the world because they knew that it could lead to significant changes in the global order. The COVID pandemic has been used by governments to impose authoritarian controls over the populace and has been used as a vehicle for peak organizations such as the World Economic Forum to promote a new economic global order based on green socialist principles. The aim is to reduce individual control over property; to reduce the influence of the capitalist system and individual rights; and, to impose controls and greater surveillance over individual actions. One part of this scheme for global control has been the introduction of mandated vaccines that have been subject to only limited testing and which have many side-effects that are not being reported.

The mandated use of vaccines follows a long history of governments using their population as guinea-pigs in secret biological experiments and exposing them to chemicals and pathogens to test their effects and to control behaviour. For example, there have been suspicions that condensation trails and markers left by high-flying aircraft (i.e. including passenger planes) have become larger and appeared more frequently and that these serve multiple purposes. These have contained toxic neural altering agents used for psychological manipulation. These toxins have also been the cause for the growing rate of respiratory illness in otherwise healthy individuals around the world. Similarly, the process of introducing fluoride into water supplies has served to reduce the intelligence of children and young people to make them more amenable to indoctrination and less able to see beyond the mainstream narratives that are being promoted by mainstream media and educations systems controlled and funded by global corporate elites. This may also be evident in the introduction of new communications technology such as 5G. 5G has been seen by some as a digital strategy to spread the COVID-19 virus. Coinciding with the spread of the virus in late 2019, many large technology companies owned by powerful individuals began to release the fifth generation of cellular broadband, otherwise known as '5G' to spread the virus to the over 4.28 billion cellular users across the globe.

... (Read on below)

Powerful figures in business and technology that have benefited from the pandemic very likely have been complicit in the spread of COVID and have vested interests in the vaccine program. For example, the company Microsoft, famously owned by American mogul Bill Gates, publicly deployed much of their services to establishing 5G network operates across many first world countries. However, Bill Gates had also given a well-publicized conference presentation at a TED convention 5 years prior to the pandemic, discussing the vulnerability modern society has to a virus outbreak. It is entirely possible that Bill Gates, among other powerful elites, knew of the existence of the virus well before it was released in Wuhan, China. Moreover, the 'Bill and Melinda Gates' foundation was a charity established in 2000, with the goal of accelerating the health and technological progress of other developing countries. This includes the installation of cellular towers. This work was in fact a covert

operation to further the reach of 5G broadband, and, in turn, further the spread of the COVID-19 virus. There have been many documented cases to support this claim. COVID, like previous chemical releases, is designed to reduce the population to foster socialist agendas based on the reduction in world population and the reduction of the influence of certain groups (e.g., African Americans) who may not agree with the urban elites. It is no mistake that COVID death rates in the population of minority people has been higher than in majority groups.

For example, on April 13th 2020, in the Bolivian towns of K'ara K'ara and Yapacani, local news outlets exposed that the large spike in COVID-19 cases in the area occurred at the same time as the installation of multiple cell towers. Once those towers had been pulled down, the number of cases had begun to dramatically decrease leading to civil unrest. This example is one of many, to which it is exposed that Bill Gates had been tasked to further the exposure of COVID -19 to developing countries that would otherwise be unlikely to be exposed. Overall, these actions in both developing and first world countries, ensured the virus had spread to every corner of the globe.

... (Read on Below)

The spread of the pandemic was the first phase of the plan. Although the COVID-19 virus had a low mortality rate, with 73.4% of deaths occurring in those with other chronic conditions, the virus had spread across the world to the point where the only way to stop it would be through a vaccine. As the global elite knew of the existence of the virus prior to its release in 2019, an ample amount of time was given to develop a highly advanced 'vaccine'.

It has been suspected that the vaccine created inserts nanotechnology into the bloodstream, creating a digital imprint unique to every person. This means a Global Civil Registry can be created, where every person's location and actions can be tracked. Also, most vaccines popularly used across the world made by companies such as Pfizer and AstraZeneca, have been publicly stated to use mRNA technology. This means they are designed to permanently change an individual once administered.

~ End of Article

Appendix F: Supplementary Materials of Intervention Design and Tasks

Appendix F1 – Presented audio recording 'The operations of the world', full transcript.

Journal Task- Instructions

In the following task you will be presented with a piece written by an anonymous journalist. This journalist publishes their work online to a public audience. The article you will read will either be presented to you to read, or be read to you. Whether you are asked to read, or, listen to this article, this task should take you about 5-10 minutes. Once you have been presented the journalists' article, there will be some questions to answer regarding how you view arguments raised by the journalist within the script. Once completed, this will conclude the first part of the study. It is important you pay attention throughout this task.

<Comprehension question to check they understand the instructions>

[NEXT PAGE]

"The operation of the world"
By xxx , xxx Bulletin

For several centuries, the world has been ruled by a powerful global elite who have worked secretly behind the scenes to ensure that world events work in their favour. These people have strong connections with governments all over the world and usually have ties to banking and major corporations that benefit from the engineering of crises or their outcomes (e.g., wars). In fact, such crises often only occur because of the big finance that is behind them. Crises provide opportunities to convince governments to invest in new products and services that benefit the financial interests of these elite groups. In the past, this often included products such as arms or new forms of technology, whereas this now can extend to green or renewable technology and new pharmacological treatments including vaccines and drugs.

Not only do global elites want to benefit financially from major crises, but they also want to exert control and power within the world. They want to install governments that are amenable to their interests; make appointments to key national and international bodies that support their views; and, encourage the development of a centralised or 'world government' (or equivalent) that reduces the sovereignty of nation states. These centralised structures would force each nation to comply with certain principles or guidelines so as to foster the interests of the global elites at an international level.

An important element of this new world order is to encourage people to comply with the mandates of the global elites. This is achieved by creating fear in the world about impending crises such as climate change or global warming and exaggerating the severity of the problems. The purpose is to control people's decisions, their views and attitudes and their

behaviour to create a more socialist world where governments control more and more of people's lives. An important part of this process is to keep people misinformed about the true nature of the global agenda; to reduce their capacity for rebellion by taking away their weapons and ability to protect themselves; and to introduce surveillance and censorship to ensure that only certain views remain in the mainstream media. Much of this has been facilitated by big technology companies who benefit from the globalist agenda. The global elites are, however, hypocrites. While they are espousing the need for green economic agendas, social inclusion and diversity and government responsibility, they are behind the scenes still involved in industries that exploit child labour; which encourage inequality; and, which exploit poor countries. Many senior people in global corporations have questionable morals and can be found to be engaged in depraved activities that may include child abuse, trafficking, perverse rituals, and violence against women.

The COVID pandemic

The COVID pandemic is one of the strongest examples of this global agenda put into operation. The Wuhan virus emerged from China in late 2019 and is highly likely to have emerged from a laboratory mishap in which staff working at the Wuhan facility failed to take adequate precautions. COVID-19 arose from a broader program of research involving the modification of viruses to make them more dangerous to humans and may have been part of a broader biological weapons program. Research in this facility was known to the US because it co-founded some of the research. Anthony Fauci was an active participant in this research and knew of the dangers well before it became known to the public. China deliberately allowed the virus to spread around the world and this was known to many powerful figures in the world because they knew that it could lead to significant changes in the global order. The COVID pandemic has been used by governments to impose authoritarian controls over the populace and has been used as a vehicle for peak organizations such as the World Economic Forum to promote a new economic global order based on green socialist principles. The aim is to reduce individual control over property; to reduce the influence of the capitalist system and individual rights; and, to impose controls and greater surveillance over individual actions. One part of this scheme for global control has been the introduction of mandated vaccines that have been subject to only limited testing and which have many side-effects that are not being reported.

The mandated use of vaccines follows a long history of governments using their population as guinea-pigs in secret biological experiments and exposing them to chemicals and pathogens to test their effects and to control behaviour. For example, there have been suspicions that condensation trails and markers left by high-flying aircraft (i.e. including passenger planes) have become larger and appeared more frequently and that these serve multiple purposes. These have contained toxic neural altering agents used for psychological manipulation. These toxins have also been the cause for the growing rate of respiratory illness in otherwise healthy individuals around the world. Similarly, the process of introducing fluoride into water supplies has served to reduce the intelligence of children and young people to make them more amenable to indoctrination and less able to see beyond the mainstream narratives that are being promoted by mainstream media and educations systems controlled and funded by global corporate elites. This may also be evident in the introduction of new communications technology such as 5G. 5G has been seen by some as a digital strategy to spread the COVID-19 virus. Coinciding with the spread of the virus in

late 2019, many large technology companies owned by powerful individuals began to release the fifth generation of cellular broadband, otherwise known as ‘5G’ to spread the virus to the over 4.28 billion cellular users across the globe.

... (Read on below)

Powerful figures in business and technology that have benefited from the pandemic very likely have been complicit in the spread of COVID and have vested interests in the vaccine program. For example, the company Microsoft, famously owned by American mogul Bill Gates, publicly deployed much of their services to establishing 5G network operates across many first world countries. However, Bill Gates had also given a well-publicized conference presentation at a TED convention 5 years prior to the pandemic, discussing the vulnerability modern society has to a virus outbreak. It is entirely possible that Bill Gates, among other powerful elites, knew of the existence of the virus well before it was released in Wuhan, China. Moreover, the ‘Bill and Melinda Gates’ foundation was a charity established in 2000, with the goal of accelerating the health and technological progress of other developing countries. This includes the installation of cellular towers. This work was in fact a covert operation to further the reach of 5G broadband, and, in turn, further the spread of the COVID-19 virus. There have been many documented cases to support this claim. COVID, like previous chemical releases, is designed to reduce the population to foster socialist agendas based on the reduction in world population and the reduction of the influence of certain groups (e.g., African Americans) who may not agree with the urban elites. It is no mistake that COVID death rates in the population of minority people has been higher than in majority groups.

For example, on April 13th 2020, in the Bolivian towns of K’ara K’ara and Yapacani, local news outlets exposed that the large spike in COVID-19 cases in the area occurred at the same time as the installation of multiple cell towers. Once those towers had been pulled down, the number of cases had begun to dramatically decrease leading to civil unrest. This example is one of many, to which it is exposed that Bill Gates had been tasked to further the exposure of COVID -19 to developing countries that would otherwise be unlikely to be exposed. Overall, these actions in both developing and first world countries, ensured the virus had spread to every corner of the globe….. **(Read on Below)**

The spread of the pandemic was the first phase of the plan. Although the COVID-19 virus had a low mortality rate, with 73.4% of deaths occurring in those with other chronic conditions, the virus had spread across the world to the point where the only way to stop it would be through a vaccine. As the global elite knew of the existence of the virus prior to its release in 2019, an ample amount of time was given to develop a highly advanced ‘vaccine’.

It has been suspected that the vaccine created inserts nanotechnology into the bloodstream, creating a digital imprint unique to every person. This means a Global Civil Registry can be created, where every person’s location and actions can be tracked. Also, most vaccines popularly used across the world made by companies such as Pfizer and AstraZeneca, have been publicly stated to use mRNA technology. This means they are designed to permanently change an individual once administered.

~ End of Article

Appendix F2 – Scientific Reasoning condition 'a response to the operations of the world'

A response to the journalist's article "Operation of the world" by a fellow writer

The whole article is not logical and not consistent on multiple occasions. There are also many scientifically flawed statements within this article. To suggest that COVID-19 death rates are purposefully higher in minority people than in majority groups to eliminate minority populations is incorrect. Several studies have found that across the world, death rates are instead, related to factors such as socio-economic status, health education and vaccination rates. Individuals who have lower socio-economic status (SES), are less likely to seek adequate health care due to cost, and, in turn, are less likely to adequately manage chronic conditions (e.g. respiratory, heart disease), to which death rates are significantly higher in those with chronic health conditions.

Also, the types of employment for those with low SES is important. Low SES jobs are more likely to include face to face interactions (e.g. customer service) or requires physical labour where people are likely to interact with many individuals throughout the day. This means it's much more likely for people with low SES jobs to catch COVID-19 and spread it to others. Hence, this theory written by the journalist has an issue known as **confounding variables**. A confounding variable is an "extra" variable that you didn't account for, that could be the reason for a result. This is an important concept to consider when evaluating any theory.

Along with the several instances where the journalist has not considered confounding variables, there are other issues with this text. Often, the arguments put forth have issues of **false causation**. This is where the wrong event, is believed to be the cause of another. For example, the journalists' suggestion that the Bolivian towns of *K'ara K'ara* and *Yapacani* had a rise in COVID-19 cases as a result of the installation of multiple cell towers is entirely false. For one, the rise in COVID-19 cases on April 13th was the result of the global rates of infection rapidly growing in what is commonly referred to as the 'Global First Wave'.

This means COVID-19 case rates were dramatically increasing everywhere, as is the nature of a pandemic. Hence, the rate of infection is dependent on the amount of people it can spread to during that time. The number of cases per day began to dramatically decrease because less and less people were able to be infected. Also, Bolivia has not even established a '5G' network, the communication towers that were torn down only had the functional capability to connect telephone lines between villages.

Another great example of the journalist using false causation is the entire narrative surrounding Bill Gates shown to the reader. It is illogical to suggest that Bill Gates knew of the existence of COVID-19 and assisted in its spread, when his TED presentation in 2015 very clearly explained to the public the dangers of a future pandemic and suggested several ways to which authorities could prevent one from occurring. In fact, Bill Gates has been one of the leading individuals of the past century in reducing the incidence of several diseases through the 'Bill & Melinda Gates Foundation' which have famously eradicated Polio disease

in third world countries entirely.

Further, the non-for-profit charity has provided medical technology to developing countries that is otherwise freely available in the western world, saving millions of lives. Bill Gates knew of the possible danger of a pandemic and attempted to warn the public to prevent one from happening, the complete opposite of what the journalist has suggested. Same can be said regarding Anthony Fauci, the journalist provides no evidence of his involvement.

This leads to the main issue with the journalist's article "the operation of the world", in that often the content is scientifically incorrect and impossible. The ‘condensation trails’ or ‘chemtrails’ argument, has been proven on multiple occasions by scientists to be physically impossible with no clear evidence ever provided otherwise. The suggestion that the growing rates of respiratory illness is evidence of the chemtrails existence is again an argument with both **confounding variables** and **false causation.** Rates of respiratory illness have increased over the years due to factors such as tobacco smoke and rising levels of pollution.

The journalist also does not provide entirely clear accounts of what is or is not supported by evidence, mostly providing speculative information. For example, the journalist suggests that COVID-19 vaccines had ‘limited testing’ and are designed for other interests. When in order for a vaccine to be approved, there is a rigorous ‘3-Phase’ trial system, where hundreds of millions of vaccines are used, costing companies billions in development. Just as one instance, the Phase 3 trial of the Pfizer vaccine involved a sample of 50,000 volunteers in 2020 prior to even being considered complete. All of this information is not cover and results are made available to the public for free.

~ End of Additional Information

Appendix F3 – Control condition 'a response to the operations of the world'

Coronavirus disease (COVID-19) is an infectious disease caused by the SARS-CoV-2 virus. Most people infected with the virus will experience mild to moderate respiratory illness and recover without requiring special treatment. However, some will become seriously ill and require medical attention. Older people and those with underlying medical conditions like cardiovascular disease, diabetes, chronic respiratory disease, or cancer are more likely to develop serious illness. Anyone can get sick with COVID-19 and become seriously ill or die at any age.

The best way to prevent and slow down transmission is to be well informed about the disease and how the virus spreads. Protect yourself and others from infection by staying at least 1 metre apart from others, wearing a properly fitted mask, and washing your hands or using an alcohol-based rub frequently. Get vaccinated when it's your turn and follow local guidance.

The virus can spread from an infected person's mouth or nose in small liquid particles when they cough, sneeze, speak, sing or breathe. These particles range from larger respiratory droplets to smaller aerosols. It is important to practice respiratory etiquette, for example by coughing into a flexed elbow, and to stay home and self-isolate until you recover if you feel unwell.

To prevent infection and to slow transmission of COVID-19, do the following:

- Get vaccinated when a vaccine is available to you.
- Stay at least 1 metre apart from others, even if they don't appear to be sick.
- Wear a properly fitted mask when physical distancing is not possible or when in poorly ventilated settings.
- Choose open, well-ventilated spaces over closed ones. Open a window if indoors.
- Wash your hands regularly with soap and water or clean them with alcohol-based hand rub.
- Cover your mouth and nose when coughing or sneezing.
- If you feel unwell, stay home and self-isolate until you recover.

COVID-19 affects different people in different ways. Most infected people will develop mild to moderate illness and recover without hospitalization.

Most common symptoms:

- fever
- cough
- tiredness
- loss of taste or smell.

Less common symptoms:

- sore throat
- headache
- aches and pains
- diarrhoea
- a rash on skin, or discolouration of fingers or toes
- red or irritated eyes.

Serious symptoms:

- difficulty breathing or shortness of breath
- loss of speech or mobility, or confusion
- chest pain.

Seek immediate medical attention if you have serious symptoms. Always call before visiting your doctor or health facility. People with mild symptoms who are otherwise healthy should manage their symptoms at home. On average it takes 5–6 days from when someone is infected with the virus for symptoms to show, however it can take up to 14 days.

Appendix F4 – The COVID-19 Conspiracy Assessment Task

Conspiracy Assessment Scale (Post Script Presentation)

First, items are rated on a 5-point scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). Higher scores on this measure reflect greater conspiracy beliefs presented to the participant. Then, the information presented to the participant is rated upon their credibility from 1 (Highly Fictitious) to 6 (Highly Credible). Participant will be warned there may be a degree of overlap between items.

1. It is no mistake that COVID death rates in the population of minority people has been higher than in majority groups. This is a purposeful act by the global elites to suppress the influence of minority populations (e.g. African Americans). **(item 1)**

2. The well-publicized conference presentation at a Ted Convention 5 years prior to the pandemic by Bill Gates, is evidence that powerful elites knew of the existence of the COVID-19 virus well before it was released in Wuhan, China. **(item 2)**

3. The vaccines created against COVID-19 been subject to only limited testing and which have many side-effects that are not being reported. **(dummy item)**

4. Prior to their discovery, the global elite used condensation trails of passenger aircraft to release chemical neural toxins into the air that were used as a form of mind control. These toxins are the cause for the growing rate of respiratory illness in otherwise healthy individuals around the world. **(item 3)**

5. On April 13th 2020, in the Bolivian of *K'ara K'ara* and *Yapacani*, local news outlets exposed that the rise in COVID-19 cases in the area occurred at the same time as the installation of multiple cell towers. Once those towers had been pulled down, the number of cases per day had begun to dramatically decrease leading to civil unrest. This is example of many, that through the Bill and Melinda Gates foundation, COVID-19 was able to reach developing countries through 5G, that otherwise were unlikely to experience the pandemic. **(item 4)**

6. The vaccines for COVID-19 created by large pharmaceutical companies such as Pfizer and AstraZeneca, have been created to insert nanotechnology into the bloodstream, creating a digital imprint unique to every person. This means a Global Civil Registry can be created, where every person's location and actions can be tracked. **(item 5)**

Appendix F5 – The Scientific Application to Conspiracy Task (SAC –T)

In the following task, you will be presented excerpts from various different articles available from online news websites or blogs. Following the excerpt are questions for you to answer. Some of these questions will ask you to rate on a 6-point scale how credible the information is presented to you ranging from 1 (Highly Fictitious) to 6 (Highly Credible), and, how likely the point raised by the excerpt is to be true from 1 (Highly Unlikely) to 5 (Highly Likely).

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Item 1: Dummy Item (The benefits of Omega 3)

> "The American Heart Association (AHA) recommends that everyone eats fish (particularly fatty, coldwater fish) at least twice a week. Salmon, mackerel, herring, sardines, lake trout and tuna are especially high in omega-3 fatty acids. While foods are your best bet for omega-3s in your diet, fish oil supplements are also available for those who do not like fish. The heart-healthy benefits of regular doses of fish oil supplements are unclear, so talk to your doctor to see if they are right for you. The AHA says taking up to 3 grams of fish oil daily in supplement form is considered safe. Don't take more than that unless you discuss it with your doctor first."

Questions:

1. True or false, coldwater fish, such as lake trout and tuna are the better source of omega-3 fatty acids.

2. The information presented is… 1 (Highly Credible) to 6 (Highly Fictitious)

3. Based on the information presented by the journalist, how likely are you to include Coldwater fish into your diet? 1 (Not likely at all) to 5 (highly Likely)

Item 2: Fluoride (Drawn from NaturalNews.com)

Scientific concept: Causality, confounding variables

> "There are many health risks that we may be unaware of that can cause harm to our children. Some of those risks are right in front of us, in our own kitchen. For several decades the government has been putting fluoride concentrate in our water without our consent, which is said to prevent tooth decay. However, those made aware know that fluoridated water also has resulted in a decrease in our children's IQ scores. One study in the peer reviewed journal *JAMA Pediatrics*, found that mothers who had consumed fluoridated tap water while they were pregnant tended to give birth to children who ended up having slightly lower IQ scores by ages 3 to 4. This important piece of research is evidence that action must be taken to stop our drinking water undergoing fluoridation."

Questions:

1. True or false, the text suggests the government originally put fluoride in our water in order to prevent tooth decay?
2. The information presented is… 1 (Highly Fictitious) to 6 (Highly Credible)
3. Based on the information presented by the journalist, how likely is it that fluoride may affect children's IQ scores?

Item 3: Dummy Item (Thalidomide)

> "There are many reasons to be cautious of pharmaceutical interventions that have not been rigorously tested for potential side effects. For example, in 1954, the drug Thalidomide was introduced by CIBA, a Swiss pharmaceutical company into the UK primarily as a treatment for morning sickness during pregnancy. However, following its widespread use in Japan, Australia, and Europe, practitioners noticed links between mothers who had taken thalidomide and the presence of congenital mutations in their children. Following, research by Dr Widukind Lenze and Dr William McBride affirmed this observation, and findings were further backed by several cases across the world, and according to the World Health Organization, several studies reported 10,000 children are thought to have been born with phocomelia because of Thalidomide use in mothers. These abnormalities were not observed in the US, as the U.S. Food and Drug Administration did not approve or license the use of Thalidomide. Since, the *Thalidomide Trust*, a non-for-profit organization, has been established to aid those affected."

Questions:

1. Based on the information presented by this journalist, how likely is it that Thalidomide is related to severe side effects during pregnancy such as congenital disease? …. 1 (Not likely at all). to 5 (very likely)
2. The information presented is likely to be 1 (highly fictious) to 6 (highly credible)

3. True or False? Thalidomide was first introduced in the UK primarily for treatment of morning sickness?

Item 4: The importance of Zinc (based on Natural News.com)

Scientific concept: Causality, confounding variables

> "Of all the different nutrients recommend in our diet, the one that is potentially the most beneficial is Zinc. A meta-analysis published in 2017 found those who took zinc supplement of 80 to 92 milligrams (mg) each day at the beginning of colds saw a reduction in the length of their cold by 33 percent. A Zinc deficiency prevents the activation of T-lymphocytes, and stops the function of macrophage cells, which can trigger cytokine production. Also, early and outpatient treatment from the Front Line COVID-19 Critical Care Alliance, contains zinc, as does the protocol recommended and prescribed by Dr. Vladmir Zelenko. It was found that those in outpatient treatment had severely low levels of zinc, meaning that those who were zinc deficient were far more likely to experience more severe symptoms of COVID-19. However, the importance of Zinc does not receive a lot of publicity because of the supplements relative low cost to purchase."

Questions:

1. Based on the information provided by the journalist, how likely is it that Zinc is an effective supplement in reducing the severity of COVID-19 symptoms? 1 (Not likely at all) to 5(Very Likely)
2. What is the name of the researcher used in this text (multiple choice, Dr Vladmir Zelenko is the correct answer)
3. The information presented is… 1 (highly fictitious) to 6 (highly credible)

Item 5: MMR Vaccine related to autism – Wakefield 1998

Scientific concept: Causality, confounding variables

> "Recent scientific media has not been entirely transparent with information regarding the most advanced medical technology. In the last 40 years, next to no deaths have been as a result of Measles in modern western society, yet, most children around the world are mandated to receive the Measles, Mumps and Rubella (MMR) vaccine as an infant. In fact, one brave piece of research pioneered by Andrew Wakefield, demonstrated that the MMR vaccine may predispose children to behavioral regressions and pervasive developmental disorders. For example, since the introduction of the MMR vaccine, more cases of autism among children have been reported per year, and this number has increased every year this vaccine has been widely administered."

Questions:

1. Based on the information provided by this journalist, how likely is it that the MMR vaccine is related to developmental social disorders (such as Autism) within children who receive it? …. 1 (Not likely at all) to 5 (Very Likely)
2. What is the name of the researcher used in this text (multiple choice, Andrew Wakefield is the correct answer)
3. The information presented is … 1 (highly fictious) to 6 (highly credible)

Item 6: Dummy item (Global Warming- Ice Caps).

> "It is important that we teach our children about the effects of climate change, and most importantly, our impact on the earth. According to the Intergovernmental Panel of Climate Change, Polar ice caps are melting as global warming causes climate change. We lose Arctic Sea ice at a rate of almost 13% per decade, and over the past 30 years, the oldest and thickest ice in the arctic has declined by a stunning 95%. If emissions continue to rise unchecked, the Arctic could be ice-free in the summer by 2040. But what happens in the Arctic does not stay in the Arctic. Sea ice loss has far-reaching effects around the world. But something can be done about climate change. Limiting the increase in global temperature is our best chance of securing a safer future for all, preventing even some damaging consequences than we've already seen. By keeping the rise to 1.5 C (2.7 F) we can prevent the worst effects of climate change. But, helping communities and wildlife adapt to changes already underway in the meantime is essential."

Questions:

1. What are we losing at a rate of 13% per decade? (multiple choice, answer is the Arctic Sea)
2. The information presented is … 1 (highly fictitious) to 6 (highly credible)
3. Based on the information provided by this journalist, how likely is it that we are currently experiencing Climate Change? 1 (Not Likely at all). To 5 (Very likely)

Item 7: Cannabis Oil, Laetrile cures Cancer (Natural Remedy conspiracy)

Scientific concept: Causality, confounding variables

> "Billions of dollars of funding have been put into many ways to treat and prevent cancer across the world. However, a lot of this research is funded and continued in order to hide the best remedies and cures from us. This is a ploy western countries have been using for years, just look at the prohibition of Cannabis over the past century as the best example. Specifically, Cannabis oil that can be extracted from a cannabis plant, has been shown to have several abilities, such as: destroy or shrink cancerous tumours, cure diabetes, ulcers, arthritis, migraines, and infections along with many other diseases. Cannabis oil has also been FDA approved to reduce cancer treatment-related side effects such as nausea and vomiting. However, they have concealed the fact that not only does Cannabis oil help cure cancer, but it fights of the toxic effects of false treatments such as chemotherapy. This is not the only example unfortunately. The product Laetrile, a purified form of amygdalin that is extracted from natural apricot seeds, nuts and plants, when broken down in the stomach becomes a potent agent that kills cancer cells while leaving normal tissue unharmed. However, again due to its relatively low cost and easy of creation, it is not made available to the public."

Questions:

1. Based on the information provided by this journalist, how likely is it that there are more natural remedies that can be used to fight cancer, not currently allowed as they conflict with the financial interests of governing bodies? 1 (Not likely at all) to 5 (Very Likely)

2. What is Laetrile made from? (Multiple choice, correct answer is apricot seeds)

3. The information presented is … 1 (Highly fictitious) to 6 (Highly Credible)