

Understanding snacking: the role of personality and habit strength

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Abstract

Snacking, or eating in-between main meals, especially the consumption of snacks high in fat, salt and/or sugar is a major contributor to excessive energy-intake and long-term weight gain. Previous research has explored the predictors of unhealthy snacking, including personality traits. However, there is a need to investigate potential explanatory variables such as reasons for snacking, and habit strength that may explain these associations. In this study, we explored the relationship between personality traits, habit strength, and snacking motivations and behaviours. Participants included 230 Australian adults (Male 26%; Female 71%; Other 3%) aged 18-77 who completed an online survey. Survey items assessed personality traits (The Big Five Inventory 2); habit strength (the Self-Report Habit Index); reasons for snacking (the Eating Motivation Scale), and snacking behaviour (the Snack Frequency Questionnaire; Snack Preference Task). Correlation and multiple regression analyses were run to explore the relationships: (a) between respondents' reasons for snacking and personality traits; (b) habit strength on snacking behaviours; and (c) between personality and habit strength and the reasons for snacking. The results indicated that personality traits and reasons for snacking predicted the quantity and quality of both momentary and habitual snack choices. In particular, the results indicated different snacking pathways based on personality and reasons for snacking, with traits such as conscientiousness being associated with healthy adaptive snacking motivations and choices, and neuroticism being associated with more emotion-driven and less healthy snack choices.

Keywords: Snacking Behaviour, Habit Strength, Personality Traits, Quantitative

Declaration

This thesis contains no material which has been accepted for the award of any other degree or diploma in any University, and, to the best of my knowledge, this thesis contains no material previously published except where due reference is made. I give permission for the digital version of this thesis to be made available on the web, via the university of Adelaide's digital thesis repository, the library search and through web search engines, unless permission has been granted by the School to restrict access for a period of time.

Signed

Contribution statement

My supervisors and I collaborated to generate research questions of interest and design the appropriate methodology. Research staff at CSIRO created the snack preference task measure used in the survey. Professor Delfabbro assisted in the reviewing of the ethics application and advised on the data preparation and analysis. I conducted the literature search, completed the ethics application, wrote the Qualtrics Survey and was responsible for data analysis and thesis write-up. Dr. Brindal, Dr. Kakoschke, and Professor Delfabbro assisted in the editing of the thesis.

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1.1 Eating Behaviours and Health

Eating is a complicated behaviour and involves, not only the foods eaten, but also the frequency, timing, portion, and quality. Eating behaviours have important implications for weight and health. One of the most common outcomes of poor dietary choices is overweight and obesity with 67% of Australian men and 52% of Australian women currently affected (Eckersley, 2001). Obesity is thought to be the outcome of a variety of behaviours, amongst which energy imbalance is a primary driver. Energy imbalance can occur through overeating large portions or through high energy density (e.g., high-fat items), and through lack of compensatory energy expenditure (Bellisle, 2014; Eckersley, 2001). Being obese has many co-morbidities including heart disease, high blood pressure, osteoarthritis, type 2 diabetes, and some cancers (Eckersely, 2001). Poor eating behaviours have also been linked to health conditions such as inflammation, oxidative stress, type 2 diabetes, and heart conditions (Fardet & Boirie, 2014). For example, a longitudinal study of personality and health from 669 US adults, found that psychological wellbeing, mortality, and reductions in quality of life can be negatively affected by less healthy eating behaviours (van den Bree, Przybeck & Robert Cloninger, 2006).

Despite these associations and appreciation of the role of dietary habits, there is no universally accepted definition of which foods are the worst for health. Health outcomes can be influenced by frequency, time, quality and quantity of eating and other behavioural factors. Nonetheless, the Australian Dietary Guidelines make suggestions about optimal ways to eat for good health. This includes eating from a variety of nutritious foods such as vegetables, legumes and beans, grain foods, lean meats, fish, poultry, eggs, yoghurt, and cheese, and limiting high-fat foods ("Australian Dietary Guidelines", 2015). Increasingly, there is a focus on the role of incidental, convenience and snack foods because it is known

that these did not exist during periods of history when fewer people were over-weight or obese (Miller, Benelam, Stanner & Buttriss, 2013).

1.1.1 Snacking

Snacking is a specific eating behaviour that has become increasingly prevalent over the last few decades and is now recognized as a key part of overall eating behaviours. Nutrient-poor foods and foods high in fat and sugar consumed as snacks can contribute to negative health outcomes, while nutrient-rich foods and low fat or sugar foods can benefit health. Thus, the quality of snacks is a determinant of their healthiness, with the frequency and quantity of snacking also being important factors. The Australian Dietary Guidelines recommend limited consumption of foods high in fat, salt, and sugar ("Australian Dietary Guidelines", 2015). Snacking is known to vary across individuals and contexts, and that it can contribute to obesity and overweight prevalence (Verhoeven, Adriaanse, de Vet, Fennis & de Ridder, 2015), although there are other findings that note the potential for snacking (or more intermittent eating) to improve appetite, and weight control and management (Miller, Benelam, Stanner & Buttriss, 2013).

Snacking as a behaviour alone is not considered unhealthy with many diet plans promoting smaller, more frequent snacking as opposed to fewer, larger meals (Bellisle, 2014). However, while some forms of snacking improve energy and nutritional intake, unregulated and spontaneous snacking commonly involves energy dense foods that are high in fats and sugars (Bellisle, 2014). The latter snacking style is linked to higher rates of overweight and obesity which can compromise mental and physical health quality (De Vet, et al., 2015). Snacking has been shown to significantly increase energy intake and balance. However, when such goods are consumed in addition to main meals there is the risk of adding in excess to daily energy intake rather than displacing it (Mattes, 2018).

Together, food quality, quantity, and frequency of consumption determine total energy intake, and total energy can increase or decrease as a result of increase or decrease in any of these three components. For example, greater frequency of smaller quantities will achieve more balance energy intake compared to greater frequency of larger quantities. A previous study examined data collected between 1971-1974 and 2007-2010 from the national health and nutrition examination survey (NHANES) in the US and found that energy intake from meals and snacks had increased significantly (Mattes, 2018). They also demonstrated that for almost 10% of the sample population, snacks made up 50% of daily energy intake, and concluded that the significant increase in energy intake was influenced by the increase in frequency of eating occasions (Mattes, 2018).

In countries such as the US, the frequency of eating determined by number of food consumption occasions has been reported at an average of 4.28 times per day for adults according to data from a sample of 19, 472 from the NHANES between 2003-2018 (Murakami & Livingstone, 2016). European studies report an average of 5.95 times per day based on cross-sectional evidence from 10 European countries (Huseinovic et al., 2016). Further, several US based studies have shown that energy intake specifically from snacking has increased, whereas energy intake from meals have decreased (Green, Siwajek & Roulin, 2017). Despite these findings, the overall impact of increased frequency of eating on health remains unclear. Some studies show that increased energy intake and increased snack frequency are associated with lower prevalence of obesity and overweight in a secondary analysis of data from the NHANES for 5,811 US adolescents from 1999-2004 (Keast, Nicklas & O'Neil, 2010). However, their study also showed that energy intake from snack foods could both foster weight gain, and aid weight management according to types of snacks, frequency, and regulation of consumption, with other studies also showing contrasting links between snacking, overweight and obesity, and energy regulation (Keast,

Nicklas & O'Neil, 2010; Green, Siwajek & Roulin, 2017). Thus, although snacking behaviours and frequency have increased, to understand the overall impact of snacking on health it is important to consider and understand the influence of snack food quality (i.e. nutritional quality) and quantity.

Another part of the reason that there is no clear or consistent health messages about snacking may be the lack of a universal definition for snacking. In particular, there is no set definition for what exactly snacking encompasses with researchers defining snacking based on consumption of specific food types, the food quantity, and context of eating occasion (Cleobury & Tapper, 2013; Conner, Fitter & Fletcher, 1999; Spanos & Hankey, 2010). However, most commonly snacking has been used to describe food or beverage consumption in between the three main daily meals i.e., breakfast, lunch, and dinner (Cleobury & Tapper, 2013). This definition was adopted in this review and the associated research because it is inclusive of a variety of snacking behaviours, including healthy and unhealthy snacks, and can be applied across multiple contexts and cultures.

Previous research on eating behaviours and related health outcomes have highlighted the necessity of considering and understanding snacking with the intention to design and implement interventions, programs and regimes to assist and coach individuals who wish to improve eating behaviours (Renner, Sproesser, Strohbach & Schupp, 2012). It has been suggested that such interventions would be more effective when considering the differences in snacking behaviours. Part of this involves understanding the frequency, quantity, and quality of snacking, but also the underlying reasons and motivations for snacking. In other words, for interventions to be targeted correctly, it is important to better understand the aspects of snacking behaviours for different individuals and what motivates them to make certain choices and not others.

1.2 Reasons for snacking and health implications

There are many potential reasons for snacking behaviours, including hunger, liking, negative affect, convenience, and sociability (Renner, et al., 2012; Steptoe, Pollard & Wardle, 1995). For example, information from conducted literature reviews, nutritionist interviews, and psychology department members were used to generate a comprehensive measure for eating motivations in a European study (Renner, et al., 2012). A total of 300 reasons were identified and then consolidated into a more focused questionnaire administered to 1,250 University students in Germany. The data from the questionnaire was then analysed and a final measure was produced with 78 remaining motivations for snacking in The Eating Motivations scale (TEMS) (Renner, et al., 2015). These motivations were further categorised into 15 sub-groups including liking, need and hunger, habit, health, pleasure, price, convenience, traditional eating, natural concerns, visual appeal, sociability, weight control, affect regulation, social norms, and social image.

Research that has examined motivation shows that sociability and social image to be the most common reasons for snacking (Verhoeven, et al., 2015), and that contextual factors are also important, with many people most commonly reporting snacking at home or at work and when they are alone (Cleobury & Tapper, 2013). These observations about the often solitary nature of snacking suggest that reasons other than sociability are also likely to be important and that the interaction between motivation and context needs to remain central to research investigations. As another example, snacking has been found to fluctuate during exam periods where some people tend to eat more, and others tend to eat less, which could be attributed to exam related stress or anxiety, time flexibility, or appetite (O'Connor & O'Connor, 2004). However, even when one understands why and when people are likely to engage in snacking, it is also important to understand who or which people are most likely to

engage this behavior in certain situations. For this reason, a number of studies have directed their attention towards the role of individual differences in predicting snacking behavior.

1.2.1 Individual differences in reasons for snacking

Individual differences have been shown in reasons for snacking. A sample randomly drawn from a population register completed a survey and the data showed that women report response to negative emotion, special occasions and gaining energy as reasons for snacking more than men (Verhoeven, et al., 2015). In another study, 60 students from an English university completed a questionnaire that included the Dutch Eating Behaviour Questionnaire and showed a common reason for eating unhealthy snack foods is negative emotion such as stress and sadness (Conner, Fitter & Fletcher, 1999). Further, a study involving a survey of university students and staff and local residents in London explored eating motives, as well two personality traits: neuroticism and openness to experience. The findings demonstrated a link between higher neuroticism scores and eating for stress responses, and a link between openness to experience and familiarity as a reason for snacking (Stephoe, Pollard & Wardle, 1995).

1.3 Personality and its relationship with snacking

One potential driver of reasons for snacking and eating generally is personality. Personality is understood and represented by repeated expressions of behavioural patterns and characteristics in individuals including thoughts, feelings, and actions (Intiful, et al., 2019; Soto & John, 2017). A widely accepted model in research is the Five Factor Model (FFM) of personality, which consist of five main personality traits that differentiate and conceptualize behavioural characteristics and patterns (Pfeiler & Egloff, 2020). The five domain traits of personality (John, Naumann & Soto, 2008; Soto & John, 2017) include:

- Openness: expanse, originality, and complexity of one's mental and experiential life and considers intellectual curiosity, creative imagination, and aesthetic sensitivity
- Conscientiousness: impulse control that affects goal directed behaviour such as thinking before acting and adhering to norms and rules, and considers organisation, productivity, and responsibility
- Extraversion: the approach and energy towards the social and material world, considers sociability, assertiveness, and energy level
- Agreeableness: orientation towards others and considers compassion, respectfulness, and trust.
- Neuroticism: opposite of emotional stability and considers anxiety, depression, and emotional volatility

These five traits have attracted different terms in research. For example, openness might also be referred to as open-mindedness (Steptoe, Pollard & Wardle, 1995; John, Naumann & Soto, 2008). Nevertheless, there is a sufficient convergence of definitions to allow insights into the role of personality and snacking (Soto & John, 2017).

Personality has been explored to understand its role in health and health-related behaviours, including eating behaviours. One example of this is the Baltimore Longitudinal Study of Aging that involved 1,988 community volunteers to examine links between personality traits and weight. The results demonstrated that neuroticism and extraversion were positively associated with overweight and obesity, while agreeableness, openness and conscientiousness were negatively correlated (Sutin, Ferrucci, Zonderman & Terracciano, 2011). In Australia, data from the Household, Income, and Labour Dynamics of 13,982 surveys found associations between carbohydrate-based and meat-based diet and conscientiousness, agreeableness, and neuroticism, and a positive association between all five

personality traits, plant-based and fish diets (Pfeiler & Egloff, 2020). Additionally, previous research has shown links between neuroticism and conscientiousness with eating behaviours and snacking. Specifically, neuroticism has been of interest with the assumption that its link with emotional volatility would influence eating behaviours, and for the most part evidence between neuroticism and eating behaviours has supported that assumption (Steptoe, Pollard & Wardle, 1995). In their study, the data of a survey that included measures of food choice, and neuroticism and openness to experience from 716 participants, aged 17-86 from a university community was analysed and the results demonstrated a positive association between neuroticism and eating response to deal with stress (Steptoe, Pollard & Wardle, 1995). The association between unhealthy eating behaviours and eating for stress or emotion response, has also been shown to be associated with neuroticism in other studies (Verhoeven, et al., 2015; van den Bree, Przybeck & Robert Cloninger, 2006).

By contrast, higher levels of conscientiousness have been found to be associate with healthier eating behaviours or foods lower in fat, less binge eating, and less likely to eat for emotion response (Intiful, et al., 2019; O'Connor & O'Connor, 2004). However, less attention has been directed towards the three remaining traits: extraversion, openness, and agreeableness, although some recent studies have shown that agreeableness is associated with more food variety (Intiful, et al, 2019), and openness with foods high in fiber, and greater levels of food interest (Goldberg & Strycker, 2002; Intiful, et al, 2019).

1.4 Habit strength and its influence on snacking

Another factor that may be linked to snacking behaviour is habit. Behaviours that are performed with automaticity and minimal cognitive process are commonly known as habits, and habits are also referred to as behaviour patterns that occur automatically in particular situations or following specific cues (De Vet, Stok, De Wit & De Ridder, 2015), for example

brushing your teeth. Many daily or regular behaviours are considered habitual as they take the form of repeated behaviours, which includes eating behaviours. Most research recognizes the prevalence of habits within the arena of eating behaviours and have acknowledged them as a key contributor (De Vet, et al., 2015). Specifically, in relation to eating behaviours, habits often maintain unhealthy eating behaviours and influence subsequent health problems (Goldberg & Strycker, 2002).

Evidence in support of the habitual nature of snacking is observed in some of the reported reasons for snacking. As Renner et al. (2012) note: people will say that: 'it's just me', 'that's just what I do', 'I don't know, I don't even think about it' which suggests an element of automaticity and frequency (De Vet, Stok, De Wit & De Ridder, 2015). Such observations are supported by quantitative research. For example, one study found a positive association between habit strength and unhealthy snacking from cross-sectional data from a survey completed by 11, 392 European adolescents (De Vet, et al., 2015). Habits may also be context specific (e.g., eating cake at a wedding). Spanos and Hankey (2010) investigated this topic in a study where a food frequency questionnaire was completed by 80 university students from Greece and 80 university students from Scotland. In their study the cultural groups selected different types of snacks as based upon the apparent differences in the availability or quality of snacks in the different countries (Spanos & Hankey, 2010). Thus, habit has the potential to indirectly influence snacking through selection of items of familiarity, or previously repeated consumption. Moreover, habits could indirectly influence the reasons for snacking in different contexts, for example, even in the absence of hunger it is common for people to snack in response to simple contextual cues such as coming home from work, meeting up with friends, or studying at university (Renner, et al., 2012; Spanos & Hankey, 2010)

The broader term, habit strength, is the measure of the overall influence of habits. In studies that have explored eating intentions, it was found that habit strength outperformed all intentions and motivations for eating. This was confirmed in a study of 118 female university students in Utrecht, that examined the results of a surveys and food diaries from a group that were ask identified intentions and a group that were not (Adriaanse, de Ridder & de Wit, 2009). Thus, despite individuals' intentions, what they wanted to eat, and whether they were aware of the potential consequences of unhealthy snacking; habits were more influential on their behaviours.

Additionally, increased levels of neuroticism, openness, and extraversion appear to be linked with unhealthy habits including smoking, addictive behaviours, lifestyle, and negative attitudes (Vingerhoets, Croon, Jeninga & Menges, 1990; Lemos-Giráldez & Fidalgo-Aliste, 1997), while conscientiousness and agreeableness are linked to heathier habits, including physical exercise, achievements, and lifestyle (Lemos-Giráldez & Fidalgo-Aliste, 1997; Wood, 2017). Therefore, personality and habit strength have shown to be associated, and both are likely to influence snacking behaviour.

1.5 The current study

While some studies have explored the relationship between habits and eating behaviours, and habits and personality, there has been little research on the combined influence of habit strength and personality on snacking as a specific eating behaviour. Thus, an aim of this study is to explore how personality and habit strength predict snacking behaviours.

This study had three main aims. First, we aimed to examine the link between each of the Big five personality traits (open-mindedness, conscientiousness, extraversion, agreeableness, and neuroticism) with snacking. It was expected that neuroticism would be

positively associated with unhealthy snacking, and that conscientiousness would be positively associated with healthy snacking, as per previous research. We also explored whether the other personality traits (Open-mindedness, Extraversion, and Agreeableness) would be significantly correlated with snacking. Given that open-mindedness has been shown to associate with greater levels of food interest (Intifal, et al., 2019), and is concerned with expanse, curiosity, and experience (John, Naumann & Soto, 2008), we expected that open-mindedness would be associated with a greater range of snacks. Additionally, as extraversion is concerned with sociability, we expected that there would be an association with snacking given the link between sociability and snacking (Verhoeven, et. Al., 2015). Finally, given that agreeableness has be shown to associate with higher levels of food variety (Intifal, et al., 2019), and concerns orientation towards others (John, Naumann & Soto, 2008), we expected that it would associate with multiple snack selections, and social reasons for snacking. As mentioned earlier, Openness, and Agreeableness have been found to associated with broader eating behaviours (Goldberg & Strycker, 2002; Intifal, et al., 2019). Therefore, we expect to see general associations between open-mindedness, extraversion, and agreeableness with snacking as a specific eating behaviour based on exploratory observations. Second, we aimed to investigate the link between each of the Big five personality traits and a comprehensive set of reasons for snacking.

Third, we aimed to examine whether personality traits, habit strength, and reasons for snacking predict snacking behaviours with the goal of further understanding not only that personality and snacking are associated, but how and why. We explored whether: (a) certain reasons for snacking would predict snack choice; and (b) personality and habit strength would both predict specific reasons for snacking. No specific hypotheses were specified for this part of the analysis, but we expected that healthy or adaptive reasons for snacking would be associated with personality factors associated with healthier snack choices (e.g.,

conscientiousness), or unhealthy choices (e.g., neuroticism). Given that some reasons for snacking have been examined in previous research and shown to influence snack choice (Renner, et al., 2012), and although this section of the analysis was principally exploratory, we expected that the reasons indicated in this study would be predicted by at least one of the Big five personality traits and/or habit strength.

Method

2.1 Participants

Participants were adults aged 18 years or older and residing in Australia. Inclusion criteria included reported consumption of snacks at least once per week. Data screening was used to remove 28 incomplete surveys and those which had not completed the key measures ($n = 19$). This yielded a final analysis sample of 230. Table 3.1 displays the descriptive statistics for the sample. As indicated in table 2.1, majority of the sample were females, and ages were 18-69 with a mean age of 34 years ($SD = 13.4$). More than half of the sample had at least a TAFE qualification or University degree. The majority of participants were not currently on a diet.

Table 2.1

Descriptive Statistics for Participants (N=230)

SAMPLE	N	%
GENDER		
Male	60	26.1
Female	164	71.3
AGE		
18-24	62	26.9
25-34	81	35.2
35-44	33	14.3
45-54	19	8.2
55+	29	12.6
EDUCATION		
High School Not Complete	7	3.0
TAFE or university degree	126	54.8
Higher education	73	31.7
CURRENT DIET		
Yes	30	13
No	200	87

Note: percentages do not sum to 100% due to non-responses/missing data

2.2 Measures

The online survey included several measures to assess snacking behaviours, personality, habit strength, and demographic information of participants.

2.2.1 Demographics

Participants provided information about their age, sex, culture, weight, diet status, and income and living information. Given that the data was collected between May 2020 and July 2020, one question was included to capture any potential influence of the COVID-19 pandemic on snacking, i.e., ‘have your snacking behaviours changed in the last month?’. (See Appendix C for demographic questions).

2.2.2 Snack Frequency Questionnaire (SFQ)

The SFQ (Gardner, Corbridge & McGowan, 2015) measured habitual snacking by asking participants to indicate specific snacks they had consumed in the last 2 weeks. The SFQ included 25-food and beverage items and participants indicate how often in the last 2 weeks they had consumed each item rated on a scale ranging from 1 (not at all) to 7 (three or more times per day). They also indicated the average serving size of each item ranging from 1 (small) to 4 (extra-large) compared to a medium serving size. Items selected were scored as healthy and unhealthy and then weighted by serve size producing a final total healthy and unhealthy habitual snacking score. This measure was also used as a screener and determined whether participants were eligible for the study based on their outcome and according to the inclusion criteria. Anyone whose responses indicated that they had not consumed snacks at least once per week were excluded from the sample.

Modifications were made to the SFQ food and beverage descriptions and examples of each item and medium serve size to make it relevant to an Australian context. Dips and dried fruit were not included in the modified SFQ as the Australian Dietary Guidelines classify these items as both healthy and unhealthy ("Australian Dietary Guidelines", 2015). Beverages were also added to the list of items as tea and coffee are commonly consumed snacks in Australia.

2.2.3 Snack Preference Task (SPT)

The SPT was developed by the study team to measure momentary snacking, namely, snack preferences and choice in a hypothetical context at a given point in time to minimize the influence of any availability and price restrictions. Snack item selection for this measure was guided by popular snack items from the Australian Bureau of Statistics Nutrition data, and were classified according to healthiness (i.e., core and non-core). An initial menu was developed and scored by three registered dietitians to ensure items met the desired criteria. The final 40 items included two options for type of snack (non-core/core) based on popularity as well as extras such as spreads to make the overall scale seem more realistic.

Participants were asked to indicate which of the items they would like to eat at that current moment and to indicate a quantity for each item by selecting from a drop-down menu. If none of the items appealed to a participant, they had the option to suggest an item they would like to eat using a free text option. Serve size and kilojoule information was recorded based on the Calorie King website for Australian products ("Food Nutritional Database | CalorieKing (Australia)", 2020), but this information was not visible to participants during the survey. Each selected item from the SPT was converted into kilojoules and according to its designated category (core/non-core). This information was used to calculate the total energy (kJ) from selected items, and a percentage of non-core items selected.

2.2.4 Big Five Inventory 2 (BFI2)

The BFI-2 (Soto & John, 2017) is an updated version of the Big Five Inventory extended to include a balanced and more robust representation of domain traits via facets. The BFI-2 assesses the Big five personality traits: Open-mindedness with facets: intellectual curiosity, creative imagination, aesthetic sensitivity; conscientiousness with facets: organization, productivity and responsibility; extraversion with facets: sociability,

assertiveness, energy level; agreeableness with facets: compassion, respectfulness, trust; and Neuroticism with facets: anxiety, depression, emotional volatility.

Participants were asked to indicate their level of agreement with 60 different statements on a scale ranging from 1 (strongly disagree) to 5 (strongly agree). The means were calculated at both domain trait level and facet levels with higher scores indicating higher levels of each, with total mean scores ranging from 1-5. The facet scores were summed with totals indicating the score for domain traits.

2.2.5 The Eating and Motivations Survey (TEMS)

The Eating Motivation Survey (TEMS) is a 46-item measure of 15 different reasons and motivations for eating (Renner, et al., 2012). The represented reasons included liking, habit, need and hunger, health, convenience, pleasure, traditional eating, natural concerns, sociability, price, visual appeal, weight control, affect regulation, social norms, and social image. Each reason was assessed with three items except for natural concerns, which had four associated items. Participants were asked to indicate on a scale of 1 (never) to 7 (always) how true each statement is regarding their snacking behaviour (e.g., because I have an appetite for it, because others like it, etc.). In this study, the scale wording was slightly modified to ask: 'I eat what I snack on...' instead of 'I eat what I eat...' to ensure that responses were specific to snacking, as opposed to broader eating behaviours. The scores for each item within each of the 15 subscales was used to calculate the mean and therefore how strongly snacking occurs for each reason with higher scores indicating the higher relevance of reason for snacking.

2.2.6 Self-Report Habit Index (SRHI)

The Self-Report Habit Index (SRHI) is a 12-item scale that measures habit strength (Verplanken & Orbell, 2003). Participants indicated on scale ranging from 1 (strongly agree) to 7 (strongly disagree) how true each statement is about how much their snacking behaviour

occurs by characteristics of habit (e.g., I do frequently, I do without thinking etc.). In this study the wording of this measure was presented as ‘snacking is something I do when...’. The responses for each of the 12 items are calculated to produce a mean score of habit strength with total mean scores ranging from 1 to 7, with higher scores indicating higher levels of habit strength.

2.3 Procedure

The survey was open from May to July 2020 and was advertised via social media including Facebook and Instagram (see Appendix A). Upon clicking the survey link, participants were presented with an information sheet to read, and consent was attained when they proceeded to the first page of the survey. The information sheet ensured anonymity of participants to encourage honest responses and described that upon completion of the survey, participants were able to go in the draw to win a single \$250 grocery voucher (see Appendix B). The SFQ was the first task in the survey and measured snacking behaviour for the previous two weeks and screened out participants that reported snacking less than once per week in that timeframe. This questionnaire was followed by demographic questions, the SPT, BFI-2, TEMS, and finally the SRHI. The survey took a total of 15-20 minutes to complete. Upon completion, participants were invited to leave their email address for either a chance to win the grocery voucher, to receive a summary of results, or both. The survey was administered using Qualtrics online software. The study was approved by the Human Ethics Sub-committee at the Adelaide University School of Psychology, project number 20/33.

2.4 Data analysis

Statistical analyses were conducted using SPSS v.26. (IBM Corp., 2017)

First, Pearson’s correlation analyses were run to assess the relationships between reasons for snacking and snack choices; personality, habit strength, and snack choices; and

personality, habit strength, and reasons for snacking. These bivariate relationships were assessed to screen for variables suitable for regression models.

Multiple regression analyses were conducted to examine the best predictors of snacking based on KJ content, and non-core items momentary snacking, and healthy and unhealthy habitual snacking totals. The models included only those variables which were found to be significantly related to each measure based on the first order correlations.

Hierarchical multiple regression analyses were run to assess whether the significant variables predicted snacking outcomes (total kJ, non-core, healthy, and unhealthy); and significant reasons (price, health, pleasure, visual appeal, habits, and natural concerns). In the multiple regression analyses for snacking, age, gender, and habit strength were entered at step 1, personality traits were entered at step 2, and reasons for snacking were entered at step 3. Thus, some regression analyses had two models, while others had three based on the need to control for other factors identified by the first order correlations. In the multiple regression analysis for reasons for snacking, habit strength was entered at step 1, and the Big five personality traits (open-mindedness, conscientiousness, extraversion, agreeableness, and neuroticism) were entered at step 2.

2.4.1 Power analysis

G*Power 3.1 (Faul, Erdfelder, Lang, & Buchner, 2009) was used to run two *a priori* power analyses with the input parameters set to: two tails, medium effect size of .3, $\alpha = .05$, and power = .95 for both a correlation point biserial model and a linear multiple regression, fixed model R^2 increase. The linear regression model included 18 tested predictors and 34 predictors in total. The correlation power analysis indicated that 138 participants were required, while the multiple regression power analysis indicated that 117 participants were required. The obtained sample size (N=230) was greater than both of these figures and so the

study had sufficient statistical power. The study being overpowered is likely a result of time-based recruitment. The survey was open for eight weeks rather than until a certain amount of completions were achieved, therefore the data quality was not known until the survey was closed and data analyses commenced.

Results

3.1 Descriptive statistics

Table 3.1 displays the means, standard deviations, and ranges for the snacking measures (SPT: kJ; non-core; SFQ: healthy; unhealthy), snacking reasons (TEMS) personality (BFI-2), and SRHI (habit strength). All measures had good internal consistency as indicated by the alpha values. Participants showed higher scores for healthy habitual snacking than unhealthy habitual snacking. The most common reasons for snacking were liking, and convenience, followed by habit, need and hunger, and pleasure, with social image being the least common reason. Personality traits and habit strength means were at the mid-point of the scale.

Table 3.1

Descriptive statistics for snacking, reasons, personality, and habit strength (N=230)

	α	M	SD	Actual range
(SNACKING)				
SPT				
Total KJ		2313.47	1860.89	0-9654
Non-core %		33.34	27.34	0-100
SFQ				
Habitual Healthy		54.22	36.57	0-224.14
Habitual Unhealthy		34.77	29.98	.98-202.37
TEMS (REASONS)				
Liking	.79	5.01	1.09	1.33-7
Habit	.92	4.32	1.44	1-7
Need and Hunger	.67	4.17	1.27	1-7
Health	.91	3.31	1.58	1-7
Convenience	.94	5.12	1.38	1-7
Pleasure	.68	4.02	1.12	1.33-7
Traditional eating	.73	2.66	1.24	1-6
Natural concerns	.88	2.53	1.45	1-7
Sociability	.88	3.12	1.38	1-6.67
Price	.80	3.21	1.43	1-7
Visual appeal	.78	2.37	1.17	1-6.33
Weight control	.90	2.64	1.49	1-7
Affect regulation	.85	2.31	1.24	1-6.67
Social norms	.86	2.33	1.25	1-7
Social image	.81	1.60	.84	1-5.67
BFI-2				
(PERSONALITY)				
Open-mindedness	.77	3.59	.61	1.92-4.92
Conscientiousness	.84	3.79	.67	2.17-5
Extraversion	.85	3.37	.71	1.42-4.83
Agreeableness	.74	3.92	.51	2.42-5
Neuroticism	.90	2.79	.81	1.08-4.67
SRHI	.93	3.85	1.31	1-7
(HABIT STRENGTH)				

3.2 Aims 1 & 2

3.2.1 Associations between habitual and momentary snacking

The results revealed that healthy habitual snacking was weakly, negatively related to non-core momentary snacking ($r = -.20, p < .01$), which suggests that people with more healthy habitual snacking behaviours selected lower levels of non-core momentary snack

choices. Additionally, unhealthy habitual snacking had moderate, positive correlations with total kJ ($r = .25, p < .01$), and non-core momentary outcomes ($r = .43, p < .01$). This shows that those with higher levels of unhealthy habitual snacking also had higher levels of non-core snacks and kJ in the momentary snack choices.

42.6% of participants indicated that their snacking behaviours had changed in the month prior to completing the survey. Of those participants, 21 indicated covid-19, isolation, or quarantine as influencing behaviour change, with other reasons including diets, specific food type inclusions and exclusions, and lifestyle changes.

3.2.2 Associations between personality, habit strength, momentary and habitual snacking, and reasons for snacking

Initial screening of Pearson's correlation coefficients between facets and corresponding traits indicated no likely additive value of including facet level traits in our analyses.

Pearson's correlation analyses explored the relationship between personality traits, habit strength, reasons for snacking, and momentary and habitual snacking. The results can be seen in Tables 3.2, 3.3, and 3.4. Most correlations were weak; however, several significant correlations were observed. There were negative correlations between health and weight control reasons for snacking and non-core and unhealthy habitual snacking. Habit strength, and affect regulation correlated positively with non-core and unhealthy habitual snacking.

Open-mindedness was positively associated need and hunger, health, natural concerns, and weight control reasons for snacking. Conscientiousness was negatively associated with affect regulation, social norms, social image reasons for snacking, and positively associated with health, and weight control reasons. Extraversion was negatively associated with affect regulation, and social norms, and positively associated with need and hunger; health; and sociability snacking reasons. Agreeableness was negatively associated

with social image and positively correlated with need and hunger. Finally, neuroticism was negatively correlated with liking and positively associated with affect regulation. Table 3.4 also shows that habit strength was positively correlated with 6 out of 15, and negatively with 1 out of 15 of the reasons for snacking.

Table 3.2

Pearson's correlation coefficients for reasons for snacking with momentary and habitual snacking

TEMS-Reasons for Snacking	Momentary snacking		Habitual snacking	
	Total kJ	Non-core (%)	Healthy	Unhealthy
Liking	.06	.07	-.08	.14*
Habit	.07	.11	.08	.21**
Need and hunger	.13	-.17*	.14*	-.04
Health	-.12	-.42**	.25**	-.33**
Convenience	.07	.08	.04	.12
Pleasure	.09	.25**	-.09	.26**
Traditional eating	-.02	.09	.12	.15*
Natural concerns	-.01	-.23**	.25**	-.16*
Sociability	-.01	.06	.02	-.03
Price	.23**	.04	.04	.15*
Visual appeal	.10	.30**	-.07	.15*
Weight control	-.05	-.27**	.13	-.24**
Affect regulation	-.01	.21**	-.05	.23**
Social norms	-.04	-.06	.01	-.04
Social image	.00	.04	.08	-.04

*significant at $p < .05$, **significant at $p < .01$

Table 3.3

Pearson's correlation coefficients for personality and habit strength with snacking

	Age	Gender	Habit strength	O	C	E	A	N
Habit Strength	-.14*	-.08	1	.05	-.19**	-.03	.08	.20**
kJ	-.15*	.01	.12	-.05	-.13	.02	.05	.07
Non-core %	-.09	-.14*	.28**	-.13	-.05	-.05	.02	.07
Healthy	.19**	.02	-.09	.04	.03	.04	-.03	.06
Unhealthy	-.04	-.07	.31**	-.11	-.06	-.09	-.08	.19**

Note: *significant at $p < .05$, **significant at $p < .01$; O=Open-mindedness, C = Conscientiousness, E = Extraversion, A = Agreeableness, N = Neuroticism

Table 3.4

Pearson's Correlations for personality traits, habit strength and reasons for snacking

	O	C	E	A	N	Habit Strength
Liking	.039	.060	.067	.098	-.137*	.146*
Habit	.029	-.007	.034	-.097	-.005	.330**
Need and hunger	.159*	.070	.163*	.143*	-.050	.082
Health	.224**	.276**	.180**	.010	-.046	-.172*
Convenience	.043	.087	-.057	.037	.008	.147*
Pleasure	.007	.041	.081	-.032	.059	.279**
Traditional eating	.112	-.004	.066	-.051	.058	.114
Natural concerns	.262**	.103	.128	.009	.007	-.109
Sociability	.074	-.039	.165*	.102	.005	.155*
Price	.048	-.080	-.045	-.124	.089	.111
Visual appeal	-.056	-.058	.001	-.102	.097	.119
Weight control	.187**	.151*	.108	-.046	.015	-.126
Affect regulation	-.021	-.231**	-.149*	-.123	.536**	.340**
Social norms	.065	-.238**	-.136*	.008	.125	.136*
Social image	-.014	-.220*	-.006	-.143*	.065	.111

**significant at $p < .01$

*significant at $p < .05$

3.3 Aim 3

3.3.1 Multiple regressions for snacking behaviours

Figure 3.1:

Schematic summary of significant regression results

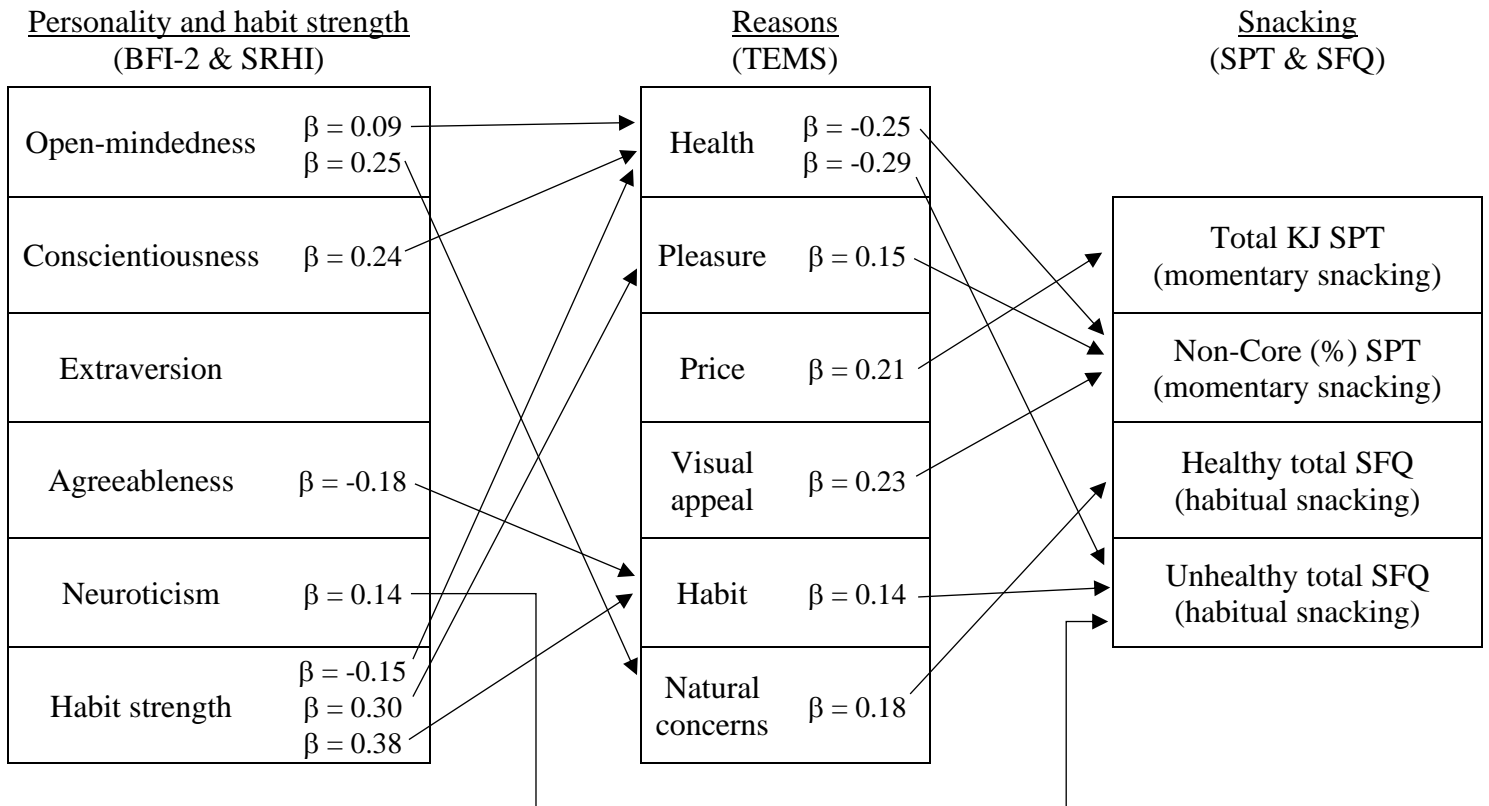


Figure 3.1 displays a schematic summary of the results from the multiple regression analyses. For full details and tables of the multiple regression analyses please refer to the appendices.

3.3.2 Predictors of momentary and habitual snacking

In the first model predicting total kJ, age and price (TEMS) were entered, and the overall model explained 6% of the variance. In the final model, only price remained as a significant predictor of total kJ with a positive beta value (see Appendix D1).

Gender and habit strength were entered and explained 10% of the variance in non-core momentary snacking, and then seven reasons were entered, and the overall model

explained 33% of the variance. In the final model, health was significant with a small, negative beta value while habit strength, pleasure, and visual appeal had significant positive beta values (see Appendix D2).

Age, need and hunger, and natural concern were entered and explained 3% of the variance in healthy habitual snacking. In the final model, only age and natural concerns were significant with positive beta values which suggest that older participants, and those whose reasons for snacking considered natural concerns were more likely to report consuming healthier snacks (see Appendix D3).

Habit strength, neuroticism, and nine reasons were entered to predict unhealthy habitual snacking, and explained 27% of the variance. In the final model, neuroticism was statistically significant, as well as habit, and health as reasons with neuroticism and habit having positive beta values and health having a negative beta value (see Appendix D4).

3.3.3 Predictors of reasons for snacking

Hierarchical multiple regression analyses were conducted to examine how well habit strength, and the Big Five personality traits predicted reasons for snacking. Habit strength was entered at step 1 and open-mindedness, conscientiousness, extraversion, agreeableness, and neuroticism were entered at step 2.

Price as a reason for snacking did not show a significant model (see Appendix D5).

The final model for health as a reason for snacking explained 15% of the variance. Habit strength, open-mindedness, and conscientiousness were significant in the final model with open-mindedness and conscientiousness having positive beta values and habit strength having a negative beta value. Lower scores on habit strength were associated with higher ratings of health as a reason for snacking while higher levels of open-mindedness and

conscientiousness were positively related to health as being a reason for snacking (see Appendix D6).

The final model for pleasure as a reason for snacking explained 10% of the variance but was non-significant. The first model explained 8% of the variance and habit strength was statistically significant with a positive beta value. This suggests that higher habit strength scores predict pleasure as a reason for snacking (see Appendix D7).

The final model for visual appeal as a reason for snacking accounted for 3% of the variance and no models reached significant (see Appendix D8).

The final model for habit as a reason for snacking explained 14% of the variance but only the first model was significant. In this model, habit strength was statistically significant with a positive beta value. This suggests that higher habit strength scores predict habit as a reason for snacking (see Appendix D9).

The final model for natural concern as a reason for snacking accounted for 9% of the variance. In the final step of this model, only open-mindedness was statistically significant with a positive beta value. This suggests that higher levels of open-mindedness predict natural concerns as a reason for snacking (see Appendix D10).

Discussion

4.1 Findings in the context of the aims of study

The aims of this study were to examine: (a) the link between the Big five personality traits, habit strength, and snacking behaviour; (b) the link between the Big five personality traits, habit strength, and reasons for snacking; and (c) whether personality and habit strength predicted reasons for snacking, and whether reasons for snacking predicted snacking behaviour.

As expected, we found that neuroticism was positively associated with unhealthy habitual snacking. We did not find an association between conscientiousness and snacking behaviour despite expecting a negative association with unhealthy snacking. Open-mindedness, extraversion, and agreeableness did not significantly associate with snacking behaviour, which potentially explains the lack of presence in previous research.

We also observed significant associations between personality traits and reasons for snacking. Open-mindedness significantly associated with four reasons for snacking (need and hunger, health, natural concern, and weight control); conscientiousness significantly correlated with five reasons (health, weight control, affect regulation, social norms, and social image); extraversion significantly associated with five reasons (need and hunger, health, sociability, affect regulation, and social norms); agreeableness significantly associate with two reasons (need and hunger, and social image); and neuroticism significantly associated with affect regulation.

Personality traits except for extraversion, and habit strength were shown to be significant predictors of several reasons for snacking. Health as a reason for snacking was predicted by open-mindedness, conscientiousness, and habit strength; pleasure was predicted by habit strength; habit as a reason was predicted by agreeableness, and neuroticism; and

natural concern was predicted by open-mindedness. Further, we found several reasons for snacking to be significant predictors of snacking behaviour. Total kJ in momentary snacking was predicted by price as a reason for snacking; non-core momentary snacking was predicted by health, pleasure, and visual appeal reasons; healthy habitual snacking was predicted by natural concern; and unhealthy habitual snacking was predicted by health, and habit reasons for snacking.

4.1.1 Personality, habit strength and snacking behaviour

Many of the findings from previous research were observed for eating behaviours more broadly. For example, (Renner, et al., 2012) explored motives only considering participants' whole diet, whereby participants were asked to think about all the foods they ate. The current study focused on snacking as a specific eating behaviour and some of the findings from previous research on eating behaviours were observed to apply to snacking behaviours as well. We hypothesized that neuroticism would be positively associated with unhealthy snacking, and that conscientiousness would be positively associated with healthy snacking, as per previous research (Verhoeven, et al., 2015; O'Connor & O'Connor, 2004). This hypothesis was partially supported with neuroticism showing a significant positive correlation with unhealthy habitual snacking, but conscientiousness not showing a significant association with any snacking outcome. Previous research frequently demonstrates associations between neuroticism and poorer eating behaviours, and conscientiousness with healthier eating behaviours (Steptoe, Pollard & Wardle, 1995; Pfeiler & Egloff, 2020).

In this study both neuroticism and conscientiousness had significant correlations with several reasons for snacking. Further, those reasons for snacking were significantly related to momentary and habitual snacking. This suggests that personality traits may be linked with snacking behaviour via their association with reasons for snacking. People with higher levels of neuroticism tended to indicate affect regulation as a reason for snacking which supports

both our expectation, and previous research (Steptoe, Pollard & Wardle, 1995), indicating that neuroticism may be associated with less healthy eating as a consequence of eating in response to negative emotion. The association between neuroticism and eating for stress response, and negative emotion has been consistently reported in previous research, which has been suggested to influence unhealthy behaviour (Steptoe, Pollard & Wardle, 1995; Conner, Fitter & Fletcher, 1999).

People with higher levels of conscientiousness tended to indicate snacking for health and weight control, and less for affect regulation and social norms. This is consistent with previous research that demonstrates higher levels of conscientiousness as associating with more control, routine, and less likely to snack in response to stress and negative emotion (O'Connor & O'Connor, 2004). It is understood that conscientious people generally have better control over impulses, and are generally deliberate and consider the outcomes and goals of specific behaviours. Because of these general tendencies, conscientiousness is commonly associated with good health behaviours and health outcomes (John, Naumann & Soto, 2008), and it is likely that these patterns transfer onto eating, and snacking behaviours specifically.

4.1.2 Personality, habit strength, and reasons for snacking

Based on previous research (Pfeiler & Egloff, 2020; Intiful, et al, 2019), we also expected to find significant associations for each of the Big five personality traits and reason for snacking. Significant correlations were observed for each personality trait and reasons for snacking. Two common reasons for snacking indicated in this study were need and hunger, and health. Need and hunger was associated with open-mindedness, extraversion, and agreeableness, and health as a reason for snacking was associated with open-mindedness and extraversion. Taken together, the findings of this study demonstrate a link between all

personality traits and suggest that personality is related to snacking in more ways than have been shown in previous research.

4.1.3 Snacking behaviour and reasons for snacking

Overall, the mean values from our sample demonstrated that liking and convenience were the most endorsed reasons for snacking, followed by habit, need and hunger, and pleasure. While previous research has shown that hunger, convenience, socialability and taste or liking are common motivations for eating and snacking (Mattes, 2018; Cleobury & Tapper, 2013), in this study we considered reasons for snacking in the context of personality. We explored whether personality and habit strength would predict reasons for snacking and the findings suggest that they do. The reasons with significant first order correlations included: price, health, pleasure, visual appeal, habit, and natural concern. Thus, the reasons for snacking that are associated with personality and habit strength are not necessarily the reasons commonly reported in previous research. While price and visual appeal were not significantly predicted by any personality trait or habit strength, health was predicted by higher levels of open-mindedness, and conscientiousness, and lower habit strength scores. Open-mindedness also predicted snacking for natural concern reasons, while habit strength predicted pleasure and habit as reasons for snacking.

These findings indicate that personality and habit strength play a role in snacking through reasons, and highlight the importance of personality and habit strength in understanding snacking as an overall behaviour. However, it should be noted that the magnitude of these effects were generally small. Most relationships were weak with the highest significant beta value being $\beta = 0.38$, and most models explained small amounts of variance with the highest explained variance for a final model being 15%. Thus, although personality and habit strength have been shown to play a role in snacking, it is likely that there are other factors worth considering to explain more of the variance in snacking

behaviour and reasons for snacking. Additionally, mediation analysis is necessary to better understand the possible, indirect relationships between these components.

4.2 The role of personality and habit strength

Aside from the weak and positive correlation between neuroticism and unhealthy habitual snacking, personality was not directly correlated with snacking in our study. Nevertheless, personality and habit strength influence people's reason for snacking which may, in turn, have an influence on snacking behaviour. Interestingly, need and hunger as one of the most common reasons for snacking was associated with open-mindedness, extraversion, and agreeableness which were the traits less explored in previous research. Open-mindedness, extraversion, and agreeableness appeared to correlate with as many or more reasons for snacking as conscientiousness, and more reasons than neuroticism. These findings may be a result of open-mindedness, extraversion and agreeableness being traits more concerned with, and influenced by external cues. Further, four out of the five personality traits were statistically significant predictors of snacking or reason for snacking. Open-mindedness was a positive predictor for two out of five predictors of snack choices, conscientiousness was a positive predictor of one, and conscientiousness, agreeableness, and neuroticism all predicted habit strength. These findings demonstrate that personality explained some of the variance in snacking and affirms the importance of considering all of the Big five personality traits and not just those more commonly reported in previous research (i.e., conscientiousness and neuroticism).

In this study habit strength showed positive associations with non-core momentary snacking and unhealthy habitual snacking which is consistent with previous research that shows habits as being related to poor snacking behaviour (De Vet et al., 2015). In their study (De Vet, et al., 2015), examined the habitual snacking behaviours of adolescents and found that habit strength was positively associated with unhealthy snacking. Our study supports

their finding, with the results demonstrating positive associations for habit strength and unhealthy habitual snacking, and non-core momentary snacking. Additionally, we observed significant correlations for habit strength and half of the reasons for snacking, with positive correlations for seven out of 15 reasons for snacking, and negatively correlating with one out of 15 reasons. Further, habit strength was a statistically significant predictor of non-core momentary snacking, as well as health, pleasure, and habit reasons for snacking. This suggests that snacking behaviour can be directly influenced by habit strength, but also that the reason for snacking can be influenced by habit. Thus, beyond the actual snack choices selected habit may be influencing the reasons for snacking. For example, fruit may be selected because it is a habit, or because health or weight control is the reasons for snacking, given that fruit classified as healthy and is low in fat.

Habits are shown to be influential on snacking behaviours, even in the absence of price, availability, and convenience restrictions (Mattes, 2018). In our sample, and before considering the influence of personality, convenience had the highest mean score for reasons for snacking, followed by liking, with the mean score of price following seven other reasons (see table 3.1). Out of these four reasons, only habit was shown to have been predicted by personality, and to have predicted unhealthy habitual snacking. It is likely that internal and personal aspects play a role in snacking and that individual differences explain more regarding snacking behaviours than external factors such as cost and convenience.

4.3 Reasons for snacking

Exploring snack choice selection gives an indication of impromptu decisions people make about which snacks to eat, and whether unhealthy snacks are chosen more often than healthy snacks in usual contexts. To understand how or why certain snacks are selected it is important to explore influences, and motivations for such choices. Understanding the reasons that people snack in general and perhaps even the reasons that certain snacks are selected

over others provides greater insight into overall snacking behaviour. It is one thing to understand snack choices and the degree of healthiness, and another to understand how or why they are selected and whether patterns exist between individual difference and certain snack selection. For example, we can identify a sweet sugary snack as generally unhealthy, but we can also understand that the selection of a sweet sugary snack is more likely when the motivation is response to negative emotion (Wallis & Hetherington, 2009).

Understanding the relationships between snack choice, reasons for snacking and any patterns that may exist between them will help to refine interventions to be better targeted and effective, with the empirical evidence to support specific approaches in targeting problem snacking. For example, suggesting healthier snack replacements to satisfy specific motivations and/or physical cravings may be effective, but only if we know that these motivations and cravings exist and influence snacking behaviour (Verhoeven, et al., 2015).

4.4 Other exploratory observations

4.4.1 common reasons for snacking

The results of this study differ from previous research in that we found less evidence for social reasons for snacking (Verhoeven, et al., 2015). The TEMS includes three items accounting for social reasons: sociability, social norms, and social image, and almost half of the other reasons for snacking were reported more than each of them, with social image being the least common reason for snacking reported in this study. None of these three social reasons for snacking were significantly correlated with snacking behaviour, nor were any significant predictors of snacking. Previous research has also shown that the most common settings for snacking was the home and workplace (Cleobury & Tapper, 2013) and we posited that given the general lack of sociability in these contexts, other factors were influencing snacking behaviour. The results of social reasons for snacking support this suggestion and infer that personal reasons as opposed to social reasons have a greater

influence on snacking. With need and hunger, health, weight control, and affect regulation appearing as more prominent reasons for snacking in this study, it is reasonable to suggest that snacking is a more internal and personal driven behaviour than it is influenced by sociability. Previously explored reasons for snacking are limited, and to achieve a consensual understanding of the most common motivations for snacking it is necessary to explore a comprehensive set of reasons. Further, this study is the first to consider a comprehensive set of reasons for snacking, personality, and habit strength together.

4.4.3 Age and gender

Age, and gender effects were also observed in relation to snacking, but habit strength and personality explained more of the variance in snacking and reasons for snacking. However, it was generally found that females and older participants indicated healthier eating behaviours, as demonstrated by a positive association between age and healthy habitual snacking, and a negative association for gender and non-core momentary snacking. It would be interesting to explore whether these results would be the same in a more gender balanced, or representative sample.

4.4.4 Potential influencing factors

It is possible that the snacking behaviours indicated in the habitual snacking task were not reflective of usual snacking behaviours. In our study we asked, 'have your snacking behaviours changed in the last month?', and 42.6% indicated that they had. To some degree this was influenced by the Covid-19 pandemic, with 21 participants specifically indicating Covid-19, isolation, or quarantine as impacting their snacking behaviours. Responses as to why snacking had changed in the preceding month also included other reasons such as diets, pregnancy, changes to family situation and bereavement, and changes to physical activity level. Additionally, some participants reported an increase in snacking behaviour, while

others reported a decrease in the month prior to completing the survey. This implies that in shorter periods of time, snacking behaviours may change due to a range of external factors and this should be considered in future research.

4.5 Broader implications of this study

Messages about the contribution of snacking in the increasing prevalence of obesity remain inconsistent (Eckersley, 2001). While generally, unhealthy snacking is commonly believed to influence poorer health outcomes including overweight and obesity, snacking behaviours differ in degree of healthiness, and other factors such as frequency and quality of snacking, total energy intake and energy expenditure sources (e.g. physical activity) need to be considered (Miller, Benelam, Stanner & Butriss, 2013). In our study participants with higher levels of neuroticism, and those that snacked for pleasure or habit reasons had higher levels of non-core momentary snacking and unhealthy habitual snacking, which suggests that interventions should target habit and internal drivers to better manage snacking behaviour. To achieve optimal benefits of snacking behaviour and to reduce the risk of snacking contributing to over-eating and obesity or other health problems, snacks higher in fat and sugar should be regulated, nutritional education and information provided, and targeting poor habits considered.

Our data also suggest that health, and weight control reasons for snacking influence better snacking behaviours, and that habit and pleasure reasons tend to influence unhealthy snacking behaviour. Together, these findings suggest that interventions would be efficient and beneficial when they promote health benefits of snacking, and inform and offer options about what snacks are health and what quantity and frequency for consumption is recommended for maintaining positive health and weight. Interventions may also be effective where habits are targeted and alternative behaviour patterns can be encouraged, including

healthier alternatives to satisfy pleasure motivations for snacking. As neuroticism was linked with unhealthy snacking and is associated with higher habit strength scores and eating for affect regulation, people with higher levels of neuroticism are in greater need of interventions that target habitual behaviours and unhealthy snacking in response to negative emotion. Open-mindedness, conscientiousness, and agreeableness were linked with snacking for health and weight control reasons, and less for habit so people with higher levels of these traits would benefit from optimising snacking behaviour through health and nutrition education, and promotion-based approaches.

4.6 Study strengths

This study had a few strengths including its time-friendliness, sample size, and the comprehensive consideration of several factors relating to snacking behaviour. Due to the nature of our online survey and measures included, our survey did not require large amounts of time or labour, which is a likely reason that our sample exceeded the minimum recommended size for statistical significance. Additionally, the measures included in our survey assessed personality, and reasons for snacking more comprehensively than previous studies. Whereas other studies had only explored one or two of the Big five personality traits together, this study explored all of them as well as a comprehensive set of reasons for snacking, which enabled the consideration and understanding of a more broad and robust range in individual differences in snacking. This study also provided a clear definition of snacking to participants.

4.7 Limitations

There were a few limitations of this study. First, our study design was purely observational and did not include any experimental manipulations, control groups, or comparison measures. This meant that we could not infer causality or what the observations mean in the context of health outcomes.

Second, although the current study used a large sample, it primarily included females, and had a more health conscious sample than what would be expected in the general population, as demonstrated by the differences in means for healthy and unhealthy habitual snacking (see Table 3.1). Therefore, our observations were heavily representative of generally health conscious females. Future studies should aim to have a more balanced sample in terms of gender, and attitudes and goals towards eating and snacking. Achieving a more representative sample could be achieved through other means of participant recruitment, as opposed to convenience and snowball sampling which was used for this study.

Third, while our survey was concise and did not impose a significant time burden compared to food frequency measures and diaries, it may have been less capable of capturing the full details of real-world snacking behaviour. Further, the surveys that measured momentary snacking and habitual snacking differed significantly. While generally each measure included items to represent a balanced amount of health and non-healthy items, the actual items included were quite different. This limitation affected the observations and comparability between habitual snacking and momentary snacking. Future research might consider more comparable measures that still aim to control for availability and price. Further, selections made in a single moment are not representative across time and contexts, while the habitual measure counters this to some degree it may be worth exploring longitudinally. A study carried out and data collected over a longer period of time may help to understand if and how snacking behaviours change over time and contexts, and whether their associations with personality remain consistent given that personality is generally consistent across time and contexts.

4.8 Future directions

There are a couple of extra recommendations for future research in addition to the recommendations to improve the limitations of this study. First, it would be worth considering the specific snacks people select in future research. Although individual food items were included in the snacking measures used in this study, this study combined and categorised foods without consideration of the individually selected items. By understanding specific foods often consumed, their degree of health, and levels of fat, sugar, and energy, an understanding of how specific nutrition levels are reached is possible. This would contribute to the understanding and determinability overall healthiness of snacking. It may also serve to indicate more precisely if and how Australian snacking behaviours are meeting and promoting Australian dietary guidelines.

Second, future research should consider frequency as an important component of snacking. While frequency of snacking has been shown to have increased in recent years (Mattes, 2018), and the effects of this on health remain unknown, it would be worth measuring for snack frequency to determine whether personality and habit strength influence this factor. It would also be worth considering how the combined differences in quantity, quality and frequency of snacking can affect snacking behaviour and related health outcomes.

4.9 Conclusion

We aimed to explore the relationships and predictive power of personality, habit strength, and reasons for snacking on snacking behaviour to better understand snacking as an overall behaviour. Exploring these three components together was important to expand previous research and edge it closer to producing an effective, targeted intervention for problem snacking.

This study showed that personality and habit strength play an important role in snacking and contributes to previous research with the additional explanation of how and why personality relates to snacking, i.e., through reasons. The results indicate that the quality

and quantity of momentary and habitual snack choices are influenced and predicted by personality traits, habit strength, and reasons for snacking. Thus, personality, habit strength, and reasons for snacking together influence the pathways of snacking behaviour, albeit the strength of these relationships were generally small. Further research is still essential to achieve a consistent health message for snacking and understand how it is good and bad; however, through this study we may be able to help people make better decisions to achieve optimal health and nutritional benefit from snacking behaviour.

References

- Adriaanse, M., de Ridder, D., & de Wit, J. (2009). Finding the Critical Cue: Implementation Intentions to Change One's Diet Work Best When Tailored to Personally Relevant Reasons for Unhealthy Eating. *Personality And Social Psychology Bulletin*, 35(1), 60-71. doi: 10.1177/0146167208325612
- Australian Dietary Guidelines Journalist Briefing. (2015). Retrieved 9 July 2020, from <https://www.eatforhealth.gov.au/guidelines/media-resources>
- Bellisle, F. (2014). Meals and snacking, diet quality and energy balance. *Physiology & Behavior*, 134, 38-43. doi: 10.1016/j.physbeh.2014.03.010
- Bénard, M., Bellisle, F., Kesse-Guyot, E., Julia, C., Andreeva, V., & Etilé, F. et al. (2018). Impulsivity is associated with food intake, snacking, and eating disorders in a general population. *The American Journal Of Clinical Nutrition*, 109(1), 117-126. doi: 10.1093/ajcn/nqy255
- Cleobury, L., & Tapper, K. (2013). Reasons for eating ‘unhealthy’ snacks in overweight and obese males and females. *Journal Of Human Nutrition And Dietetics*, 27(4), 333-341. doi: 10.1111/jhn.12169
- Conner, M., Fitter, M., & Fletcher, W. (1999). Stress and snacking: A diary study of daily hassles and between-meal snacking. *Psychology & Health*, 14(1), 51-63. doi: 10.1080/08870449908407313
- De Vet, E., Stok, F., De Wit, J., & De Ridder, D. (2015). The habitual nature of unhealthy snacking: How powerful are habits in adolescence?. *Appetite*, 95, 182-187. doi: 10.1016/j.appet.2015.07.010
- Eckersley, R. M. (2001). Losing the battle of the bulge: causes and consequences of increasing obesity. *Medical Journal of Australia*, 174(11), 590–592.
<https://doi.org/10.5694/j.1326-5377.2001.tb143446.x>

- Fardet, A., & Boirie, Y. (2014). Associations between food and beverage groups and major diet-related chronic diseases: an exhaustive review of pooled/meta-analyses and systematic reviews. *Nutrition Reviews*, 72(12), 741-762. doi: 10.1111/nure.12153
- Food Nutritional Database | CalorieKing (Australia). (2020). Retrieved 24 April 2020, from <https://www.calorieking.com/au/en/foods/>
- Gardner, B., Corbridge, S., & McGowan, L. (2015). Do habits always override intentions? Pitting unhealthy snacking habits against snack-avoidance intentions. *BMC Psychology*, 3(1). doi: 10.1186/s40359-015-0065-4
- Goldberg, L., & Strycker, L. (2002). Personality traits and eating habits: the assessment of food preferences in a large community sample. *Personality And Individual Differences*, 32(1), 49-65. doi: 10.1016/s0191-8869(01)00005-8
- Green, H., Siwajek, P., & Roulin, A. (2017). Use of nutrient profiling to identify healthy versus unhealthy snack foods and whether they can be part of a healthy menu plan. *Journal Of Nutrition & Intermediary Metabolism*, 9, 1-5. doi: 10.1016/j.jnim.2017.07.001
- Huseinovic, E., Winkvist, A., Slimani, N., Park, M., Freisling, H., & Boeing, H. et al. (2016). Meal patterns across ten European countries – results from the European Prospective Investigation into Cancer and Nutrition (EPIC) calibration study. *Public Health Nutrition*, 19(15), 2769-2780. doi: 10.1017/s1368980016001142
- IBM Corp. (2017). SPSS Statistics for Windows (Version 26.0). Armonk, New York: IBM Corp.
- Intiful, F., Oddam, E., Kretchy, I., & Quampah, J. (2019). Exploring the relationship between the Big five personality characteristics and dietary habits among students in a Ghanaian University. *BMC Psychology*, 7(1). doi: 10.1186/s40359-019-0286-z

- John, O. P., Naumann, L. P., & Soto, C. J. (2008). Paradigm shift to the integrative Big five trait taxonomy: History, measurement, and conceptual issues. In O. P. John, R. W. Robins, & L. P. Pervin (Eds.), *Handbook of personality, third edition: Theory and research* (pp. 114-158). New York, Guildford Press Publications
- Keast, D., Nicklas, T., & O'Neil, C. (2010). Snacking is associated with reduced risk of overweight and reduced abdominal obesity in adolescents: National Health and Nutrition Examination Survey (NHANES) 1999–2004. *The American Journal Of Clinical Nutrition, 92*(2), 428-435. doi: 10.3945/ajcn.2009.28421
- Lemos-Giráldez, S., & Fidalgo-Aliste, A. (1997). Personality Dispositions and Health-related Habits and Attitudes: a Cross-sectional Study. *European Journal Of Personality, 11*(3), 197-209. doi: 10.1002/(sici)1099-0984(199709)11:3<197::aid-per283>3.0.co;2-h
- Mattes, R. (2018). Snacking: A cause for concern. *Physiology & Behavior, 193*, 279-283. doi: 10.1016/j.physbeh.2018.02.010
- Miller, R., Benelam, B., Stanner, S., & Buttriss, J. (2013). Is snacking good or bad for health: An overview. *Nutrition Bulletin, 38*(3), 302-322. doi: 10.1111/nbu.12042
- Murakami, K., & Livingstone, M. (2016). Associations between Meal and Snack Frequency and Diet Quality in US Adults: National Health and Nutrition Examination Survey 2003-2012. *Journal Of The Academy Of Nutrition And Dietetics, 116*(7), 1101-1113. doi: 10.1016/j.jand.2015.12.012
- O'Connor, D., & O'Connor, R. (2004). Perceived changes in food intake in response to stress: the role of conscientiousness. *Stress And Health, 20*(5), 279-291. doi: 10.1002/smi.1028

- Pfeiler, T., & Egloff, B. (2020). Personality and eating habits revisited: Associations between the Big five, food choices, and Body Mass Index in a representative Australian sample. *Appetite, 149*, 104607. doi: 10.1016/j.appet.2020.104607
- Renner, B., Sproesser, G., Strohbach, S., & Schupp, H. (2012). Why we eat what we eat. The Eating Motivation Survey (TEMS). *Appetite, 59*(1), 117-128. doi: 10.1016/j.appet.2012.04.004
- Soto, C., & John, O. (2017). The next Big Five Inventory (BFI-2): Developing and assessing a hierarchical model with 15 facets to enhance bandwidth, fidelity, and predictive power. *Journal Of Personality And Social Psychology, 113*(1), 117-143. doi: 10.1037/pspp0000096
- Spanos, D., & Hankey, C. (2010). The habitual meal and snacking patterns of university students in two countries and their use of vending machines. *Journal Of Human Nutrition And Dietetics, 23*(1), 102-107. doi: 10.1111/j.1365-277x.2009.01005.x
- Step toe, A., Pollard, T., & Wardle, J. (1995). Development of a Measure of the Motives Underlying the Selection of Food: the Food Choice Questionnaire. *Appetite, 25*(3), 267-284. doi: 10.1006/appe.1995.0061
- Sutin, A., Ferrucci, L., Zonderman, A., & Terracciano, A. (2011). Personality and obesity across the adult life span. *Journal Of Personality And Social Psychology, 101*(3), 579-592. doi: 10.1037/a0024286
- van den Bree, M., Przybeck, T., & Robert Cloninger, C. (2006). Diet and personality: Associations in a population-based sample. *Appetite, 46*(2), 177-188. doi: 10.1016/j.appet.2005.12.004
- Verhoeven, A., Adriaanse, M., Evers, C., & de Ridder, D. (2012). The power of habits: Unhealthy snacking behaviour is primarily predicted by habit strength. *British*

Journal Of Health Psychology, 17(4), 758-770. doi: 10.1111/j.2044-8287.2012.02070.x

Verhoeven, A., Adriaanse, M., de Vet, E., Fennis, B., & de Ridder, D. (2015). It's my party and I eat if I want to. Reasons for unhealthy snacking. *Appetite*, 84, 20-27. doi: 10.1016/j.appet.2014.09.013

Verplanken, B., & Orbell, S. (2003). Reflections on Past Behavior: A Self-Report Index of Habit Strength1. *Journal Of Applied Social Psychology*, 33(6), 1313-1330. doi: 10.1111/j.1559-1816.2003.tb01951.x

Vingerhoets, A., Croon, M., Jeninga, A., & Menges, L. (1990). Personality and health habits. *Psychology & Health*, 4(4), 333-342. doi: 10.1080/08870449008400401

Wallis, D., & Hetherington, M. (2009). Emotions and eating. Self-reported and experimentally induced changes in food intake under stress. *Appetite*, 52(2), 355-362. doi: 10.1016/j.appet.2008.11.007

Wood, W. (2017). Habit in Personality and Social Psychology. *Personality And Social Psychology Review*, 21(4), 389-403. doi: 10.1177/1088868317720362

Appendix A

Example social media advertisement

Project Number: 20/33

Project title: Understanding snacking: The role of personality, habit strength and motivations for snacking

Snacking is an eating behaviour that is a part of everyday life for many of us and it is continually increasing in popularity and diversity. Surprisingly, little is understood about what drives people to snack.

If you are over the age of 18 and snack a minimum of 2 times per week, we would greatly appreciate your participation in our study. Taking part in the 20-minute survey will be completely confidential and anonymous. The survey consists of rating scales and choice selection items and will tell us something about your personality and snacking behaviours. Upon completion of the survey, you are welcome to go into the draw to win a \$250 grocery voucher for your participation.

The results of the survey will form the basis of a thesis for the Bachelor degree in Psychological Science (Honours) at the University of Adelaide.

Example extended social media post

I am [My student is] currently completing my [her] Honours year in Psychological Science at The University of Adelaide. My [Her] Thesis is looking at the relationships between personality and reasons for snacking, snack choice and habits.

Participation in this study is completely anonymous and confidential, and upon completion you can go in the draw to receive a \$250 grocery voucher.

Please follow the link if you are aged 18 years old or older, reside in Australia, and snack a minimum of once per week and wish to participate (or if you want more information about the study). We need 300 participants so please also feel free to share the link with anyone who you think might be interested in participating in the survey.

Example shortened social media posts

1. Do you snack at least once a week and have 20 minutes to spare?? We are looking for people to complete an online survey about personality, habits and snacking. Results will be used for an Honours student's work. Plus, you can go in the draw to win a \$250 grocery voucher. Click here for more info.
2. We want to know more about why people eat snack foods. If you have 20 minutes to spare to complete an online survey, we'd love your help. Plus, you can go in the draw to win a \$250 grocery voucher.

Example images



Appendix B

Example participant information sheet

PARTICIPANT INFORMATION SHEET

PROJECT TITLE: Understanding snacking: The role of personality, habit strength and motivations for snacking

HUMAN RESEARCH ETHICS COMMITTEE APPROVAL NUMBER: H-2019-20/33

PRINCIPAL SUPERVISOR: Dr. Emily Brindal

STUDENT RESEARCHER: Sarah Mercorella

STUDENT'S DEGREE: Bachelor of Psychological Science (Honours)

Dear Participant,

What is the project about?

You are invited to participate in this research project which will explore the relationship between personality traits, reasons for snacking, habitual snacking and snack choice.

Who is undertaking the project?

This project is being conducted by Sarah Mercorella, an Honours student at the University of Adelaide, under the supervision of Dr. Emily Brindal and Dr. Naomi Kakoschke from CSIRO and Professor Paul Delfabbro from the University of Adelaide.

Why am I being invited to participate?

You are being invited to participate as you are aged 18 years or older, reside in Australia, and have access to a computer and internet. Should you wish to participate, it is also essential that you identify as snacking (eating in between meals) on a minimum of 2 occasions per week based on our screening measure of commonly consumed snacks. For the purposes of this study, snacking refers to consumption of any food or beverages outside of the 3 main meals per day (i.e., breakfast, lunch, dinner).

What am I being invited to do?

Should you choose to participate, you will be directed to an online survey that will ask you questions on a series of topics related to snacking and you will be asked to rate your agreeance with a series of statements. You will also be asked a few questions about yourself including how you view yourself and some basic demographic information (e.g., gender, age etc). Your participation in all parts of the survey will be entirely confidential and anonymous. When you have finished the survey, you will be invited to provide your email address to go into the draw to receive a \$250 grocery voucher.

How much time will my involvement in the project take? Are there any risks associated with participating in this project? Can I withdraw from the project?

This survey should take approximately 20 minutes to complete. It is unlikely that you will encounter any risk by participating, but if you become uncomfortable with answering personal questions, an option to not answer will be provided. As participation is voluntary, you will be able to discontinue the study at any time by closing your web browser or navigating away from the survey page. Please note that you will only be able to enter the draw for the voucher at the end if you complete the entire survey. Please note that all data entered up to the point that you withdraw will be retained for analysis. We are unable to remove individual data as there is no way of identifying your individual response.

What are the potential benefits of the research project?

Findings from this research will contribute to scientific knowledge in the field of eating behaviours and personality. Results also have the potential to be considered in future by researchers aiming to establish interventions for eating behaviours.

What will happen to my information?

Data will be used in analyses and results of analyses will be used to form the basis of an Honours thesis. Only summary data will be published in the thesis. Results may also be published in academic journals or conference proceedings to be shared with other researchers. All collected data will be stored on a secured server at CSIRO with access limited to only the involved researchers in this study. Anonymous data will be kept in a database and a data custodian at CSIRO (Dr Emily Brindal) will review requests from other researchers to analyse this database for any related future research questions. This database will be retained for 5 years, at which point, it will be deleted from CSIRO's secure servers. Email addresses supplied in order to receive a summary of results or enter the draw to win the \$250 grocery voucher will be removed from responses and kept in a separate file which will be deleted once used. Individual results will not be available to participants; however you are welcome to provide your email at the end of the survey and opt in to receive a summary of the results, which will be emailed to interested participants at the end of 2020.

Your information will only be used as described in this participant information sheet and it will only be disclosed according to the consent provided, except as required by law.

What if I have a complaint or any concerns?

The study has been approved by the Human Research Ethics Committee at the University of Adelaide with reciprocal review and approval from the CSIRO Low-Risk Human Ethics Committee. This research project will be conducted according to the NHMRC National Statement on Ethical Conduct in Human Research 2007 (Updated 2018). If you have questions or problems associated with the practical aspects of your participation in the project, or wish to raise a concern or complaint about the project, then you should consult the Principal Investigator. If you wish to speak with an independent person regarding concerns or a complaint, the University's policy on research involving human participants, or your rights as a participant, please contact the Human Research Ethics Committee's Secretariat on:

Phone: +61 8 8313 6028

Email: hrec@adelaide.edu.au

Post: Level 4, Rundle Mall Plaza, 50 Rundle Mall, ADELAIDE SA 5000

Any complaint or concern will be treated in confidence and fully investigated. You will be informed of the outcome.

If I want to participate, what do I do?

Thank you for your time and consideration of participating in this study. If you would like to participate, please press 'continue' which will direct you to the survey. Once you have clicked the 'continue' button to proceed with the survey, this will act as your consent to participate, and for the collection and analysis of your data for this project. The survey can be completed online with instructions and prompts for you to follow. Once the survey is completed, you will be invited to leave your email address and opt to go into the random draw for a \$250 voucher, and to receive a summary of the research.

**The draw for the \$250 groceries voucher will be made using a random number generator to select a single email address from the database. The winning person will be contacted by Dr. Emily Brindal or a representative at CSIRO and given 2 weeks to respond with a postal address where the voucher can be sent. If no response is given, or the email address is not valid, the draw will be re-run minus that email address. This process will continue until a winner is found*

Yours sincerely,

Sarah Mercorella (Psychology Honours Student), Dr. Emily Brindal (Senior Research Scientist – CSIRO), Dr. Naomi Kakoschke (Research Scientist – CSIRO), & Prof. Paul Delfabbro (Professor – University of Adelaide)

Appendix C

Demographic questions included in survey

DEMOGRAPHIC QUESTIONS

1. Age in years (free text)
2. Sex (Male, Female, prefer to self-describe (free text), prefer not to say)
3. Do you know your current weight? Yes – please specify, No, Prefer not to say
 - a. If yes, what is your current weight in kgs?
4. Do you know your current height? Yes – please specify, No, Prefer not to say
5. If yes, what is your current height in cm?
6. Were you born in Australia? (Yes, No)
7. What culture do you identify with? (free text)
8. Are you currently on a diet to control your weight? (yes, no, prefer not to say)
9. Have your snacking behaviours changed in the last month? (Yes/No, if yes, how? - free text)
10. Over your lifetime, how many serious attempts have you made to actively manage your weight? (Never, 1-5 times, 6-10 times, 11-15 times, 16-25 times, more than 25 times)
11. Are you the primary grocery shopper for your residence? (yes, no, prefer not to say)
12. How many other people do you live with? (in number)
13. What is your highest level of education? (did not complete high school, high school, TAFE or university degree, higher education, other-please specify, prefer not to say)
14. What is the total of all net income you receive per week? (\$0-\$149, \$150-\$299, \$300-\$500, \$500-\$700, \$700-\$999, \$1000+, prefer not to say)

Appendix D

Tables indicating results for multiple regression analyses

Appendix D1

Table 3.5

Predictors of momentary snacking kJ

<u>Variable</u>	<u>Model 1</u>			<u>Model 2</u>		
	<u>B</u>	<u>Beta</u>	<u>Sig.</u>	<u>B</u>	<u>Beta</u>	<u>Sig.</u>
<i>Step 1:</i>						
<i>Demographics</i>						
Age	-20.17	-0.15	.000	-14.23	-0.10	.124
<i>Step 2: Reasons</i>						
Price				272.67	0.21	.000
Model significance	$F(1, 222) = 4.82, p=.029$			$F(2, 221) = 7.46, p=.001$		
Total variance explained (unadjusted)	2%			6%		

Appendix D2

Table 3.6

Predictors of momentary non-core % snacking

<u>Variable</u>	<u>Model 1</u>			<u>Model 2</u>			<u>Model 3</u>		
	<u>B</u>	<u>Beta</u>	<u>Sig.</u>	<u>B</u>	<u>Beta</u>	<u>Sig.</u>	<u>B</u>	<u>Beta</u>	<u>Sig.</u>
<i>Step 1:</i>									
<i>Demographics</i>									
Gender	-6.58	-0.14	.038	-5.57	-0.12	.068	-5.09	-0.11	.069
<i>Step 2: Habit strength</i>									
Habit strength				5.79	0.28	.000	2.73	0.13	.037
<i>Step 3: Reasons</i>									
Need and Hunger							-1.32	-0.06	.390
Health							-4.35	-0.25	.004
Pleasure							3.53	0.15	.029
Natural concerns							-1.12	-0.06	.385
Visual Appeal							5.29	0.23	.000
Weight Control							-1.83	-0.10	.158
Affect regulation							1.50	0.07	.287
<hr/>									
Model significance	$F(1, 228) = 4.35, p=.038$			$F(2, 227) = 12.01, p=.000$			$F(79, 220) = 11.79, p=.000$		
Total variance explained (unadjusted)	2%			10%			33%		

Appendix D3

Table 3.7

Predictors of habitual healthy snacking

<u>Variable</u>	<u>Model 1</u>			<u>Model 2</u>		
	<u>B</u>	<u>Beta</u>	<u>Sig.</u>	<u>B</u>	<u>Beta</u>	<u>Sig.</u>
<i>Step 1:</i>						
<i>Demographics</i>						
Age	0.53	0.19	.004	0.53	0.19	.004
<i>Step 2: Reasons</i>						
Need and hunger				3.26	0.13	.076
Natural concerns				4.47	0.18	.012
Model significance	$F(1, 222) = 8.66, p=.004$			$F(3, 220) = 8.05, p=.000$		
Total variance explained (unadjusted)	4%			3%		

Appendix D4

Table 3.8

Predictors of habitual unhealthy snacking

<u>Variable</u>	<u>Model 1</u>			<u>Model 2</u>			<u>Model 3</u>		
	<u>B</u>	<u>Beta</u>	<u>Sig.</u>	<u>B</u>	<u>Beta</u>	<u>Sig.</u>	<u>B</u>	<u>Beta</u>	<u>Sig.</u>
<i>Step 1: habit strength</i>									
Habit strength	7.07	0.31	.000	6.48	0.28	.000	2.55	0.11	.101
<i>Step 2: Personality</i>									
Neuroticism				4.91	0.13	.038	5.16	0.14	.045
<i>Step 3: Reasons</i>									
Liking							1.54	0.06	.428
Habit							2.89	0.14	.045
Health							-5.39	-0.29	.001
Pleasure							3.04	0.14	.126
Traditional eating							2.12	0.09	.205
Natural concerns							-1.13	-0.05	.459
Price							1.92	0.09	.165
Visual appeal							-0.45	-0.09	.799
Weight control							-1.38	-0.07	.358
Affect regulation							0.21	0.01	.910
Model significance	$F(1, 228) = 24.14, p=.000$			$F(2, 227) = 14.44, p=.000$			$F(12, 217) = 6.75, p=.000$		
Total variance explained (unadjusted)	10%			11%			27%		

*Appendix D5**Table 3:9**Personality predictors of price*

<u>Variable</u>	<u>Model 1</u>			<u>Model 2</u>		
	<u>B</u>	<u>Beta</u>	<u>Sig.</u>	<u>B</u>	<u>Beta</u>	<u>Sig.</u>
<i>Step 1: Habit strength</i>						
Habit strength	0.12	0.07	.094	0.12	0.11	.107
<i>Step 2: Personality</i>						
Open-mindedness				0.20	0.08	.226
Conscientiousness				-0.05	-0.02	.776
Extraversion				-0.09	-0.05	.496
Agreeableness				-0.38	-0.14	.060
Neuroticism				0.19	0.01	.884
Model significance	$F(1, 228) = 2.84, p=.094$			$F(6, 223) = 1.47, p=.189$		
Total variance explained (unadjusted)	1%			4%		

Appendix D6

Table 3:10

Personality predictors of health

<u>Variable</u>	<u>Model 1</u>			<u>Model 2</u>		
	<u>B</u>	<u>Beta</u>	<u>Sig.</u>	<u>B</u>	<u>Beta</u>	<u>Sig.</u>
<i>Step 1: Habit strength</i>						
Habit strength	-0.21	-0.17	.009	-0.17	-0.15	.025
<i>Step 2: Personality</i>						
Open-mindedness				0.50	0.09	.003
Conscientiousness				0.58	0.24	.001
Extraversion				1.85	0.08	.227
Agreeableness				-0.19	-0.04	.573
Neuroticism				0.19	0.10	.181
Model significance	$F(1, 228) = 6.98, p=.009$			$F(6, 223) = 6.33, p=.000$		
Total variance explained (unadjusted)	3%			15%		

Appendix D7

Table 3:11

Personality predictors of pleasure

<u>Variable</u>	<u>Model 1</u>			<u>Model 2</u>		
	<u>B</u>	<u>Beta</u>	<u>Sig.</u>	<u>B</u>	<u>Beta</u>	<u>Sig.</u>
<i>Step 1: Habit strength</i>						
Habit strength	0.24	0.28	.000	0.26	0.30	.000
<i>Step 2: Personality</i>						
Open-mindedness				-0.04	-0.02	.748
Conscientiousness				0.18	0.11	.137
Extraversion				0.12	0.08	.278
Agreeableness				-0.15	-0.07	.336
Neuroticism				0.05	0.04	.625
Model significance	$F(1, 228) = 19.25, p=.000$			$F(6, 223) = 4.05, p=.001$		
Total variance explained (unadjusted)	8%			10%		

Appendix D8

Table 3.12

Personality predictors of visual appeal

<u>Variable</u>	<u>Model 1</u>			<u>Model 2</u>		
	<u>B</u>	<u>Beta</u>	<u>Sig.</u>	<u>B</u>	<u>Beta</u>	<u>Sig.</u>
<i>Step 1: Habit strength</i>						
Habit strength	0.11	0.12	.072	0.11	0.12	.090
<i>Step 2: Personality</i>						
Open-mindedness				-0.09	-0.05	.477
Conscientiousness				-0.05	-0.02	.967
Extraversion				-0.01	-0.00	.613
Agreeableness				-0.20	-0.09	.226
Neuroticism				0.07	0.05	.503
Model significance	$F(1, 228) = 3.26, p=.072$			$F(6, 223) = 1.18, p=.317$		
Total variance explained (unadjusted)	1%			3%		

Appendix D9

Table 3.13

Personality predictors of habit

<u>Variable</u>	<u>Model 1</u>			<u>Model 2</u>		
	<u>B</u>	<u>Beta</u>	<u>Sig.</u>	<u>B</u>	<u>Beta</u>	<u>Sig.</u>
<i>Step 1: Habit strength</i>						
Habit strength	0.36	0.33	.000	0.41	0.38	.000
<i>Step 2: Personality</i>						
Open-mindedness				0.07	0.03	.647
Conscientiousness				0.14	0.06	.357
Extraversion				-0.01	-0.01	.923
Agreeableness				-0.51	-0.18	.009
Neuroticism				-0.20	-0.11	.120
Model significance	$F(1, 228) = 27.80, p=.000$			$F(6, 223) = 6.15, p=.000$		
Total variance explained (unadjusted)	12%			14%		

Appendix D10

Table 3.14

Personality predictors of natural concern

<u>Variable</u>	<u>Model 1</u>			<u>Model 2</u>		
	<u>B</u>	<u>Beta</u>	<u>Sig.</u>	<u>B</u>	<u>Beta</u>	<u>Sig.</u>
<i>Step 1: Habit strength</i>						
Habit strength	-0.12	-0.11	.100	-0.13	-0.10	.074
<i>Step 2: Personality</i>						
Open-mindedness				0.60	0.25	.000
Conscientiousness				0.15	0.07	.355
Extraversion				0.13	0.06	.363
Agreeableness				-0.04	-0.01	.856
Neuroticism				0.16	0.09	.211
Model significance	$F(1, 228) = 2.73, p=.100$			$F(6, 223) = 3.88, p=.001$		
Total variance explained (unadjusted)	1%			9%		