Testing the transdiagnostic model of eating disorders in adolescents using longitudinal data: Understanding risk factors for eating disorder symptoms in adolescence

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This report is submitted in partial fulfilment of the degree of Master of Psychology (Clinical)

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Declaration

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Data Availability Statement

The data that support the findings of this study are available from the Australian Data Archive (ADA) and the National Centre for Longitudinal Data (NCLD). Restrictions apply to the availability of these data, which were used under license for this study. Data are available through Dataverse, an online platform which facilitates access to its longitudinal datasets, with the permission of ADA and NCLD.

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The authors have no conflict of interest to declare.

Abstract

Objective: Although risk factors associated with eating disorders (EDs) have been widely studied, prospective longitudinal studies that examine risk factors at early adolescence, before the peak age of ED onset, remain limited. The study examined the transdiagnostic model of EDs, and investigated the potential influence of body dissatisfaction, negative reactivity and self-esteem in adolescents aged 10-11, on partial-syndrome ED status at age 16-17. **Method:** The sample comprised of 2,372 adolescents drawn from Wave 3, 4 and 7 of the Longitudinal Study of Australian Children. Partial-syndrome ED status was measured at age 16-17 using the Branched Eating Disorder Test, to identify adolescents who met partial-criteria for anorexia nervosa, bulimia nervosa or binge eating disorder. The associations between risk factors at age 10-11 and partial-syndrome ED at age 16-17 were examined whilst adjusting for relevant confounding family factors at age 8-9. **Results:** Negative reactivity and self-esteem did not show significant association with partial-syndrome ED at age 16-17. Body dissatisfaction significantly predicted partial-syndrome ED in the reverse to expected direction; dissatisfaction was associated with decreased likelihood of meeting partial-syndrome ED at age 16-17. **Discussion:** Findings of the study suggest that the transdiagnostic model of EDs may not represent well the risk factors of EDs in early adolescence. Body dissatisfaction, negative reactivity and self-esteem may be sensitive to time and changes throughout adolescence in their predictive ability for subsequent ED development in late adolescence. Further research is needed to understand the developmental trajectory of these factors in adolescence.

Key Words: adolescent, longitudinal studies, feeding and eating disorders, anorexia nervosa, bulimia, binge-eating disorder, risk factors, body dissatisfaction, emotions, self concept

1. Introduction

Eating disorders (EDs) are clinical syndromes which are categorized by severe disturbances in eating or eating-related behaviours. EDs represent a concern to society due to both high incidence in adolescents and a high mortality rate (Yeo & Hughes, 2011), as well as the associated high social and economic costs (Paxton et al., 2012). A recent review indicated the lifetime prevalence of EDs as 8.4% and 2.2% in females and males respectively, with peak incidence during adolescence (Galmiche et al., 2019). Due to complexities associated with EDs, they are resistant to treatments once onset occurs (Halmi, 2013). Hence, literature has emphasized the importance of early detection and prevention to limit symptom progression and improve outcomes (Rowe, 2017).

Adolescence has been identified as an unique stage of development spanning from the age of 10 to 19 (World Health Organisation, 2021). Although research suggests the peak incidence of EDs to be during mid adolescence to early adulthood, age 15-24, problematic eating behaviour tends to present earlier (Smink et al., 2012; Micali et al., 2013). It was found that by age 12, ED symptoms were already present at levels similar to those found in older adolescents (Wichstrøm, 2000). Therefore, this suggested that antecedent conditions may be established early in adolescence. However, prospective studies of risk factors remain limited, and this has impeded early prevention efforts (Evans et al., 2017).

While the distinctive features of different EDs, including anorexia nervosa (AN), bulimia nervosa (BN), and binge eating disorder (BED), have been established in previous literature (e.g. Thomas et al., 2009), research over the past two decades has attempted to understand the development and maintenance of EDs collectively. Fairburn et al. (2003)

argued that certain clinical features, while distinctive from other psychological disorders, are shared across different types of EDs. This led to Fairburn et al.'s (2003) development of the transdiagnostic model of EDs which describes the common core psychopathology of EDs as a dysfunctional system of evaluating self-worth based on eating habits, shape and weight and one's ability to exert control over them, which is maintained by four main psychological processes. These are (1) clinical perfectionism, (2) mood intolerance, (3) interpersonal difficulties and (4) pervasive (also termed "core") low self-esteem. The validity of the transdiagnostic model has been justified in adults as these four maintenance factors were found to be associated with ED symptoms in non-clinical (Dakanalis et al., 2014) and clinical adult samples (Lampard et al., 2013). However, there has been limited examination of the applicability of the model in adolescents. Curzio et al. (2018) studied the model in adolescents with a mean age of 15 years, and found that perfectionism, low self-esteem, mood intolerance and overevaluation of shape and weight (measured through body dissatisfaction and shape and weight concern) were associated with ED symptoms across ED diagnoses. A recent study conducted by Jones et al. (2020) tested the model with 270 adolescents, also with a mean age of 15 years, and found that mood intolerance and low self-esteem were directly associated with ED symptoms, whilst perfectionism was indirectly associated through self-esteem and mood intolerance. These two studies suggested that the transdiagnostic model of EDs may be applicable to adolescent population. However, both studies used a cross-sectional design with treatment-seeking sample of adolescents diagnosed with an ED. Therefore, it is not clear whether these factors can predict the development of EDs prospectively in community samples. Hence, longitudinal studies are needed to understand how risk factors are expressed during adolescence and their associations with subsequent ED onset in a community sample.

Across all multivariate aetiological models of EDs (e.g. Polivy & Herman, 2002; Riva, 2011, 2012), as well as in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5; American Psychiatric Association [APA], 2013), body dissatisfaction has been consistently referenced as a contributing factor to the development of EDs. According to Fairburn et al. (2003), as a result of over-emphasis of the importance of eating, shape, weight and their control in individuals with EDs, their lives become focused on thinness, dietary control and weight loss. Therefore, body dissatisfaction can be viewed as a consequence of this preoccupation. This was reflected in meta-analytic data which indicated body dissatisfaction as the most robust causal risk factor for ED symptomatology for both genders (Stice, 2002). Previous longitudinal studies have investigated the predictive power of body dissatisfaction during early adolescence on the later development of ED symptoms. For example, Rohde et al. (2015) used data from a longitudinal study of 496 American community adolescent girls, who were followed from age 13 to 21. The study found that body dissatisfaction emerged as a significant predictor of ED onset between ages 13 and 16, with elevated body dissatisfaction associated with 68% increased likelihood of development of EDs. These results paralleled those from Gardner et al. (2000), who tested ED risk factors longitudinally with a younger sample aged 6 to 14 who were assessed annually for 3 years. Results from this study found that body dissatisfaction emerged as a significant predictor of elevated scores on an ED survey at age 11, thus even earlier than that found in Rohde et al. (2015). Although these previous studies have examined ED risk longitudinally, they did not account for potential confounders other than adolescents' BMI status or socioeconomic status. Further longitudinal research that accounts for other relevant confounding factors is needed to affirm the predictive utility of body dissatisfaction for the subsequent development of EDs in adolescents.

The contribution of one's ability to understand, communicate and respond adaptively to the experience of emotion (i.e., emotional regulation) has also been identified as an important factor in understanding ED risk. Emotion regulation difficulties are considered to underlie EDs, with evidence suggesting that individuals with an ED exhibit higher level of emotion regulation difficulties as compared to healthy individuals (Brockmeyer et al., 2014; Harrison et al., 2010). While emotion regulation has been extensively studied in relation to EDs, relatively little research has investigated whether emotion regulation difficulties in ED, or "mood intolerance" as defined by Fairburn et al. (2003), may be due to elevated emotional reactivity (i.e., more prone to experience negative affective states more intensely and frequently). This is important to investigate as it has been proposed that disordered eating behaviours may represent efforts to avoid intense and aversive cognitive and emotion states as a result of individuals' elevated reactivity, contributing to the development of EDs (García-Grau et al., 2002). An exploratory study supported this suggestion, finding that adolescents with an ED exhibited elevated emotional reactivity compared to those without an ED (Nock et al., 2008). Additionally, Juarascio et al. (2016) found that emotional reactivity in adolescents was significantly associated with increases in ED attitudes over time in a 6-year longitudinal study. Therefore, there is evidence to suggest that in the context of EDs, emotional reactivity underpins emotion regulation difficulties which can lead to the engagement in disordered eating behaviours as a maladaptive coping strategy to avoid negative and intense mood states.

The transdiagnostic model of EDs describes core low self-esteem as a key factor in understanding the development and maintenance of EDs. Numerous studies have been consistent in describing that for individuals with an ED, a pervasive negative view of the self predicts engagement in weight-controlling behaviours in order to pursue a highly valued goal

of attaining a desired body shape as a mean to improve self-esteem. Failure to maintain these weight control behaviours is subsequently perceived as confirming a negative self-image (e.g., "I am a failure") which results in the maintenance of low self-esteem and disordered eating behaviours. Indeed, Gual et al. (2002) found a strong and independent association between low global self-esteem, which encompassed self-concept in multiple domains (i.e., social, emotional, familial and academic), with higher prevalence of psychiatrist-diagnosed EDs in Spanish adolescents aged 12 to 21 using a cross-sectional design. In a further study using a prospective design, Cervera et al. (2003) found that lower global self-esteem was a significant predictor of psychiatrist-diagnosed ED over the subsequent 18 months in adolescents, while higher self-esteem was protective against the development of ED. In a recent meta-analysis, it was concluded that low self-esteem is a universal risk factor across different EDs (Colmsee et al., 2021). This effect was more prominent in females, but appeared to be robust across ages from late childhood to young adulthood. However, the meta-analysis did not account for possible confounding factors. Nevertheless, previous research has consistently supported the influence of low self-esteem on the development and maintenance of EDs.

Previous research has also investigated the contribution of environmental factors to the development of EDs. In particular, while it has been recognised that families do not cause EDs, certain family characteristics may increase risk for problematic eating behaviours (Allen et al., 2014). Studies have suggested that ED risk in children may be influenced by maternal psychological distress, as opposed to mothers suffering from EDs specifically (Micali et al., 2011; Stein et al., 2006). Milan and Acker (2014) used longitudinal data and found that maternal depression, anxiety and anger indirectly predicted disordered eating attitudes and behaviours for adolescents with a history of insecure attachment at age 15. Parenting factors

have also been found to influence ED risk, with low maternal warmth found to predict eating problems and attitudes associated with EDs (e.g., shape and weight concern, body dissatisfaction) in late adolescents (Haudek et al., 1999). In terms of broader environmental factors, past research has supported that disordered eating and dieting show higher prevalence amongst higher socioeconomic groups, and that socioeconomic status may influence the strength of ED risk factors, such as body dissatisfaction (French & Jeffery, 1994; West et al., 2019). Considering the different family factors that may influence ED risk, it would be sensible to adjust for these factors in ED research, which has not been consistently done in the past.

Considering the previously described literature on ED risk factors during adolescence, it is clear that there is a need for research to establish a comprehensive understanding of core risk factors associated with EDs in adolescents prospectively, while controlling for relevant factors that may confound this relationship. This can have important implications for preventative efforts for EDs, by identifying factors during early adolescence that may be targeted before the peak period of ED onset. Additionally, by examining risk of development of any EDs, it can better inform preventative efforts, as intervention programs would ideally target risk in any ED, rather than one specific type. Although meta-analytic reviews have found significantly weaker effects for ED intervention programs aimed at adolescents less than 15 years old compared to those aimed at older adolescents (Stice et al., 2007), some media literacy programs focusing on factors such as body dissatisfaction and self-esteem have produced significant effects in early adolescent samples immediately post-intervention (McVey et al., 2004), at 3-month follow up (Neumark-Sztainer et al., 2000), or even at 12-month follow up (O'Dea & Abraham, 2000). Therefore, by examining the predictive utility of risk factors in early adolescence, it may inform the identification of those at risk of EDs in

early adolescence, in turn informing preventative programs to reduce risk of adolescents developing EDs by late adolescence.

The present study will examine ED risk factors in early adolescence on ED symptoms in later adolescents, and test key features of the transdiagnostic model proposed by Fairburn et al. (2003) longitudinally. Specifically, the focus of the present study is to determine whether body dissatisfaction, negative reactivity and self-esteem during early adolescence (age 10-11) could predict ED development in later adolescence (age 16-17). The study will do so while controlling for multiple potentially confounding family factors, which may be especially influential for early adolescents. Studying risk factors at age 10-11 can address the finding from previous research that antecedent conditions for EDs may be established very early in adolescence. Moreover, age 10-11 is a favourable time to investigate ED risk as this is the age when adolescents have the capacity to engage in preventative interventions during primary schooling. The study will also use a large Australian representative sample of over 2000 adolescents to study ED risk factors prospectively.

The aim of the present study was to therefore investigate whether body dissatisfaction, negative reactivity and self-esteem at age 10 to 11 could predict the development of partial-syndrome ED at age 16 to 17 in a prospective longitudinal study design (See Figure 1). Partial-syndrome ED is defined as the fulfilment of two of the three DSM-5 criteria for AN and BN, and one single criteria for BED (Selzer et al., 1996; Bisset et al., 2019). The study examined these associations while adjusting for the potential influence of pre-existing maternal psychological distress, maternal warmth and family socioeconomic status at childhood age 8 to 9. It was hypothesized that body dissatisfaction, higher negative reactivity, and lower self-esteem at age 10 to 11 would be significantly associated with a

positive detection of partial ED syndrome at age 16 to 17, while adjusting for relevant confounding variables.

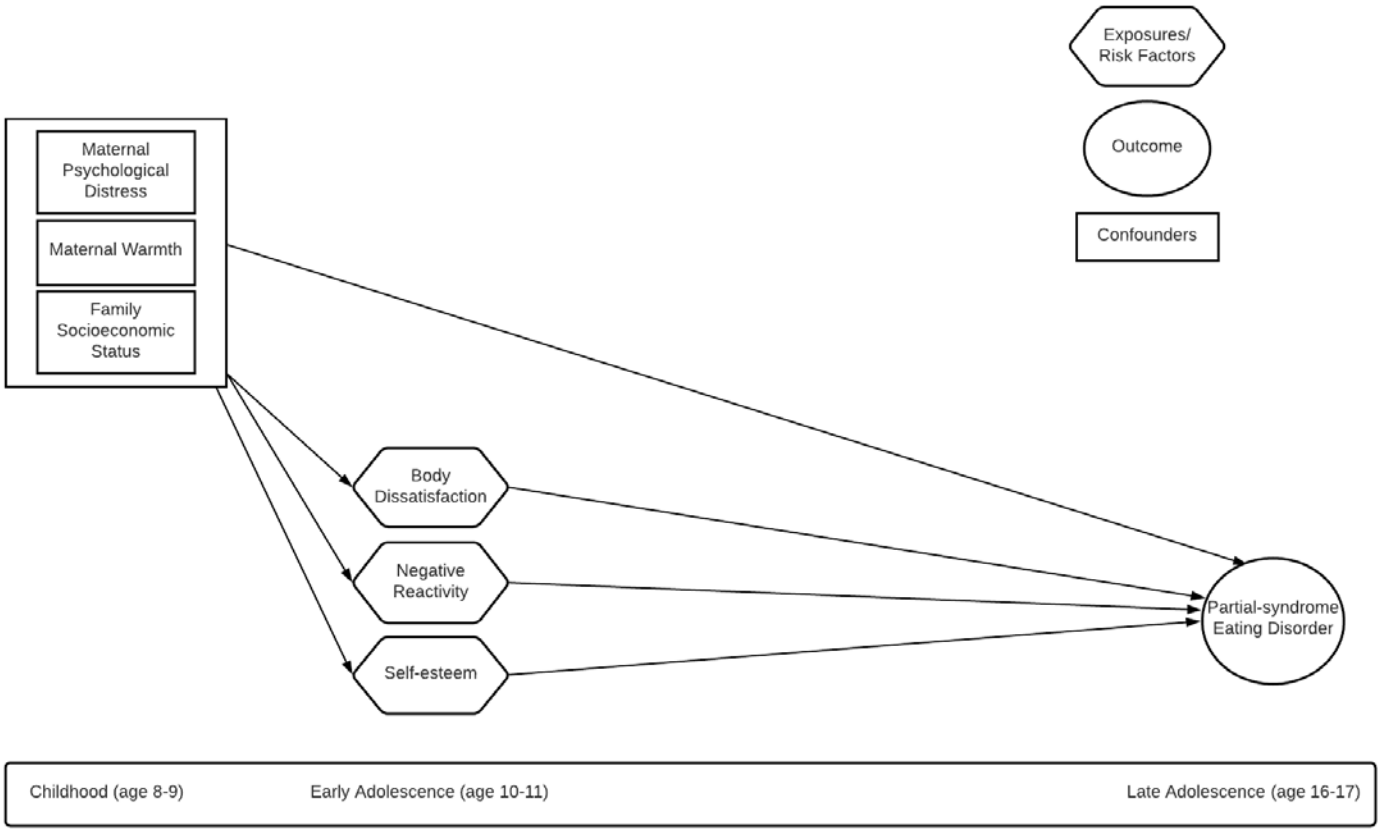

Figure 1.

Diagram illustrating study variables and the direction of associations examined.

2. Method

2.1 Participants and Procedure

Data for this study came from the Longitudinal Study of Australian Children (LSAC), and included children and adolescents at age 8-9, 10-11 and 16-17, and their parents from Kinder (K) Cohort. These data were drawn from Wave 3, 4 and 7 of the LSAC, conducted in 2008, 2010 and 2016 respectively. Details of the study design and sampling procedure are described

in detail elsewhere (Soloff et al., 2005). In brief, the study used a two-stage cluster sampling design in which Australian postcodes were randomly sampled and stratified by state of residence and remoteness to ensure representativeness. The study was approved by the Australian Institute of Family Studies ethics committee.

For the K cohort, 4983 children were recruited at age 4 to 5, with 4331 (87%), 4169 (84%) and 3089 (62%) retained at wave 3, 4 and 7 respectively. The number of participants lost at each wave was a result of failure to maintain contact, participants' withdrawal from the study or children moving out of scope (i.e., relocating overseas). At wave 7, 2372 adolescents (representing 48% of the initial sample in 2004) had complete data available for all measures used in the present study across the three waves of data collection, and represent the "complete-case" sample. These 2372 adolescents are the focus of the present study. The flow of these adolescents through the study waves in LSAC are shown in Figure 2 and the sample characteristics of the adolescents who participated are shown in Table 1. "Response sample" in Table 1 represents those participants in LSAC with completed responses for each individual measure.

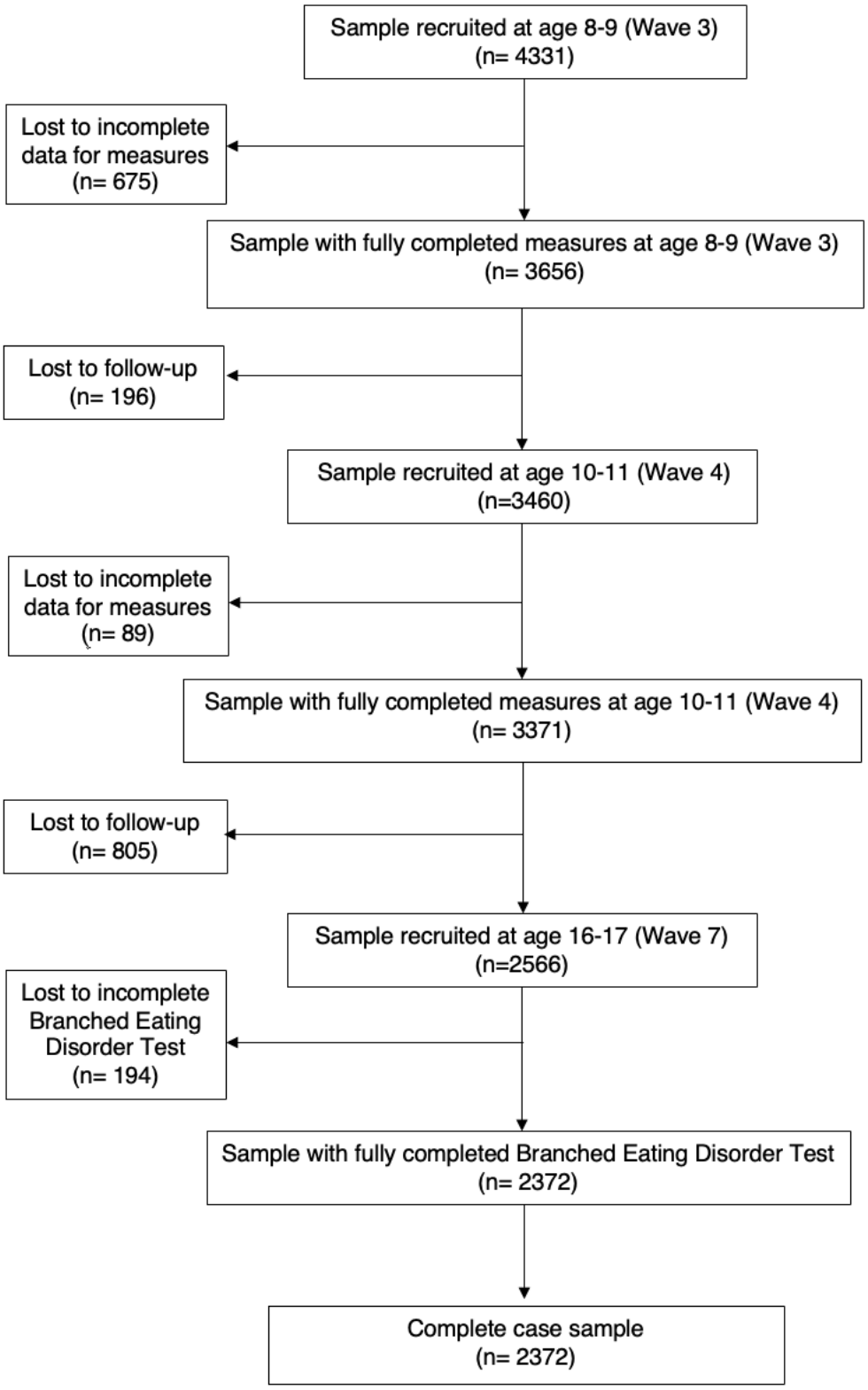

Figure 2.

Flow of participants with available data for the present study through the LSAC study waves.

Table 1.

Characteristics of the Response and Complete-Case Samples.

		Response sample†		Complete-case sample‡ (n = 2372)
	Age (years)	n	M (SD) or %	M (SD) or %
Adolescent gender (Girls)				
Age 8-9	8-9	4331	48.9%	48.7%
Age 10-11	10-11	4169	48.9%	48.7%
Age 16-17	16-17	3089	49.0%	48.7%
Indigenous status (Yes)				
Age 8-9	8-9	4329	2.8%	1.8%
Age 10-11	10-11	4167	2.8%	1.8%
Age 16-17	16-17	3089	2.2%	1.7%
Body dissatisfaction (PBII) (% Want a thinner body)	10-11	4084	37.9%	35.4%
(95% CI)			(36.4-39.4)	(33.5-37.4)
Negative reactivity (SATI)	10-11	4115	2.3 (0.8)	2.3 (0.8)
Self-esteem (SDQ-II)	10-11	4089		
Median (Interquartile range)			34.0 (8.0)	35.0 (7.0)
% below median			43.6%	48.8%
Partial-syndrome ED criteria met (BEDT)				
Anorexia Nervosa	16-17	2833	4.1%	4.3%
Bulimia Nervosa	16-17	2928	1.8%	1.6%
Binge Eating Disorder	16-17	2929	0.9%	0.8%
Any Eating Disorder	16-17	2833	6.2%	6.2%
Partial-syndrome ED criteria not met (BEDT)	16-17	2833	93.8%	93.8%
Maternal psychological distress (K6)	8-9	3688		
M (SD)			3.5 (3.6)	3.3 (3.3)
Range			24	23
% probable serious mental illness§			3.0%	1.7%
Maternal warmth (CRQ)	8-9	3718		
Median (Interquartile range)			4.3 (0.8)	4.3 (0.8)
% below median			44.0%	44.4%
Family socioeconomic status (SEIFA)	8-9	4331		
1st quartile			14.9%	12.9%
2nd quartile			34.9%	34.1%
3rd quartile			26.5%	27.3%
4th quartile			23.7%	25.7%

†Response sample is the number of participants who responded to each item for each study measure
‡Complete-case sample includes participants with complete data on all items across study measures
§K6 cut off score for 'probable serious mental illness' is 13 (Kessler et al., 2003)
Abbreviations: ED, eating disorder; M, mean; SD, standard deviation; CI, confidence interval; PBII, Pictorial Body Image Instrument; SATI, School-Age Temperament Inventory; SDQ-II, Self-Description Questionnaire II; BEDT, Branched Eating Disorder Test; K6, Kessler 6 Psychological Distress Scale; CRQ, Child Rearing Questionnaire; SEIFA, Socio-Economic Indexes for Areas.

2.2 Measures

2.2.1 Body Dissatisfaction

Body dissatisfaction was measured at age 10-11 using the Pictorial Body Image Instrument (PBII; Collins, 1991). This measure involved the use of a schematic figure rating method, in which adolescents were shown an array of seven figures depicting adolescents of the same sex, which ranged in body size from very thin to very large. Participants were then asked to select the figure that represented their "actual" body size and the figure that represented their "ideal" body size. The discrepancy between the perceived actual and ideal body images was used as a measure of body dissatisfaction, with a positive score indicating that the adolescent wanted a thinner body, a negative score indicating that the adolescent wanted a larger body, and a score of 0 indicating that the adolescent was satisfied with their body size. As literature has associated EDs with a specific desire for thinness (e.g., Fairburn et al., 2003), adolescents who wanted a thinner body were categorized into one group, and those who were satisfied with their body were categorized together with those who wanted a larger body. For the present study, the group who desired a thinner body was classified as experiencing body dissatisfaction. The validity and reliability of the Pictorial Body Image Instrument has been supported in previous research (Gardner & Brown, 2010).

2.2.2 Negative Reactivity

Negative Reactivity was measured at age 10-11 using the School-Age Temperament Inventory (SATI; McClowry, 1995). The SATI is a parental report that measures adolescents' temperament and consists of four dimensions. Of the original 38 items, four items from the "negative reactivity" dimension were included in the LSAC (e.g., "Responds intensely to disapproval (shouts, cries, etc.)"). Parents rated their child on a 5-point Likert scale from "1=

never" to "5= *always*". Reactivity scores were obtained by deriving the mean score of the four items, with a higher score representing higher negative reactivity. The original SATI has been validated in a previous study and it demonstrated good internal consistency (α=.80-.92; McClowry et al., 2003).

2.2.3 Self-Esteem

Self-esteem was measured at age 10-11 using the Marsh Self-Description Questionnaire II (SDQ-II; Marsh, 1990). Of the original 102 items, the LSAC included eight items from the General Self Scale, which measures adolescents' feelings of self-worth, self-confidence and self-satisfaction (e.g., "In general, I like the way I am"). Adolescents responded to the items on a 5-point Likert scale from "1= *false*" to "5= *true*". Self-esteem scores were obtained by summing responses from the eight items, with a higher score indicating a higher self-esteem. The SDQ-II scales demonstrated good internal consistency in the original validation study (α=.83-.91; Marsh, 1990). Due to the negatively skewed distribution of adolescents' summed scores, scores were categorized into two groups through performing a median split.

2.2.4 Child and family confounders

Maternal psychological distress was measured at age 8-9 using the Kessler 6 Psychological Distress Scale (K6; Kessler et al., 2003). The K6 consists of six items that ask about a participant's feelings over the past 4-week period (e.g., "In the past four weeks, about how often did you feel hopeless"). Items were answered on a 5-point Likert scale from "1= *all of the time*" to "5= *none of the time*". Mothers' responses were scored following the scoring protocol and a threshold value of 13 was used to identify mothers with "No probable serious mental illness" (scores <13) and those with scores at clinical range or with "Probable serious mental illness" (Kessler et al., 2003).

Maternal warmth was measured at age 8-9 using the parental warmth scale that was derived from the Child Rearing Questionnaire (CRQ; Paterson & Sanson, 1999). The CRQ has been widely used and was found to show predictive relationships with adolescents' internalizing and externalizing behaviours (Bradley et al., 1988). The parental warmth scale included six of the original 10 items, and measures how often parents express affection, have warm and intimate times with the child, and feel close to the child. Items were answered on a 5-point Likert scale from "1= *never/almost never*" to "5= *always/almost always*". Mothers' responses were used to derive mean scores of the six items, with a higher score representing more maternal warmth. This scale has demonstrated good internal consistency in a previous study (α= 0.84; Kemmis-Riggs et al., 2020). Due to the negatively skewed distribution of mean scores, scores were categorized into two groups through performing a median split.

Family socioeconomic status was measured at age 8-9 using the Socio-Economic Indexes for Areas (SEIFA) Index of Advantage/Disadvantage (Trewin, 2001). This measure was developed by the Australian Bureau of Statistics (ABS) and is a census-based measure of socio-economic advantage and disadvantage in an area based on variables including income, occupation, and education. Lower scores on this measure indicated more disadvantage and less advantage, and higher scores indicated the reverse. The SEIFA index has demonstrated good validity based on analyses using Australian census (Trewin, 2001).

2.2.5 Partial-syndrome ED

Partial-syndrome ED diagnoses were measured at age 16-17 using the Branched Eating Disorder Test (BEDT; Selzer et al., 1996). The BEDT is suitable for use in community samples and is designed to allow for the identification of partial syndrome EDs, defined as

the fulfillment of two DSM criteria for AN and BN, and one single criteria for BED. The instrument has shown high agreement with the Eating Disorder Examination (EDE; sensitivity 100%, specificity 99% and positive predictive value 70%) using an Australian community sample of adolescent girls (Selzer et al., 1996). The BEDT has been used to assess partial-syndrome ED diagnoses according to DSM-IV (APA, 1994) criteria (Patton et al., 2008). However, minor revisions were made in the LSAC to the original BEDT to ensure consistency with DSM-5, and to clarify wording. The BEDT consists of nine stem items branching out to a maximum of 31 items. Stem items ask participants about their engagement in particular behaviours and attitudes over the past 4 weeks (e.g., "In the last four weeks have you felt at any time that you have lost control of your eating or felt you ate too much?"). If participants answered "yes", they would complete follow-up questions regarding the frequency and duration of engagement in the endorsed behaviours or attitudes. The identification criteria for partial-syndrome AN, BN and BED diagnoses were adopted from Bisset et al. (2019) (See Appendix 1). A partial-syndrome ED was identified if adolescents met any partial-syndrome criteria for AN, BN or BED.

2.3 Statistical Analysis

LSAC data was analyzed using the Statistical Package for the Social Sciences (SPSS, Version 27). The first step of data analysis involved the identification of the response and complete-case sample through removing missing responses. Secondly, the characteristics of the group who met partial-syndrome ED and those who did not were analyzed separately. Confidence intervals (CIs) were used to provide information on the precision of these estimates and the extent to which differences in characteristics between the two groups may be statistically significant.

Separate univariate logistic regression analyses were conducted to examine the association of body dissatisfaction, negative reactivity and self-esteem with partial-syndrome ED status. Subsequently, multivariate logistic regression analyses were conducted to examine any changes in the reported associations after adjusting for potential reciprocal effects amongst the risk factors and for potential confounders including maternal psychological distress and warmth, and family socioeconomic status.

As part of post-hoc analyses, the proportions of adolescents with body dissatisfaction and with self-esteem below the median, and mean level of reactivity were examined in partial-syndrome met and partial-syndrome not met groups for each ED type separately. This was followed by separate multivariate regression analyses for each ED type, to examine whether the three factors were associated with each ED type when adjusting for confounding variables. Conducting these post-hoc analyses allowed the examination of whether effects from the main analyses were replicated for each ED type, and whether any effects were specific to certain ED types and potentially driving the effects seen in the main analyses. Hence, this allowed for further examination of the validity of the transdiagnostic model.

3. Results

3.1 Sample Characteristics and Descriptive Statistics

Table 1 shows that the scores from the response and complete-case samples were generally consistent, however, the complete-case sample consisted of a slightly lower proportion of adolescents who identified as Indigenous (by 0.5-1% across three age groups) and slightly more advantaged families (with 0.8% and 2% more families in the 3rd and 4th socioeconomic quartiles respectively). The complete-case sample also consisted of slightly less

psychologically distressed mothers (by 1.3%) and slightly less body dissatisfied adolescents (by 2.5%), though the 95% confidence intervals for this difference slightly overlapped. Despite slight differences in sample characteristics, the response and complete-case samples had consistent proportions of adolescents who met partial-syndrome in any EDs and in the specific diagnoses (i.e., AN, BN and BED).

All subsequent analyses were conducted with the complete-case sample. Approximately half of the adolescents, 48.7%, were girls and the remaining 51.3% were boys. At age 10-11, 35.4% of adolescents wanted a thinner body, 7.9% wanted a larger body, and 56.7% indicated no dissatisfaction at all. Reactivity scores at age 10-11 were relatively normally distributed, and the mean score within the sample was 2.3 (*SD*= 0.8, maximum possible score of 5). The median self-esteem score was 35.0 (maximum possible score of 40), which supported that adolescents generally indicated high level of self-esteem at age 10-11.

At age 16-17, 6.2% of adolescents (n= 148) met partial-syndrome criteria for any of the three EDs and 4.3% (n= 101), 1.6% (n= 38) and 0.8% (n= 20) met partial-syndrome AN, BN and BED respectively.

In terms of the confounding variables measured at age 8-9, only 1.7% of mothers indicated psychological distress in the clinical range. The median score for maternal warmth was 4.3 (maximum possible score of 5), which supported that mothers generally reported high level of warmth. The distribution of families across the socioeconomic quartiles supported a generally average level of socioeconomic status, with majority of families falling in the 2nd and 3rd quartiles.

Table 2 shows the distribution of risk factors and potential confounders for adolescents who met partial-syndrome ED and those who did not at age 16-17. The proportion of adolescents who experienced body dissatisfaction, as defined by wanting a *thinner* body, was higher in the partial-syndrome not met group (36.4%, 95% CI: 34.4-38.5%), than the partial-syndrome met group (20.3%, 95% CI: 14.1-27.7%). This suggested that there were more adolescents who indicated body dissatisfaction in those who did not meet partial-syndrome ED when they reached age 16-17, compared to those who did meet partial-syndrome ED. The mean reactivity scores at age 10-11 were highly similar between the partial-syndrome met and partial-syndrome not met groups. The proportion of adolescents who had a self-esteem score lower than the median cut-off point was slightly higher, by 3.1%, in the partial-syndrome not met group than the partial-syndrome met group, though the 95% confidence intervals for this difference were overlapping.

588 **Table 2.**

589 *Distribution of characteristics comparing individuals meeting partial -syndrome ED criteria*

590 *to those who did not meet criteria (n = 2372).*

	Partial-syndrome ED met group (n= 148)	Partial-syndrome ED **not** met group (n = 2224)
	M (SD) or % (95% CI)	M (SD) or % (95% CI)
Body dissatisfaction (% Want a thinner body)	20.3% (14.1-27.7%)	36.4% (34.4-38.5%)
Negative reactivity (95% CI)	2.3 (0.8) (2.2-2.4)	2.3 (0.8) (2.2-2.3)
Self-esteem (% below median cut-off)	45.9% (37.7-54.3%)	49.0% (46.9-51.1%)
Maternal psychological distress (% probable serious mental illness)	2.7% (0.7-6.8%)	1.7% (1.2-2.3%)
Maternal warmth (% below median cut-off)	49.3% (41.0-57.7%)	44.1% (42.0-46.2%)
Family socioeconomic status		
1st quartile	16.9% (11.2-23.9%)	12.6% (11.2-14.0%)
2nd quartile	32.4% (25.0-40.6%)	34.2% (32.2-36.2%)
3rd quartile	23.6% (17.1-31.3%)	27.6% (25.7-29.5%)
4th quartile	27.0% (20.1-34.9%)	25.6% (23.8-27.5%)
BMI (% underweight)	68.9% (60.8-76.3%)	5.2% (4.3-6.2%)

591 Abbreviations: ED, eating disorder; M, mean; SD, standard deviation; CI, confidence interval

592

593 Table 2 additionally shows that the proportion of underweight adolescents at age 16-17,

594 identified based on adolescents' BMI scores, was notably higher in the partial-syndrome met

595 group (68.9%, 95% CI: 60.8-76.3%) than the partial-syndrome not met group (5.2%, 95% CI:

596 4.3-6.2%).

597

598 3.2 Univariate and Multivariate Analyses

599 Table 3 shows the regression analyses for the associations between risk factors at age 10-11
600 and partial-syndrome ED at age 16-17, in unadjusted and adjusted models. In *Model 1,* body
601 dissatisfaction showed a significant association with partial-syndrome ED at age 16-17 ($p<$
602 .001), and the associated odds ratio (OR: 0.44, 95% CI: 0.30-0.67) indicated that body
603 dissatisfaction was associated with 56% *decrease* in odds of meeting partial-syndrome ED at
604 age 16-17. Negative reactivity and low self-esteem were not significantly associated with
605 increased odds of meeting partial-syndrome ED criteria at age 16-17. Adjusting for the
606 influence of the other risk factors (*Model 2*) did not change the pattern of effects. In the final
607 model *(Model 3),* which adjusted for all variables including confounding variables (i.e.,
608 maternal psychological distress and warmth and family socioeconomic status), the same
609 pattern of effects emerged, with body dissatisfaction being significantly associated with a
610 56% *decrease* in odds of meeting partial-syndrome ED at age 16-17 ($p<$ .001, OR: 0.44, 95%
611 CI: 0.29-0.67). Negative reactivity and low self-esteem were not significantly associated with
612 increased odds of meeting partial-syndrome ED in the final model. Moreover, the R^2 value
613 for the final model indicated that the fully adjusted model only accounted for 2% of variance
614 in adolescents' partial-syndrome ED status at age 16-17, suggesting that the significant effect
615 of body dissatisfaction may be weak.
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Table 3.

Unadjusted and adjusted multiple regression analyses for the associations between body dissatisfaction, negative reactivity and self-esteem at age 10-11 and partial-syndrome ED status at age 16-17 (n= 2372).

	Model 1- unadjusted			Model 2- adjusted			Model 3- adjusted		
	p	OR (95% CI)	R^2	*p*	OR (95% CI)	R^2	*p*	OR (95% CI)	R^2
Body dissatisfaction	**<.001*** **	**0.44 (0.30-0.67)**	0.02	**<.001*** **	**0.45 (0.30-0.67)**	0.02	**<.001*** **	**0.44 (0.29-0.67)**	0.02
Negative reactivity	0.89	1.02 (0.82-1.26)	0.00	0.82	1.03 (0.83-1.27)		1.00	1.00 (0.81-1.24)	
Self-esteem	0.48	0.89 (0.63-1.24)	0.00	0.84	0.97 (0.69-1.36)		0.77	0.95 (0.68-1.34)	

Abbreviations: OR, odds ratio; CI, confidence interval; R^2, Nagelkerke R Square; Bold and ***, p <.001
Model 1 presents the association between the risk factors and outcome, without adjustment for other risk factors.
Model 2 adjusts for all risk factors in the same model.
Model 3 additionally adjusts for maternal psychological distress, maternal warmth and family socio-economic status.

3.3 Post-hoc Analyses

Post-hoc analyses were conducted to investigate whether the observed pattern of effects was consistent across all three types of EDs. The results of disorder-specific associations are presented in Appendix 2. In terms of body dissatisfaction, similar to main analyses, there was a higher proportion of adolescents with body dissatisfaction in the partial-syndrome AN not met group than the partial-syndrome AN met group. The effect of body dissatisfaction on partial-syndrome AN was significant (p< .001) in a fully adjusted regression model, and the associated OR (0.23, 95% CI: 0.12-0.43) suggested that body dissatisfaction was associated with 77% *decrease* in odds of meeting partial-syndrome AN at age 16-17. Conversely, for BN and BED, there were more adolescents with body dissatisfaction in the partial-syndrome met group than the partial-syndrome not met group, though the difference between those meeting criteria and those not meeting criteria was not statistically significant. Similar to the main analyses, mean reactivity scores were highly consistent between partial-syndrome met

and not met groups across AN, BN and BED. The effect of self-esteem was statistically significant for partial-syndrome BN in a fully adjusted model (p= .012). The associated OR (2.51, 95% CI: 1.23-5.15) suggested that there was 2.51 times the likelihood of meeting partial-syndrome BN for adolescents with low self-esteem than those without low self-esteem.

Given the unexpected finding that those with a desire for a thinner body showed *decreased* likelihood of meeting partial-syndrome ED, further analyses were conducted to investigate any potential influences from the means of categorising body dissatisfaction in the present study. Appendix 3 presents the results of these further analyses, investigating the proportions of adolescents indicating dissatisfaction across different ED groups when body dissatisfaction was categorised in different ways (e.g., using raw "perceived-ideal" scores). Results from these analyses were consistent with the main analyses, suggesting that the present effect was not dependent on the method of analysing body dissatisfaction.

4.0 Discussion

The aim of the present study was to investigate whether body dissatisfaction, negative reactivity and self-esteem in adolescents aged 10-11 years can predict partial-syndrome ED status when adolescents reached age 16-17 years, while controlling for the potential influence of relevant confounders (i.e., maternal psychological distress and warmth, and family socioeconomic status). As little is known about the applicability of the transdiagnostic model of EDs in adolescent samples, the present study aimed to investigate the predictive utility of risk factors on partial-syndrome status in any of the three ED types (i.e., AN, BN and BED). It was hypothesized that body dissatisfaction, higher negative reactivity and lower self-

esteem would predict a positive detection of partial-syndrome ED later in adolescence. To the knowledge of the authors, there has been no previous study that tested the longitudinal association of these risk factors adapted from the transdiagnostic model and which showed consistent association with ED outcomes in adolescence, whilst controlling for the specific confounding factors using a nationally representative sample.

The results of the present study found that body dissatisfaction at age 10-11, defined as wanting a *thinner* body, was significantly associated with *less likelihood* of meeting partial-syndrome ED at age 16-17. Contrary to expectations, body dissatisfaction was associated with a 55-56% *decrease* in likelihood of meeting partial-syndrome ED at age 16-17, even when other risk factors (i.e., negative reactivity and self-esteem) and confounding family factors (i.e., maternal psychological distress and warmth and family socioeconomic status) were adjusted for. This effect was reflected in the higher proportion of adolescents indicating body dissatisfaction amongst those who did not later meet partial-syndrome ED, than those who did. Post-hoc analyses suggested that this unexpected finding was largely a function of adolescents meeting partial-syndrome criteria for AN at age 16-17, with lower proportion of adolescents reporting body dissatisfaction at age 10-11 than those who did not meet partial-syndrome AN. Consequently, body dissatisfaction was associated with 77% *decrease* in likelihood of meeting partial-syndrome AN at age 16-17. However, this pattern was not evident for those who met partial-syndrome BN and BED, as there was evidence of slightly more adolescents with body dissatisfaction at age 10-11 than those without partial-syndrome BN or BED. Considering that partial-syndrome AN had the highest prevalence compared to BN and BED in the study sample, this supported that the reverse effect of body dissatisfaction seen in partial-syndrome AN only was driving the overall reverse effect of body dissatisfaction on partial-syndrome ED.

In terms of negative reactivity and self-esteem at age 10-11, results showed that these factors were not significantly associated with partial-syndrome ED at age 16-17. However, post-hoc analyses found that self-esteem had a specific significant effect for partial-syndrome BN during late adolescence, with those with lower self-esteem at age 10-11 having 2.51 times the likelihood of meeting partial-syndrome BN at age 16-17. Overall, the findings from the present study did not support the initial hypothesis, as findings suggested that when studying partial-syndrome EDs in a transdiagnostic manner, body dissatisfaction was the only significant predictor of partial-syndrome ED at age 16-17, and in the reverse direction as expected. However, body dissatisfaction and self-esteem may show unique associations with AN and BN respectively. Additionally, results showed that body dissatisfaction, negative reactivity and self-esteem collectively only accounted for 2% of variance in adolescents' partial-syndrome ED status at age 16-17 when adjusted for confounding factors. Therefore, the study's results suggested that the transdiagnostic model may not represent well the risk factors for EDs over the adolescent years, and that it may be more appropriate to develop understanding of risk factors in early adolescence for different types of EDs separately, rather than grouping them across diagnoses.

Body Dissatisfaction

The finding that body dissatisfaction did not positively predict adolescents meeting partial-syndrome ED was inconsistent with Rohde et al. (2015) which found that elevated body dissatisfaction in early adolescence predicted subsequent EDs in late adolescence. However, Rohde et al. (2015) tested body dissatisfaction starting at the age of 13 and measured ED onset within the subsequent 4-year period, as opposed to testing body dissatisfaction earlier at age 10-11 and partial-syndrome ED 6 years later in the present study. Although Gardner et al.

(2000) tested body dissatisfaction earlier in adolescence and found that it significantly predicted higher ED scores starting at age 11, ED scores were measured 3 years following the measurement of body dissatisfaction. Hence, these longitudinal studies examined the effect of body dissatisfaction on subsequent ED development over a shorter longitudinal time span than the present study. Therefore, the discrepancy in results may suggest that although higher body dissatisfaction may be a robust predictor of EDs, it is not a reliable predictor when testing the association over a longer period of time across adolescence.

An alternate explanation for the study's results may concern the use of figural body rating scales to assess body dissatisfaction. Previous research has criticised the use of figure rating scales as concerns were raised regarding changes in participants' responses based on method of stimuli presentation (i.e., presentation of body images in an ordered array or unordered array) and the failure to account for rapid body changes that occur during early adolescence (Gardner, 2001; Doll et al., 2004). Some studies suggested that figure rating scales are not sufficient for measuring body dissatisfaction, as the scales may specifically assess weight and shape dissatisfaction, whereas body dissatisfaction likely encompasses dissatisfaction in additional aspects of appearance (Vander Wal & Thelen, 2000). Current research emphasises the need to collect attitudinal information related to body dissatisfaction rather than solely relying on the discrepancy between perceived and ideal body images. In fact, Rohde et al. (2015) used the Satisfaction and Dissatisfaction With Body Parts Scale (Berscheid et al., 1973), which asks participants to rate their level of satisfaction with different body parts. This type of measure that includes attitudinal components may be more appropriate to use in future research.

Moreover, the present study examined community families with an overall average level of socioeconomic status. It is possible that adolescents who indicated body dissatisfaction at age 10-11 were able to subsequently engage in activities that helped them reach a satisfied body size, which in turn would protect them from meeting partial-syndrome ED during late adolescence. This may be able to explain why body dissatisfaction was not associated with positive detection of partial-syndrome ED in the present study.

However, despite likely being a weak effect, it is unclear why 10-11 year old adolescents who indicated body dissatisfaction, through wanting their body to be thinner than they currently perceived it to be, were *less likely* to develop symptoms of disordered eating and meet partial-syndrome ED criteria, specifically AN criteria, at age 16-17 years. In addition to this surprising finding, there were more adolescents who wanted a larger body at age 10-11 in those who later met partial-syndrome ED and who met criteria for AN specifically, compared to those who did not meet criteria. A possible explanation for this pattern of results is that as body size changes rapidly during early adolescence (Gardner, 2001), it is possible that adolescents who were initially satisfied with their bodies, or even wanting a larger body, at the start of early adolescence, may have experienced subsequent changes in body size and had less capacity to manage subsequent dissatisfaction throughout adolescence, thus subsequently met partial-syndrome AN at age 16-17. Therefore, in order to further understand the study's results, it would require investigation into the trajectory of body dissatisfaction throughout adolescence. This is worthy of further investigation as although there is evidence of body dissatisfaction as a short-term risk factor for EDs in previous studies, the longitudinal course of this characteristic for early adolescents remains unclear.

Negative reactivity

In terms of negative reactivity, the present study's results were inconsistent with Juarascio et al. (2016), which found that negative reactivity in adolescence significantly predicted increase in ED attitudes concerning weight and eating behaviours over the subsequent 6 years. A key difference between this study and the present study is that the present study measured subsequent partial-syndrome ED status, rather than ED attitudes. Juarascio et al.'s (2016) study used a seven-item measure, The College Eating Disorders Screen (COEDS; Nowak et al., 2003), to measure ED attitudes (e.g., "I believe I am fatter than most people say I am"), which only showed low to moderate correlations with disordered eating behaviours, as opposed to the BEDT used in the current study which is a much longer (40-item) measure of both ED attitudes and disordered eating behaviours. Therefore, discrepancy between results suggests that negative reactivity may better predict cognitive symptoms of EDs, rather than actual disordered eating in late adolescence.

It is also possible that other factors, such as impulsivity (Evans et al., 2019), interact with negative reactivity during early adolescence, and it is the combination of these difficulties that increase risk for EDs. This possibility is consistent with the transactional model of emotion dysregulation for AN proposed by Haynos and Fruzzetti's (2011) which describes the transactional effects between emotional vulnerabilities, such as elevated reactivity, social environment and ED development. Specifically, this model hypothesizes that the combination of emotional vulnerabilities and a history of invalidating responses from others regarding a variety of inner experiences (e.g. body image and emotions) increases the likelihood of individuals becoming emotionally dysregulated when encountering ordinary events (e.g., eating or seeing one's body reflection in a mirror), and as a result may lead to disordered eating behaviours as a maladaptive coping strategy. Hochgraf et al. (2017) tested

this transactional model in early adolescents aged 11-12, and found that the combination of emotional reactivity and parent hostility, which may be a source of invalidating feedback, was positively associated with ED symptoms. Therefore, the findings of the present and previous studies suggest that although negative reactivity alone may predict ED attitudes for early adolescents, as supported from previous research, other factors may be required (e.g., negative parental experiences) to accurately identify early adolescents who will later develop subclinical EDs and those who will not during late adolescence at age 16-17.

Self-Esteem

In terms of self-esteem, the current study's results were also inconsistent with previous literature that examined ED risk across diagnoses. For example, Gual et al. (2002) and Cervera et al. (2003) both found that lower self-esteem in adolescence was associated with greater ED risk. However, both studies used a slightly older adolescent sample across a larger age range (age 12-21) compared to the current study. Moreover, Gual et al. (2002) used a cross-sectional design, and although Cervera et al. (2003) used a prospective design, presence of EDs was assessed after a short 18-month follow-up period. These methodological differences with the current study may explain the discrepancy in results. Specifically, low self-esteem measured later in adolescence may be able to predict ED development across diagnoses within the subsequent two years approximately, but low self-esteem earlier in adolescence may not predict transdiagnostic ED development over a longer period into late adolescence.

The relatively unstable nature of self-esteem during early adolescence may be able to explain why self-esteem is only predictive of subsequent EDs across diagnoses when measured later in adolescence, compared to during early adolescence in the present study. It

has been discussed in previous literature (e.g. Bolognini et al., 1996) that early adolescence is a key transitional period during which adolescents' evaluation of self is expected to change. Two longitudinal studies, Lintunen et al. (1995) and Alsaker and Olweus (1992), found that self-esteem in early adolescents, at age 11, became more fixed and less impacted by situational factors with time. Although Colmsee et al.'s (2021) meta-analysis supported low self-esteem across adolescence as a risk factor for ED development, the study was limited in making conclusions about the temporal relationship between self-esteem and ED development, due to the limitations of recruited studies. Therefore, the present study highlights a need for future research to investigate the developmental course of self-esteem throughout adolescence in relation to ED risk, in order to identity exactly when self-esteem may predict, over a long term, subsequent transdiagnostic ED development in late adolescence. However, as the current study did find that low self-esteem predicted partial-syndrome BN specifically during late adolescence, this suggests that BN development may be more sensitive to global self-esteem at an early age compared to AN and BED.

The Transdiagnostic Model of EDs

The finding that the transdiagnostic model of EDs was not supported in the current study was in contrast to previous research, such as Curzio et al. (2018) and Jones et al. (2020) which tested the transdiagnostic model in adolescents and provided partial support for the use of the model in understanding EDs in adolescence. A key difference between these two studies and the present study is that both previous studies were cross-sectional and used a treatment-seeking clinical sample of slightly older adolescents (mean age of approximately 15 years), who were diagnosed with an ED. Therefore, the discrepancy between findings can suggest that the transdiagnostic model may be suitable in understanding factors that are associated with ED symptoms for slightly older adolescents who have reached clinical level of ED

symptomology, however, for healthy younger adolescents (aged 10-11), the model may not be suitable for identifying the factors that can prospectively predict symptoms across ED types in later adolescence.

Moreover, slight differences in how the risk factors have been conceptualised may also explain discrepancy in findings with previous research. Specifically, mood intolerance in Curzio et al. (2018) and Jones et al. (2020) was assessed by measuring interoceptive deficits (i.e., ability in recognising and understanding emotional states) and impulse dysregulation (i.e., tendency to respond to negative emotional states with impulsivity). As the present study relied on negative reactivity, which is consistent with the impulse dysregulation component only, as a representation of mood intolerance, the present findings may not be able to confidently conclude that mood intolerance, when accounting for interoceptive deficits, is not a predictor of ED development in adolescence.

4.1 Strengths and Limitations

The strengths of the present study include the use of a longitudinal prospective design, the use of data from a large representative sample of Australian adolescents from the community, and the account for confounding family factors. However, results from the study should be interpreted in the light of several limitations. For example, the study did not test for other factors outlined in the transdiagnostic model of EDs, including interpersonal difficulties and perfectionism. Therefore, it is not clear whether these factors can predict development across ED types in late adolescents. Moreover, the study was limited by the use of a self-reported measure of eating disorder symptoms, which was only able to identify partial-syndrome EDs, therefore results cannot adequately inform the predictive ability of the study factors on the development of EDs that meet full set of DSM-5 criteria in late adolescence. However, as

adolescents with subclinical EDs often progress into threshold disorders (Stice et al., 2009), the study's results provide some approximation of the true effects for EDs that meet full criteria. A further limitation is that some measures used in the present study were shorter subscales extracted from larger measures, so it was not possible to have participants complete comprehensive evaluations of the constructs of interest (i.e., negative reactivity and self-esteem). Nevertheless, the measures chosen were valid and reliable instruments, as such results do provide information on the associations between the study factors and subsequent partial-syndrome ED development. Furthermore, the examination of gender differences was outside the scope of the present study. Given that there may be slightly varied mechanisms of ED risk factors between the genders (e.g. Dakanalis et al., 2015), future studies may benefit from studying the genders separately when examining ED risk in adolescence.

4.2 Implications

This study is one of a few studies to examine the risk factors for EDs longitudinally in early adolescence. The findings suggest that further research is needed to understand how best to identify those at increased risk for the development of EDs across diagnoses in late adolescence. This may involve testing risk factors, especially body dissatisfaction and self-esteem, at multiple time points throughout adolescence to understand when exactly these factors may predict ED development during the peak age of onset in late adolescence. In the context of the present findings, it is likely that early intervention for EDs should focus on the provision of universal preventative interventions, as it is not yet clear which factors identify those at increased risk for EDs in later adolescence. Although the effect of low self-esteem was specific to BN in the present study, it may still be a useful factor to target in early interventions to minimize risk for adolescents.

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893 4.3 Conclusion

894 In conclusion, the current study showed that when examining eating disorders in a
895 transdiagnostic manner, negative reactivity and self-esteem at early adolescence did not
896 predict risk of developing partial-syndrome eating disorder in late adolescence, although
897 there was evidence of self-esteem being a specific risk factor for partial-syndrome bulimia
898 nervosa development. Moreover, body dissatisfaction showed an unusual reverse effect, in
899 that body dissatisfaction in early adolescence decreased the odds of adolescents meeting
900 partial-syndrome eating disorder in late adolescence. This result was driven by adolescents
901 who met partial-syndrome anorexia nervosa. The study suggests that the transdiagnostic
902 model of eating disorders may be limited in terms of its ability to explain risk factors in early
903 adolescence for the development of eating disorders in late adolescence. Overall, as one of
904 the very few longitudinal studies to examine eating disorder risk factors in early adolescence,
905 the study provides useful information which suggests that eating disorder risk factors in early
906 adolescence is a complex picture, in which factors may be sensitive to time and changes
907 throughout adolescence, and may also interact with other factors to predict future
908 symptomology, thus highlighting the need for research that explores the trajectory of risk
909 factors and ED symptom development across adolescence.

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Contribution

My supervisors, A.T. and A.S., and I collaborated to generate research questions relating to eating disorders that could be investigated using existing data from the Longitudinal Study of Australian Children (LSAC), which provided the participant recruitment for this study. My supervisors provided guidance on the design of the study, including the selection of measures and the method of data-analysis. I conducted the literature search, data analysis and the thesis write-up, while my supervisors reviewed and made comments on the report drafts to assist with revisions.

Instructions to Authors

Chosen journal for this study is the International Journal of Eating Disorders. Below are snapshots of the author guidelines. Full descriptions can be found on:

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Appendices

Appendix 1.

Criteria for identification of DSM-5 eating disorder symptoms and partial syndrome diagnoses using the Branched Eating Disorder Test (Bisset et al., 2019).

Symptom	Criteria
Partial-syndrome anorexia nervosa (at least two symptoms present)	
A. Body weight that is significantly lower than minimally expected	Being assessed as having a very low body weight, sourced from their body mass index (BMI).
B. Fear of gaining weight, or behaviours that interfere with weight gain, despite low body weight	Assessed as being underweight, sourced from their BMI. AND At least ONE of the following: Reported fearing weight gain for at least 2 days per week AND reported being "very" or "extremely" concerned about gaining weight. OR Reported at least ONE of the following behaviours, lasting at least 3 months: Self-induced vomiting to control weight at least weekly; taking medication to control weight at least weekly; fasting to control weight at least 4 days per week; excessive exercise (2+ hours) to control weight at least 6 days per week.
C. Disturbance in experience of body weight or overvaluation of weight	If underweight: Rated themselves as being "about the right weight," "somewhat overweight," or "very overweight"; If normal weight: Rated themselves as being "somewhat overweight" or "very overweight"; If overweight: Rated themselves as being "very overweight" (note: could not be rated if obese). OR Reported weight as being "very important" to how they feel about themselves.
Partial-syndrome bulimia nervosa (at least two symptoms present)	
A. Regular objective binge eating	Reported experiencing a loss of control over eating at least weekly for at least 3 months. AND Reported that it is "very difficult" or "impossible" to stop eating after starting to eat in this way. AND The amount of food eaten in a 2-hour period is equivalent to "8 pieces of bread and half a litre of ice cream and 5 biscuits" OR "12 pieces of bread and 1 L of ice cream and 10 biscuits" OR "1 loaf of bread and 2 L of ice cream and 1 packet of biscuits."
B. Overvaluation of weight	Rated their weight as "very important" to how they feel about themselves.
C. Regular engagement in compensatory behaviours	Reported at least ONE of the following behaviours, lasting at least 3 months: Self-induced vomiting to control weight at least weekly; taking medication to control weight at least weekly; fasting to control weight at least 4 days per week; excessive exercise (2+ hours) to control weight at least 6 days per week.

Partial-syndrome binge-eating disorder (the following symptom is present)	
A. Regular objective binge eating	Reported experiencing a loss of control over eating at least weekly for at least 3 months. AND Reported that it is "very difficult" or "impossible" to stop eating after starting to eat in this way. AND The amount of food eaten in a 2-hour period is equivalent to "8 pieces of bread and half a litre of ice cream and 5 biscuits" OR "12 pieces of bread and 1 L of ice cream and 10 biscuits" OR "1 loaf of bread and 2 L of ice cream and 1 packet of biscuits."

Appendix 2.

Post-hoc analyses examining characteristics of risk factors at age 10-11 and multiple regression analyses in disorder-specific partial-syndrome ED groups at age 16-17 (n= 2372).

	Partial-syndrome AN			Partial-syndrome BN			Partial-syndrome BED		
	Met (n= 101)	Not Met (n= 2271)	OR (95% CI)	Met (n= 38)	Not Met (n= 2334)	OR (95% CI)	Met (n= 20)	Not Met (n= 2352)	OR (95% CI)
	M (SD) or % (95% CI)			M (SD) or % (95% CI)			M (SD) or % (95% CI)		
Body dissatisfaction *(% Want a thinner body)*	10.9% (5.6-18.7%)	36.5% (34.5-38.5%)	**0.23 (0.12-0.43)*****	42.1% (26.3-59.2%)	35.3% (33.4-37.3%)	1.15 (0.60-2.22)	45.0% (23.1-68.5%)	35.3% (33.4-37.3%)	1.29 (0.53-3.15)
Negative reactivity (95% CI)	2.3 (0.8) (2.1-2.4)	2.3 (0.8) (2.2-2.3)	1.02 (0.79-1.33)	2.3 (0.8) (2.0-2.5)	2.3 (0.8) (2.2-2.3)	0.93 (0.61-1.41)	2.4 (0.8) (2.0-2.7)	2.3 (0.8) (2.2-2.3)	1.02 (0.58-1.79)
Self-esteem *(% below median cut-off)*	36.6% (27.3-46.8%)	49.3% (47.2-51.4%)	0.67 (0.44-1.03)	71.1% (54.1-84.6%)	48.4% (46.4-50.5%)	**2.51 (1.23-5.15)****	70.0% (45.7-88.1%)	48.6% (46.6-50.6%)	2.29 (0.86-6.07)

Abbreviations: AN, anorexia nervosa; BN, bulimia nervosa; BED, binge eating disorder; OR, odds ratio; CI, confidence interval; M, mean; SD, standard deviation
Bold and **, $p \leq .01$; ***, $p < .001$ in regression model adjusted for all exposure variables and potential confounding variables (i.e., maternal psychological distress and warmth and family socioeconomic status)

Appendix 3.

Distribution of adolescents with body satisfaction and dissatisfaction across different ED groups with different methods of representing dissatisfaction (n= 2372).

	Partial-syndrome ED		Partial-syndrome AN		Partial-syndrome BN		Partial-syndrome BED	
	Met (n=148)	Not met (n=2224)	Met (n= 101)	Not met (n=2271)	Met (n=38)	Not met (n=2334)	Met (n=20)	Not met (n=2352)
	M (SD) or % (95% CI)		M (SD) or % (95% CI)		M (SD) or % (95% CI)		M (SD) or % (95% CI)	
Raw "perceived vs ideal" score †								
M (SD)	0.1 (0.8)	0.4 (0.9)	-0.1 (0.6)	0.4 (0.9)	0.7 (1.0)	0.4 (0.9)	0.7 (1.2)	0.4 (0.9)
(95% CI)	(0.0-0.3)	(0.3-0.4)	(-0.2-0.0)	(0.3-0.4)	(0.4-1.0)	(0.3-0.4)	(0.2-1.2)	(0.3-0.4)
Directional body dissatisfaction								
% Want a larger body	14.2% (9.0-20.9%)	7.5% (6.4-8.6%)	17.8% (10.9-26.7%)	7.4% (6.4-8.6%)	2.6% (0.1-13.8%)	8.0% (6.9-9.1%)	10.0% (1.2-31.7%)	7.9% (6.8-9.0%)
% Satisfied	65.5% (57.3-73.2%)	56.1% (54.0-58.2)	71.3% (61.4-79.9%)	56.1% (54.0-58.1%)	55.3% (38.3-71.4%)	56.7% (54.7-58.7%)	45.0% (23.1-68.5%)	56.8% (54.8-58.8%)
% Want a thinner body	20.3% (14.1-27.7%)	36.4% (34.4-38.5%)	10.9% (5.6-18.7%)	36.5% (34.5-38.5%)	42.1% (26.3-59.2%)	35.3% (33.4-37.3%)	45.0% (23.1-68.5%)	35.3% (33.4-37.3%)
Absolute body dissatisfaction								
% Satisfied	65.5% (57.3-73.2%)	56.1% (54.0-58.2%)	71.3% (61.4-79.9%)	56.1% (54.0-58.1%)	55.3% (38.3-71.4%)	56.7% (54.7-58.7%)	45.0% (23.1-68.5%)	56.8% (54.8-58.8%)
% Dissatisfied	34.5% (26.8-42.7%)	43.9% (41.8-46.0%)	28.7% (20.1-38.6%)	43.9% (41.9-46.0%)	44.7% (28.6-61.7%)	43.3% (41.3-45.3%)	55.0% (31.5-76.9%)	43.2% (41.2-45.2%)

† Positive values for "perceived vs ideal" score indicates desire for a thinner body, negative values indicate desire for a larger body

Abbreviations: ED, eating disorder; AN, anorexia nervosa; BN, bulimia nervosa; BED, binge eating disorder; M, mean; SD, standard deviation; CI, confidence interval.

These analyses showed that when body dissatisfaction was analysed differently by using raw "perceived-ideal" scores, by categorizing raw scores into the direction of dissatisfaction (wanting a larger or smaller body), and by categorizing raw scores into those who were satisfied and dissatisfied (regardless of direction), results were consistent with main analyses. There was a consistent pattern across these results that for partial-syndrome ED, there were more adolescents indicating satisfaction, and less adolescents indicating general dissatisfaction and desire for thinness, in the partial-syndrome met group than not met group. This pattern was similar when examining partial-syndrome AN specifically. On the other hand, similar to main analyses, partial-syndrome BN and BED showed opposite pattern of results.