A BIOPSISCHOSOCIAL MODEL OF BODY IMAGE DISSATISFACTION IN ADOLESCENT BOYS AND GIRLS: CROSS-SECTIONAL AND LONGITUDINAL ASSOCIATIONS FROM A POPULATION STUDY

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To my secret companion during the last months of this journey

Manuel Octavio Percy, my son.

Pure love
Abstract

Body image is a biopsychosocial phenomenon that relates to how we perceive ourselves physically and how we think others perceive us. Body image is believed to be formed from the moment we become body aware as infants and is then based on the complex ongoing interactions between child, caregivers, and the environment. Research shows that by the time children are 7 to 8 years of age, they already have developed images of an “ideal body”, but it is during adolescence that concerns with body image become most salient. Working from the approach that body image is a multi-determined construct; this thesis explores three different areas of potential influence, encompassing psychological, social, and biological factors. Each of these components may influence adolescent body image dissatisfaction (BID). BID is becoming increasingly common among adolescents. BID has been linked to mental disorders such as depression and anxiety, and represents a major risk factor for eating disorders.

This thesis investigated the associations between cross-sectional and longitudinal data in relation to psychological, social, and biological/weight-related factors and BID in adolescent boys and girls aged 14 years. The key issues of interest were related to: a) gender differences in adolescent BID, and b) longitudinal study of the impact of early life variables on adolescent BID. Participants were drawn from the Western Australian Pregnancy Cohort (Raine) Study which has collected data from the offspring of 2900 women recruited when pregnant over 25 years ago. The current thesis reports data related to the pregnancy, and from the follow-up testing at 1, 2, 3, and 14 years. Both boys and girls were included since research has identified
that body image levels of satisfaction or dissatisfaction differ by gender, and gender differences exist in terms of BID development and presentation. The studies reported in this thesis provide further evidence of gender differences. In girls, low global self-worth, higher body mass index (BMI), unhealthy family functioning, and teasing were related to the experience of BID. In boys, low athletic competence self-concept, maternal anxiety, teasing, and BMI were significantly associated with BID. Early life family socioeconomic status was only marginally related to BID and there were no significant associations between early life diet and later BID. However, pre-pregnancy maternal BMI was significantly related to BID in both boys and girls.

The findings of this thesis add to the study of adolescent BID. Understanding the potential predictors and associated factors of a positive or negative body image can assist in the planning of educational and therapeutic programs designed to foster healthy body image. This thesis illustrates the importance of considering individual, family, peer, and biological influences on adolescent BID.

Keywords: body image dissatisfaction, body image, adolescence, gender differences, body mass index, biopsychosocial
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List of abbreviations

BFPS: The Body Figure Perception Scale

BID: Body image dissatisfaction

BMI: Body mass index

CI: Confidence interval

DASS: The Depression-Anxiety-Stress Scale

EAT: Eating Assessment in Toddler score

KEMH: King Edward Memorial Hospital

MFAD: The McMaster Family Assessment Device

OR: Odds ratio

SES: Socioeconomic status

SPSS: Statistical Package for the Social Sciences
**Statement of candidate contribution**

For all manuscripts included in this thesis, the candidate took the major role in study design, conducted all literature reviews, executed the data analysis, interpreted results, and prepared and revised all of the manuscripts. Co-authors provided guidance during this process (Neil McLean and Monique Robinson); and provided comments on drafts manuscripts (Neil McLean, Monique Robinson, Karina Allen, Wendy Oddy, and Peter Jacoby). All co-authors approved the inclusion of the papers and manuscripts in this thesis.

_____________________________________________
Katerina Chin-A-Loy (Candidate)

_____________________________________________
Neil McLean (Coordinating supervisor)
Publications and manuscripts arising from this thesis

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Manuscripts in progress
Preamble

This thesis is presented as a series of manuscripts either submitted or prepared for publication. Chapter 1 is an introductory chapter offering a conceptual and theoretical context for the thesis. This chapter presents a discussion of some of the key research on body image dissatisfaction, its prevalence and presentation in adolescence. In this introductory chapter an overview of gender differences, measurement challenges, and the clinical relevance of studying body image is included. Chapter 2 investigates the associations between self-concept, weight status, and body image dissatisfaction at age 14, it has been submitted for publication, and is under review. Chapter 3 concentrates on the relationship between early life socioeconomic status, body mass index, and body image dissatisfaction at age 14. Chapter 4 looks at the relationship between early life diet (ages 0 to 3) and body image dissatisfaction in adolescence, taking into account long-term parental body mass index. Chapter 5 explores the psychosocial environment of the adolescent (family and peer factors) and investigates the relationship between a series of intra-familial and interpersonal variables and body image in a cross-sectional study. Chapter 6 draws together all significant findings from previous chapters and analyses them in one model in order to learn about their relative contribution to body image dissatisfaction in adolescence; this is an integrative chapter. Finally, in Chapter 7 a summary of the findings of this thesis is presented in light of a general discussion where implications, limitations, and future research directions are articulated.
Chapter 1  General introduction

1.1 BODY IMAGE AND BODY IMAGE DISSATISFACTION

Body image is the way in which people perceive themselves physically and the way they think others see them (Cash & Pruzinsky, 1990). Historically, body image, physical appearance, and beauty have been central to humanity and therefore diverse theories and conceptualisations of body image have emerged from multiple perspectives. However, the scientific study of body image formally began in the early 1900s with neurologists trying to understand their patients’ unusual forms of body perception following brain injuries (Cash & Smolak, 2011). Seymour Fisher (1986) dedicated most of his life to the study of body image, and published the first exhaustive review on the many layers of body image. Fisher’s review included the work of Paul Schilder who argued for a biopsychosocial approach to body image highlighting the need to embrace neurological, psychological, and sociocultural components. Additionally, Fisher’s (1986) own research is dominated by strong psychodynamic views and the use of projective instruments, such as the Rorschach inkblot test, to assess body image. Multiple publications after this period have shown the growth and expansion of the body image field. For example, contemporary authors such as Cash and Pruzinsky (1990) have published handbooks covering the work of various authors with multiple perspectives which have contributed to the broadening of the study of body image. Cash and Pruzinsky’s editorial work covers periods from 1951 to 2000 and the first decade of the 21st century. Over this period, the inclusion of new contexts, populations, and methodologies have shaped the theories and hypotheses about the contemporary study of body image, covering cultural and ethnic differences, body image in specific medical conditions and
dysfunctions, gender differences, and interventions for treatment and prevention. Perhaps the study of body image has received such a great deal of attention due to the fact that human experiences of the body are deeply connected to various psychological functions and have an impact on quality of life. Sociocultural, evolutionary, psychodynamic, neuroscientific, cognitive-behavioural, and feminist perspectives on body image have been explored, discussed and continue to be researched (Cash, 2004; Cash & Smolak, 2011).

Taking into account its multifaceted nature, body image could be defined as a biopsychosocial construct interlaced with elements of the self, due to the fact that the body is linked to early representations of an individual’s self and shaped through active interchanges between subject and environment starting early in life (Fallon, 1990). This conceptualisation relies on the basis that identity begins with the awareness of one’s body (Baumeister, 1997) and is shaped by social, psychological, and biological factors. Among these factors, cultural socialization, interpersonal experiences, physical characteristics, and individual differences, are believed to be central (Cash, 2011).

The Cash and Pruzinsky (1990) definition of body image (i.e., “body image is the way in which people perceive themselves physically and the way they think others see them”) implies an evaluation, critical view, and some level of comparison. Body image evaluation is, consequently, related to the level of satisfaction or dissatisfaction that a given individual has with his or her body (Cash, 2011), which may include cognitive, emotional and perceptual aspects. At a perceptual level, body image dissatisfaction (BID) is represented by the discrepancy between current body
image perception and desired body image (Collins, 1991). Although there are multiple terms used in the literature to refer to BID (e.g., body image disturbance, body concerns, appearance satisfaction), each with slightly different connotations, they all tend to refer to the level of satisfaction or dissatisfaction that the individual experiences in relation to his or her body. Other dimensions of body image have received great research and clinical attention, for example the concept of appearance schematicity, which is related to the internalisation of societal standards of attractiveness (Thompson, 2004). However, in order to avoid methodological problems, it is important to delineate the concept of body image used throughout this thesis. This thesis concentrated on the perceptual dimension of body image among a nonclinical population of adolescents in Western Australia, and investigated potential related factors to whether the boys and girls were satisfied (or not) in relation to their ideal body.

1.2 BIOPSYCHOSOCIAL MODEL OF BODY IMAGE

One of the questions that presents as a challenge in the study of body image is: Why if all individuals are embodied beings are only some dissatisfied with their bodies? And more specifically to this thesis: What makes some adolescents at increased risk of presenting with BID? To answer these questions, the study of the development of body image has seen different models and approaches. One of the most accepted models in terms of evidence is the Tripartite model, a model of sociocultural influences (Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999). Under this model, it is proposed that societal ideals of beauty are transmitted through a variety of sociocultural channels (i.e., family, peers, and media). These messages are then internalised by individuals to differing degrees. The internalisation of
appearance ideals together with body comparison forms the baseline against which an individual appraises their own body (Tiggemann, 2011). While the principles included in the Tripartite model have been found to play an important role in the presentation of BID and eating problems (Field et al., 2001; Thompson & Stice, 2001), this sociocultural model has some limitations such as the fact that it does not incorporate individual and biological components. As discussed by Tiggemann (2011), this model would have most people or everyone struggling with BID, which is not the case. Individual differences are likely to moderate the degree of vulnerability experienced by an individual in relation to sociocultural pressures. Also, the findings of studies using the Tripartite model have shown some difficulties due to inconsistent definition, labelling, and classification of some of the sociocultural dimensions such as the role of parental influence in the development of body image (Abraczinskas, Fisak, & Barnes, 2012).

The complexity of the body image construct and its relevance, given that BID has been associated with a range of psychological problems, indicate the need for a more comprehensive developmental approach. Individual psychological characteristics (e.g., self-esteem, self-concept, negative affect) and biological variables (e.g., BMI, pubertal timing) have also been found to influence BID (Muris et al., 2005; Wertheim, Koerner, & Paxton, 2001). However, only recently, models that include all three aspects (sociocultural, psychological, and biological) as potential predictors or potential associated factors have been researched under what can be called the Biopsychosocial model (Muris et al., 2005; Ricciardelli, McCabe, Holt, & Finemore, 2003; Rodgers, Paxton, & McLean, 2014). The findings of studies using the Biopsychosocial model demonstrate the importance of including
psychological and biological factors in addition to sociocultural elements. For example, Rodgers et al. (2014) highlight the damaging role of negative affect among adolescent girls in internalisation of the thin ideal and appearance comparison, while Muris et al. (2005) suggest that BMI, self-esteem, and sociocultural factors predict BID among adolescent boys and girls, with body comparison being a mediator. The study by Presnell et al. (2004), which looks at a set of putative risk factors for BID, is another good example of how sociocultural, biological, and interpersonal factors increase the risk for BID among adolescent boys and girls. Specifically to their study, factors identified to predict BID were: high BMI (biological factor), negative affect (psychological factor), and perceived pressure to be thin from peers (sociocultural factor).

As noted, the rationale and structure of this thesis is aligned with the Biopsychosocial model of body image in which psychological (self-concept), sociocultural (socioeconomic, family functioning, maternal mental health, and teasing), and biological (BMI, breastfeeding, and early life diet) factors were investigated in terms of their potential influence and associations with adolescent BID. Several variables were included that have not previously been considered in studies seeking to understand the development of body image. For example, breastfeeding history was included for study, as although there has been no research investigating links between breastfeeding and subsequent BID, breastfeeding has been suggested to protect against risk of obesity. Hence it is plausible that breastfeeding may have at least an indirect impact on BID if it is associated with lower BMI levels.
This thesis paid particular attention to the role of BMI. The relationship between BMI and BID has been broadly studied in the past; however, BMI is generally included as a covariate and only a few studies have looked at its effects thoroughly. BMI data is often not available or hard to obtain as requires the investment of time and human efforts i.e., to obtain the actual BMI, participants need to be physically weighed and measured for their height. This thesis also assessed the long-term impact that maternal and paternal BMI may have on BID, which is not only a biological aspect to consider but one that could have psychological implications as well. The study of the influence of maternal and paternal BMI on adolescent BID is not well documented. However, a study by Fulkerson et al. (2002) included maternal BMI as a covariate in models examining mothers’ encouragement to diet on adolescent weight concerns and dieting practices. The study found that mothers who encouraged their child to diet were significantly heavier than mothers that did not encourage their child to diet, but maternal BMI did not have an impact on these results. Among the aims of this thesis was to investigate the relationship between maternal and paternal BMI and adolescent BID per se.

1.3 BODY IMAGE DISSATISFACTION IN ADOLESCENCE

Although BID can be experienced by individuals of all ages, including young children and older adults (Pliner, Chaiken, & Flett, 1990), researchers and clinicians agree that adolescents are most vulnerable to negative body image (Feingold & Mazzella, 1998; Kostanski, Fisher, & Gullone, 2004; Wertheim & Paxton, 2011). The notion that BID presents at its maximal degree during adolescence has been supported by developmental theories for over four decades (e.g., Erikson, 1968). Adolescence is a period of time in human development characterised by radical
physical, psychological and social changes, together with increased awareness of the self, and thus is the time of life when disturbances in body image, increased weight and shape concerns, and difficulties with self-concept are often most salient. Through various studies, Lerner and colleagues (Lerner & Karabenick, 1974; Lerner, Karabenick, & Stuart, 1973; Lerner, Orlos, & Knapp, 1976) suggested that during adolescence, physical attractiveness, as judged by body attributes, and physical effectiveness become of essential importance to both boys and girls. One hypothesised mechanism is that adolescents place increased attention on physical appearance and, therefore, experience a greater chance of being dissatisfied with their body (Muris, Meesters, van de Blom, & Mayer, 2005).

Prevalence data on BID in adolescence indicate that 78% to 83% of adolescent girls report BID (Eisele, Hertsgaard, & Light, 1986; Storz & Greene, 1983) while BID in boys has been found to vary between 7% (Hoffmann-Müller, & Amstad, 1994) and 53% (Collins, 1991). From more recent literature using large community samples, BID among adolescent girls has been shown to be between 24% and 46% and between 12% and 26% among adolescent boys (Neumark-Sztainer, Story, Hannan, Perry, & Irving, 2002; Presnell, Bearman, & Stice, 2004; Stice & Whitenton, 2002). An Australian study focusing on adolescent body size, has found that only 12% of girls and 16.6% of boys were their desired size (Ricciardelli & McCabe, 2001). Another Australian study by Kostanski & Gullone (1998), also looking at adolescents, has indicated that 80% of girls and 40% of boys have high levels of dissatisfaction with their body image as per body image perception. The body mass index (BMI) of this study group was normally distributed, yet 43% of girls and 9% of boys who were a healthy weight identified themselves as “heavy”.
Reported prevalence of BID in children and adolescents seems to vary widely in community samples (Littleton & Ollendick, 2003); however, BID prevalence rates are consistently higher than 50% and there is consistent report of significant numbers of healthy-weight girls perceiving themselves as overweight (Rayner, Schniering, Rapee, Taylor, & Hutchinson, 2013).

Research has also suggested that BID is evident in younger children, with research reporting evidence of BID in early childhood (McCabe & Ricciardelli, 2005; Schur, Sanders, & Steiner, 2000; Smolak, 2011). In fact, a recent U.S. study found that BID may be present in boys and girls of various ethnic backgrounds as young as 7 years old (Heron, Smyth, Akano, & Wonderlich, 2013). Other studies indicate that 38% of 10-year-old girls, when shown a series of body figures, would prefer a smaller body figure than their own as their ideal figure (DeLeel, Hughes, Miller, Hipwell, & Theodore, 2009). Boys may also focus on losing weight from a young age, but are more likely to aspire to a larger body, with boys as young as 8 responding to messages promoting muscularity from parents peers and the media (McCabe & Ricciardelli, 2005). The fact that BID is an issue present in young children highlights the importance of studying early life environment factors that may related to later BID. The potential associations between early life factors and later BID can provide insights with implications in terms of prevention and treatment interventions.

While BID presents as a clear concern among the young population, there are considerable variations in estimates of prevalence, as already stated. The varying prevalence of BID may be due to real differences between samples, but it may also
be an artefact of the methods utilised in measuring BID. Paxton et al. (1991) compared the prevalence of BID using multiple measurement tools and concluded that BID percentages vary depending on the measure utilised. Despite these variations, the increasing prevalence of BID among youth is concerning as previous research indicates that BID during childhood and adolescence predicts a range of adverse health conditions later in life (Johnson & Wardle, 2005; Paxton, Neumark-Sztainer, Hannan, & Eisenberg, 2006b).

Further, developmental studies show that concerns with weight and BID are significantly correlated with feelings of ineffectiveness, low self-esteem, and depression (Furnham, Badmin, & Sneade, 2002; Grossbard, Lee, Neighbors, & Larimer, 2009; Kostanski & Gullone, 1998; Stice, Hayward, Cameron, Killen, & Taylor, 2000; Tiggemann, 2005). Some of the negative outcomes that have been linked to BID include disordered eating, dieting, and eating disorders (Attie & Brooks-Gunn, 1989; Stice, Marti, & Durant, 2011; Wertheim et al., 2001) all of which carry the potential for long-term negative consequences. In fact, a review of 21 prospective studies by Wertheim, Paxton, and Blaney (2009) showed that weight and shape concerns among school-age girls predicted later negative outcomes such as increases in dieting, drive for thinness, bulimic symptoms, binge eating, compensatory behaviours, and symptoms of bulimia nervosa, over periods ranging from 8 months to 4 years. Additionally, poor body image during childhood and early adolescence has been associated with chronic BID, weight cycling, obesity, eating disorders, exercise dependence, and the use of unhealthy weight-control or body shape strategies later in adolescence and adulthood (Birch & Fisher, 1998; Kotler, Cohen, Davies, Pine, & Walsh, 2001; Shisslak et al., 1999). BID has also been
associated with depression, low self-esteem, and anxiety (Kostanski & Gullone, 1998; Paxton, Neumark-Sztainer, Hannan, & Eisenberg, 2006b; Stice & Bearman, 2001). Further to the research indicating that BID is a strong predictor of eating disorders and is related to other mental health issues, concerns with body, weight and shape have been found to mediate the relationship between overweight and the development of eating disorders and depression in young populations (Allen, Byrne, Blair, & Davis, 2006).

1.3.1 Predictors of the development of body image dissatisfaction in adolescence

Among the factors that may contribute to the development of BID, body weight, usually measured through BMI, has been shown to play an important role. A number of studies have pointed to the link between higher BMI scores and higher BID (Calzo, Sonneville, Haines, Blood, Field, & Austin, 2012; Paxton, Eisenberg, & Neumark-Sztainer, 2006a). Boys tend to have a particular focus on the importance of their muscles and girls tend to centre on the importance of their weight and being thin (McCabe & Ricciardelli, 2005). This pattern has been shown in other studies where a linear relationship between body weight and BID among females but a curvilinear relationship among males (Muth & Cash, 1997) has been found. In contrast, Jones (2004) indicated that BMI is not a prospective predictor of BID among boys while it is for girls; and longitudinal findings from Bearman, Presnell, Martinez, and Stice (2006) indicated that BMI does not predict increases in BID for either gender, suggesting that body weight status is not related to experiences of BID and does not operate differently for boys and girls. As can be noted, the relationship between BID and BMI is not totally clear, particularly in terms of gender differences as it appears clearer that higher BMI relates to increased BID in girls, but this
relationship does not seem to follow the same pattern or is less evident among boys. In addition, the fact that adolescents of normal weight also have problems with body image (Kostanski & Gullone, 1998) suggests that although BMI may play a part in the development of BID in adolescence, the causal and contributing factors of dissatisfaction with body image go beyond actual weight status.

Other factors that have been identified as strongly related to adolescent BID are located in the psychosocial environment and include critical and/or judgmental appearance-related messages from parents, siblings, peers (Webb & Zimmer-Gembeck, 2013) and the media (Keel & Forney, 2013). Mass media has been described as the most powerful transmitter of the sociocultural ideal of beauty (Tiggemann, 2011) through promoting an often, unrealistic ideal body which if internalised may become a standard against which the individual evaluates their own body. When there is a discrepancy between body self-perception and the internalised ideal, the platform for BID is established.

Research has also shown that BID in both boys and girls is influenced by exposure to magazines, particular television shows such as soap operas, and music clips. For example, in terms of fashion magazines, Sypeck, Gray, & Ahrens (2004) found an increased frequency in thinner female body sizes portrayed by some of the most popular U.S. fashion magazines during the 1980s and 1990s as well as more frequent full-body depictions as opposed to older magazine covers showing only face or torso. This trend may be related to the increased value women have progressively placed on thin bodies (Brunet, Sabiston, Dorsch, & McCreary, 2010; Sands, 2000). More recently, research has shown that the extended use of the Internet and social
media platforms such as Facebook and MySpace is linked to increased body surveillance, drive for thinness, internalisation of the thin ideal, and BID in girls (Tiggemann & Slater, 2014). Nevertheless, the review study by Levine & Murnen (2009) analyzing causal links between mass media messages, BID and disordered eating among females, concludes that engagement with mass media is currently a variable risk factor rather than a causal risk factor as essential criteria for causality are not met. Additionally, Ferguson, Muñoz, Garza, & Galindo (2014) who examined the impact of television and social media on BID and eating disorder symptoms in adolescent girls, found that neither television exposure to thin ideals nor social media use predict BID and they suggested that the media may influence individuals who have pre-existing concerns regarding body image. A caveat of the psychosocial approach to the study of BID is that concerns with body image present only in some adolescents. Despite the fact that all adolescents of the same culture are exposed to similar broad social standards and messages (Tiggemann, 2011), not all develop BID and/or disordered eating. Therefore, it is likely that other factors are important in determining who is affected by BID.

Peer pressure is a psychosocial factor that has received a fair amount of attention in the study of adolescent BID. Research indicates that peers resemble each other in terms of eating practices and related factors, and this has been explained through two processes: selection and socialization. Selection describes the tendency for friendships to occur between individuals with pre-existing similarities, while socialization is the process by which friends become more similar to each other over time. Socialization is thought to work at several levels and is thought to take place through mechanisms such as modeling, reinforcement, and direct pressure to
A study using a large sample of Australian high school girls aimed to examine the underlying psychosocial processes (i.e. selection and socialization) that may contribute to the influence of the peer environment on adolescent BID, dieting, and bulimic behaviour. The authors concluded that when examined simultaneously, selection but not socialization processes were important in explaining similarity of BID and bulimic behaviours (Rayner, Schniering, Rapee, Taylor, & Hutchinson, 2013). As noted, the influence of peers and friends on BID among adolescents may stem from the interests and values shared by adolescents who spend time together and the way these shared interests and values may shape individuals within this social subgroup. In this way, adolescents may come to be concerned with the issues discussed more frequently among his or her group of friends (Wertheim & Paxton, 2011), so that an adolescent girl who spends time with peers who place a high value in appearance, for example, may start to take on this focus on physical attributes and hence become more likely to experience BID.

Adolescents may also influence each other through appearance conversation or what has been called the “Fat talk”. Nichter and Vukovic (1994) coined this term in their book *Fat talk: Body image among adolescent girls*. The “Fat talk” is a type of communication, particularly seen among girls, in which the script: “I’m so fat” followed by “No, you’re not” occurs repeated times within a given group of friends. In a group this exchange may generate reassurance and encouragement from peers promoting group affiliation (Nichter & Vuckovic, 1994), but it also highlights the disgust for fat and the value of thinness. As described by Jones (2011), an underlying psychological process may result from the repeated critiques and laments friends can
go through about body size and weight, which has the potential to normalise self-
disparaging discourse, and as a consequence individuals may internalise a critical,
judgemental voice that in turn may increase BID.

However, Rayner, Schniering, Rapee, and Hutchinson (2013) suggest that peers may have more impact on those adolescents who already present with BID rather than peer influence being a predictor of BID per se. In this sense, the onset of BID may be related to individual differences that make some adolescents more vulnerable than others. In other words, the psychosocial factors abovementioned may represent a risk to adolescents with particular personality characteristics (e.g., perfectionism). Hence the importance of taking into account individual/psychological factors in the study of the sociocultural and biological components of BID. Individual differences are constituted by a set of characteristics that make each individual unique. As personality is under development during adolescence, the closest construct in relation to individual characteristics would be the self-concept given that the level of self-concept in childhood relates to particular personality characteristics (Devi, 1990). The self-concept is considered to be made up of the totality of properties which individuals attribute to themselves (Chodorkoff, 1954). Therefore, rather than being a unidimensional concept, the self-concept is more accurately considered a multidimensional construct of individuality.

The existing research looking at individual differences and BID has mainly concentrated on the effects of self-esteem, perfectionism, and negative affect (Cash, 2011; Paxton, Schutz, Wertheim, & Muir, 1999; Stice & Bearman, 2001; van den Berg, Thompson, Obremski-Brandon, & Coovert, 2002; Wade & Lowes, 2002).
Longitudinal studies indicate that low self-esteem is a prospective risk factor for BID in girls; while depression predicts BID in boys (Paxton et al., 2006a). The concept of self-esteem (analogous to global self-worth) should not be confused with the domain-specific operationalisation of the self (Wichstrøm, 1995). Although self-esteem is considered a component of an individual’s self-concept (Harter, 2012), the self-concept involves many other evaluations of the self in relation to other competencies, academic and non-academic, such as social, behavioural, and athletic (Manning, 2007). In this sense, only a few studies on adolescent BID have considered multidimensional self-concept and those existing have either considered only some of the self-concept domains (Stockton et al., 2009); concentrated on eating disorders among females rather than in BID (Stein, 1996); or focused on general self-concept rather than in specific domains of the self-concept (Wood, Becker, Thompson, 1996).

A good example of how BID is multi-determined can be seen in Project EAT (Eating Among Teens) led by Dianne Neumark-Sztainer et al. (2002). In a large cohort of U.S. adolescents from diverse ethnical backgrounds this project found that predictors for eating disturbance and BID include: BMI, weight-related teasing by family or peers, parental weight-related concerns and compensatory behaviours, and friend dieting. Frequent family meals, positive atmosphere at family meals, and frequent lunch intake have been identified as protective factors. Furthermore, over a 5-year follow-up period and independently of BMI status, higher BID predicted higher levels of dieting, unhealthy weight control behaviours, among adolescent girls and boys, and less physical activity, among girls (Neumark-Sztainer, Paxton, Hannan, Haines, & Story, 2006).
Apart from the influence of family and peers, in terms of the broader social context, the study of the relationship between socioeconomic status (SES) and BID has received attention; however, there are inconsistencies in results. There is evidence that lower SES prospectively (over a 5-year period) predicts BID in early adolescent boys and middle adolescent girls (Paxton et al., 2006a). However, why SES seems to play a role at different development stages in girls and boys is unclear and further research is needed to clarify these relationships. The authors of this study discuss how the association found between SES and BID may be through the relationship between low SES and lower self-esteem. Further, they speculate that lower SES girls may be less able to afford fashionable clothes which may negatively impact the way they feel about their bodies. Cross-sectional research has also found higher SES adolescents to be more likely to report weight satisfaction than middle SES adolescents (Story, French, Resnick & Blum, 1995). But the opposite has also been found, with middle to high SES children presenting with increased BID (O’Dea & Caputi, 2001). Other studies have not found a significant relationship between SES and adolescent BID (Barker & Galambos, 2003; Wang, Byrne, Kenardy & Hills, 2005). As noted in a meta-analysis investigating BID among women from diverse ethnic backgrounds in the U.S., although studies looking at BID should include the role of SES given its relationship with obesity and the known strong link between BMI and body concerns, most studies have not included this variable (Grabe & Hyde, 2006) mostly as BMI requires the measurement of weight and height usually performed by qualified research personnel in order to achieve accuracy. The study of the potential influence of SES on BID taking into account BMI is important as it could inform prevention and intervention programs in terms of population targets.
Thus far this introduction has covered some of the key biological, psychosocial, and social factors linked or thought to be linked to adolescent BID. However, literature involving other factors potentially related to BID is limited, particularly in terms of potential longitudinal associations (e.g., studies involving the early life environment). Expanding our knowledge on the factors associated with BID is important, as is including potential variables that have the power to identify the at-risk population from early stages, particularly in terms of informing BID interventions. The inclusion of variables not yet investigated in the BID field and their potential long-term effect on BID is among the aims of this thesis. Certainly, tackling the topic from the various components thought to be related to BID would improve our understanding of human body image.

1.4 GENDER DIFFERENCES

Research around body image has traditionally focused on females. However, over the last fifteen years, the study of male body image has seen a rise (McCabe & Ricciardelli, 2001) with overall conclusions suggesting that both sexes are affected by BID but that males and females differ in terms of the development, presentation, and complications related to body image (Cohane & Pope, 2001). A recent U.S. study that investigated gender differences on body image among adolescents, found girls to have more BID than boys, and boys to present with higher drive for muscularity (Schaefer & Salafia, 2014).
There is evidence that gender differences start in early years (Ricciardelli & McCabe, 2001). In fact, Lowes and Tiggemann (2003) found that girls start to develop a desire to be thin from as early as six years old, whereas concerns related to body and shape in boys seem to begin at a later age. The degree of the concerns regarding body image in girls also appears to be greater in comparison to boys (Phares, Steinberg, & Thompson, 2004) although negative consequences are present for both genders. As a result of BID, adolescent females are more likely to start unhealthy weight-control behaviours, whereas males are more likely to be concerned with muscularity and adopt strategies to increase muscle mass (McCabe & Ricciardelli, 2001; Ricciardelli, McCabe, Lillis, & Thomas, 2006). Findings from a key study four decades ago suggest that BID in females is influenced most strongly by concerns about physical appearance, whereas perceptions of physical effectiveness are more closely related to BID in males (Lerner et al., 1976). In a more recent study, Field et al. (2001) found that girls who reported a high value for thinness were twice as likely as their peers to become concerned with their weight.

Presnell, Bearman, and Stice (2004) found that both boys and girls were equally influenced by perceived pressure from peers. In relation to weight, boys experienced dissatisfaction with their weight when they were below or above average weight; in contrast, girls were dissatisfied with their bodies when body weight was elevated. In the same study further gender differences were identified: boys’ BID was influenced by negative affect with elevated negative affect predicting BID which is in contrast with previous findings on negative affect linked to BID primarily among girls. This study also showed that girls were more affected by high BMI with a positive linear relationship (girls’ BID increases with higher body weight).
The issue of how weight status influences BID perceptions and the gender differences involved in this process has been also explored by Paxton et al. (1991) in an Australian study including adolescent boys and girls. The authors of this study found that nearly two-thirds of girls and boys thought that having a thinner body would have an impact on their lives, but interestingly, the majority of girls considered this would be positive while the majority of boys believed this would be negative. This study also showed that adolescent girls associate thinness with fitness (both seen as advantageous to them) while boys seem to see these two characteristics as independent. In females, BID partly occurs as a result of two known processes: the internalisation of the thin ideal (Thompson & Stice, 2001) and appearance comparison (Schutz, Paxton, & Wertheim, 2002), whereas the processes underlying BID in males are less clearly understood.

In terms of the individual psychological characteristics, identity and perceived qualities of the self specifically, previous research indicates that both genders tend to have lower levels of self-worth and higher rates of depressive symptoms when experiencing greater BID (Phares et al., 2004). This pattern seems to be stronger in girls. Nevertheless, in a study looking at girls only, Stockton et al. (2009) did not find differences between weight and self-perception variables despite a tendency that associates BID to poor self-perception. The study of how individual characteristics relate to BID and the potential gender differences present in this interplay merits more research, particularly concerning boys as in some aspects body image seems to be uni-dimensional for girls but multi-modal for boys (Kostanski et al., 2004). However, one aspect that has received strong support in gender differences and the
psychological processes associated with the internalisation of appearance ideals underlying BID is the pursuit for thinness in girls and muscularity in boys (Jones, Vigfusdottir, & Lee, 2004).

1.5 ASSESSMENT CONSIDERATIONS

As suggested thus far, body image consists of perceptions, cognitions, affect, attitudes, and behaviours in relation to the body and/or physical attributes (Cash & Pruzinsky, 1990). Although difficulties with body image can be assessed from all of these angles or perspectives (Thompson, 2004), perceptual body image has received ample attention in the study of body image (Cash & Brown, 1987). To measure perceptual BID a comparison between the perception of current body image and desired or ideal body image is usually performed. The resulting discrepancy not only represents BID but has the potential for accounting for more specific weight and shape concerns (Thompson, Penner, & Altabe, 1990). Since the 1970s pictorial body figures have been used to assess current and ideal body figure perception.

The drawings by Stunkard, Sorenson, and Schulsinger (1983) – Appendix A – constitute the first scale of body size estimation. Interestingly, this was originally designed so that participants described the typical body shape and weight of their deceased parents through nine drawings representing different-sized body figures. Stunkard et al. (1983) scale to estimate body size, shape and weight has been the template for the more recently developed body figure pictures utilised in body image research. Separate series of male and females body figures are typically included in the many versions of this type of scale with representations of extremely thin
individuals with ribs protruding (on the left end of the scale) and pictures of overweight individuals with thicker waist and round face (on the right end of the scale).

Collins’ Body Figure Rating Scale (Collin, 1991) is a more contemporary scale based on the original body figure perception principle. It includes seven figures for each gender with stepped gradation in shape. Another comparable instrument to the scale by Collins is the Contour Drawing Rating Scale developed by Thompson and Gray (1995) used mostly in the adult population. Benefits of perceptual measures of BID rely on the non-verbal nature of the instrument, which as a result tend to be short, concise, visually-appealing, and easier to use than questionnaires (Hill, 2011). Psychometric characteristics of pictorial body figure scales support their continued use as a measure of BID (Thompson & Gray, 1995). However, figure rating scales (discrepancy scores) have been criticized on several grounds, including their inability to assess the affective aspects of BID (Truby & Paxton, 2002; Thompson, Penner, & Altabe, 1990).

1.6 AIM OF THIS THESIS

Body image dissatisfaction in childhood and adolescence has been linked with numerous adverse outcomes for both physical health and emotional wellbeing. Longitudinal studies, where possible, contribute to shaping developmental pathways towards the prevention of clinical complaints related to BID and the design of interventions before adverse mental health outcomes are installed. One of the reasons for investigating the potential influence of early life variables into the presentation of
BID, is the fact that concerns with body image are becoming evident at very young ages. Comprehensive longitudinal studies can help to determine some of the early life factors that may influence the development of body image, which could then inform the design of prevention programs and public health strategies to reduce the incidence of BID and prevent related psychopathology. Further, not many studies to the present include all three aspects of the Biopsychosocial model of BID, partly because it is difficult to find a study comprehensive enough to have collected data on all of these different parts of life.

The aim of this thesis was to assess the relationship between a series of socioeconomic, psychosocial, psychological, and biological factors and BID in adolescents recruited from the Western Australian Pregnancy Cohort (Raine) Study. The research questions tested in each study as part of this thesis involve some of the factors identified in the literature to be related to BID. Additionally, this thesis assessed potential predictors of BID that have not been previously tested, particularly in terms of early life. The research of diverse factors potentially associated with the development and presentation of BID has the potential to improve our understanding of BID. This type of research can then inform prevention initiatives and treatment programs tackling BID among adolescents. By taking into account diverse biopsychosocial factors at different timeframes, the implications of research can have a broader scope such as the potential to inform prevention programs based on the type of public health approach to prevention (i.e., universal, selective, or targeted) (Paxton, 2002) and the possibility of targeting associated factors in clinical contexts.
As mentioned earlier in this introduction, the conceptualisation of body image under which this thesis has been conceived is based on the Biopsychosocial model for the study of body image. Although a biopsychosocial approach to body image has good theoretical support in that body image is seen as a multifaceted construct involving biological, psychological, and sociocultural elements (Cash & Smolak, 2011), there is little research covering all three elements and their associations to BID, in particular, the factors that this thesis concentrated on (e.g., early life diet) whereby the rationale for the investigation of potential links is based on previous knowledge (e.g., the impact that early diet has shown to have on BMI and the link between BMI and BID). As it is the case with other psychological issues, BID may be directly and indirectly influenced by a great variety of factors. Therefore, the intention of this thesis is to add to the field of BID by investigating a set of biological, psychological, and sociocultural variables.

A diagram including the specific biopsychosocial factors studied in this thesis is presented below (Figure 1.1).
Figure 1.1 Biological, psychological, and social variables investigated in relation to adolescent body image dissatisfaction in this thesis

1.6.1 General objective

This thesis investigated the influence and relationship of individual characteristics, socioeconomic conditions, psychosocial environment, and some early life biological factors on body image dissatisfaction in adolescent boys and girls of a population study (the Western Australian Pregnancy Cohort Raine Study).

1.6.2 Specific objectives

To investigate:

1. The degree to which multidimensional self-concept is related to adolescent BID considering body mass index and focusing on gender differences;

2. The relationship between family socio-economic characteristics during early life and adolescent BID;
3. The longitudinal relationship between pre- and postnatal biological variables (early life diet, maternal BMI, and paternal BMI) and adolescent BID;

4. The cross-sectional relationship between psychological factors within the family and peers and adolescent BID;

5. The relative importance of the factors abovementioned in a biopsychosocial integrative model.

1.6.3 The Western Australian Pregnancy Cohort (Raine) Study

The Western Australian Pregnancy Cohort (Raine) Study is well placed to provide the information needed to conduct the studies contemplated in this thesis. The Raine Study was initially developed as a randomised controlled trial investigating the impact of frequent ultrasound imagining and Doppler flow studies during pregnancy. Women attending the public antenatal clinic at King Edward Memorial Hospital (KEMH), a tertiary maternity hospital in Western Australia, or surrounding private practices between May 1989 and November 1991 were enrolled (Newnham, Evans, Michael, Stanley, & Landau, 1993). The enrolment criteria were as follows: gestational age between 16 and 20 weeks; proficiency in English sufficient to understand the implications of participating; an expectation to deliver at KEMH; and an intention to reside in Western Australia for the foreseeable future in order to facilitate follow-ups. In addition to the ultrasound and Doppler flow studies, women completed detailed questionnaires at recruitment (average 18 weeks gestation) and at 34 weeks gestation. These questionnaires contained items regarding past medical history, environmental exposures, social and economic circumstances, lifestyle, and maternal health risk behaviours in pregnancy. A second questionnaire
was completed by the woman’s partner to obtain information about his social and economic circumstances, lifestyle, and environmental exposures. Comprehensive obstetric information from the pregnancy, birth, and neonatal periods were derived from the women’s hospital records.

Follow-up of the children in this cohort has been sustained since, and the oldest of the study children are now 25 years of age. Cohort follow-ups were conducted at ages one, two, three, five, eight, ten, fourteen, seventeen, eighteen, twenty and twenty-three, by way of a broad range of clinical examinations and questionnaires; however, not all measures and questionnaires were included at each time frame. The study has maintained a reasonably low-rate of attrition over 26 years, and detailed analyses of the characteristics of participants and non-participants at various follow-ups are presented elsewhere (Kozyrskyj, Kendall, Jacoby, Sly & Zubrick, 2010). Socially disadvantaged families were less likely to remain in the study population over follow-up. As the original cohort over-represented socially disadvantaged families, the socioeconomic characteristics of the Raine Study families progressively represented more closely the Western Australian population (Allen, Byrne, Oddy, & Crosby, 2013; Li et al., 2008; Whitehouse et al., 2010).

Trajectories on family-income among the Raine Study population ranging from age 1 year to age 14 years can also be found in Kozyrskyj et al. (2010). In brief, these authors found that 8% to 21% of children pertaining to the Raine Study were living in a low-income household at any point between birth and 14 years of age. Further, at age 14 years, 12% of adolescents were in increasing income households, 19% were in decreasing income households, while 62% of adolescents had never lived in low-
income households. Additionally, the families showing a chronic low-income status predominantly included women (the mothers of the adolescents) who had not completed high school, and these families reported the greatest number of stressful life events.

Of particular relevance to this thesis is the follow-up at age 14 years in which a variety of measures were administered. The year 14 follow-up of the Raine Study was conducted between May 2003 and May 2006. The Raine Study participants, their primary and secondary caregivers, school teacher and school principal were asked to complete questionnaires. The child, mother and father attended the Telethon Kids Institute for a physical assessment carried out by trained research assistants. In total, 1860 participants, 1799 primary caregivers, 1334 secondary caregivers, 1197 teachers and 378 school principals provided data for this follow-up. The Raine Study participant questionnaire was completed by the child while they were attending the assessment. They were assisted by a research assistant. This questionnaire surveyed elements of their lives such as television and computer use, physical activity, self-concept, bullying, attitude to school, pain, diet, family life, perceived body image, and risk taking behaviour such as smoking, drugs, alcohol consumption and sexual activity. The physical assessment of the Raine Study participant included anthropomorphic measures such as height and weight, waist, hip and mid arm measurements, blood pressure measurements, and posture assessment. Blood samples from participants and their parents were also taken in order to analyse biochemical markers. The primary care giver questionnaire surveyed elements of the adolescent's life such as home and neighbourhood environment, family structure, family income and employment, diet, attendance at health services, immunization,
hospitalization, illness and injury, prescription and non-prescription medications, respiratory and allergy problems, pet exposure, smoking, television and computer use, and family medical history. The primary caregiver was asked about their own stressful life events and their alcohol consumption. Ethical approval for the Raine Study 14-year follow-up was obtained from Princess Margaret Hospital Human Research Ethics Committee.

The use of a cohort with comprehensive data such as the Raine Study allows for the investigation of both cross-sectional and longitudinal data, although not all measures were administered at the different time frames, restricting the possibility to do repeated measures analyses for some variables. The Raine Study data not only provides the opportunity to investigate long-term relationships which is highly valued in BID research, but allows the inclusion of relevant confounding variables relating to the adolescents and their parents.
Chapter 2  The relationship between body image dissatisfaction, multidimensional self-concept, and weight status in adolescent boys and girls

2.1 FOREWORD

The first study presented in this thesis was designed to investigate the associations between multidimensional self-concept, weight status, and body image dissatisfaction in adolescence, using the Body Figure Perception Scale (considering the direction of the dissatisfaction: wanting to be bigger or wanting to be thinner). The study design was cross-sectional and used multinomial logistic regression with categorical self-concept for each domain, continuous BMI, and categorical body image dissatisfaction as the outcome variable. The study presented in Chapter 2 has been submitted for publication, and revisions are currently under review in ‘Sex Roles: A Journal of Research’.

2.2 ABSTRACT

Body image dissatisfaction (BID) is a multifaceted concept with a broad range of physical and psychological implications for both males and females. This study investigated the relationship between BID, multidimensional self-concept, and weight status in adolescents who were participants in the longitudinal Western Australian Pregnancy Cohort (Raine) Study. At the 14-year follow-up, 1425 Caucasians adolescents (744 boys, 681 girls) completed measures of body image
(The Body Figure Perception Scale) and self-concept (Harter’s Self-Perception Profile for Adolescents). BID was present in 41% of boys and 52% of girls. In girls, higher overall self-worth had a negative relationship with BID, independently of weight; athletic competence also had a negative relationship with BID but only in the lower weight group. Similarly but among the overweight and obese boys, a sense of athletic competence was negatively associated with BID, while global self-worth and behavioural conduct were negatively associated with BID among the lower weight boys. These results reflect the important links between some self-concept domains and body image by gender. This study has potential implications for the treatment and prevention of BID in terms of positive enhancement of specific self-concept domains.

Keywords: body image; self-concept; weight status; body mass index; adolescence; gender differences; Raine Study

2.3 INTRODUCTION

Body image dissatisfaction (BID) is common among adolescents. In fact, the Australia’s 2016 Youth Survey Report indicated that body image is, once again, among the top three personal concerns among young people with 30.4% of respondents expressing body image concerns (extremely concerned: 15.4%; very concerned: 15.0%). The Australia’s 2016 Youth Survey Report indicated that body image is, once again, among the top three personal concerns among young people with 30.6% of respondents expressing body image concerns (extremely concerned: 13%; very concerned: 17.6%). The Mission Australia’s Youth Survey 2016 included
responses from a total of 21,846 young people aged 15-19 years. Body image was a concern for a higher proportion of young women 41.4% than young men 17.0% (Bailey, Baker, Cave, Fildes, Perrens, Plummer, & Wearring, 2016). From previous research, estimated prevalence ranges from 40% to 70% in girls (Wertheim & Paxton, 2011) and 7% (Hoffmann-Müller, & Amstad, 1994) to 53% (Collins, 1991) in boys, with estimates influenced by variations in sampling methods and differences across samples in the evaluation of BID (Paxton et al., 1991).

BID has been identified as the strongest predictor of eating disorders in females (Attie & Brooks-Gunn, 1989; Leon, Fulkerson, Perry, & Cudeck, 1993; Stice, Marti, & Durant, 2011). Eating disorders constitute a serious form of psychopathology commonly starting in adolescence, especially in Western cultures (Kjelsås, Bjørnstrøm, & Götestam, 2004). Problems with body image have also been linked to depression (Paxton, Neumark-Sztainer, Hannan, & Eisenberg, 2006b), anxiety (Kostanski & Gullone, 1998), and body dysmorphic disorder (Rosen, Reiter, & Orosan, 1995). A large population-based study from the UK looking at adolescents aged 14 years shows that 40% of girls and 12% of boys report dieting, 7.5% of girls and 3.5% of boys admitted engaging in bingeing while 2.4% of girls and 0.8% of boys acknowledged purging behaviours (Micali, De Stavola, Ploubidis, Simonoff, Treasure, & Field, 2015). In Australia, as reviewed by Paxton (2002), the percentage of BID and weight loss behaviours among adolescent boys and girls is high. Between 70-76% of adolescent girls desire a body figure thinner than their own, while a third of adolescent boys wish to be thinner and over a third desire to be larger (Paxton et al., 1991).
2.3.1 Body image and gender

While body image research has traditionally focused on girls (Ricciardelli & McCabe, 2003) more recent studies show that a large proportion of boys also experience BID (Ricciardelli & McCabe, 2011). There is now evidence indicating that BID in boys has particular characteristics and is associated with different developmental mechanisms than BID in girls (Calzo, Sonneville, Haines, Blood, Field, & Austin, 2012; Cohane & Pope, 2001; Jones, Bain, & King, 2008).

Findings from a key study four decades ago suggested that BID in females is mostly influenced by concerns about physical appearance, whereas BID in males is closely related to perceptions of physical effectiveness (Lerner et al., 1976). More recent research has suggested that BID in boys is mainly driven by a desire for muscularity (Brunet, Sabiston, Dorsch, & McCreary, 2010; Jones, 2004; McCreary & Sasse, 2000; Schaefer & Salafia, 2014) and sporting competence (Ricciardelli & McCabe, 2004) while BID in girls seems to be driven mainly by a desire for beauty (Tatangelo & Ricciardelli, 2013) and thinness (Brunet et al., 2010; Sands, 2000). Socially, the female body has received a different treatment than the male body, as explained by the theories of the commodification and self-objectification, with the female body, praised and valued for its appearance, while the male body has been valued for it effectiveness (McKinley, 2011).

In terms of the individual psychological characteristics and perceived qualities of the self, research findings indicate that girls tend to have lower levels of self-worth
when experiencing greater BID as compared to boys (Phares et al., 2004) indicating that self-worth (or self-esteem) is more of an issue for girls than for boys (Furnham, Badmin, & Sneade, 2002; Grossbard, Lee, Neighbors, & Larimer, 2009). Although previous research on BID has identified the impact of drive for muscularity in boys, and drive for thinness and self-worth in girls; other aspects of the self such as social competence, romantic appeal, or perspectives on close friendship, for example, have not been equally investigated. It is important to have a broader understanding of the potential individual and gender-specific factors related to BID in order to target the specific components associated with BID and prevent related mental health problems with the use of appropriate clinical interventions (Grossbard et al., 2009; Smolak, 2004).

2.3.2 Body image dissatisfaction and self-concept in adolescence

Adolescence is a critical period of life in which individuals further develop and define their sense of self. It is a period when BID becomes more prominent carrying a particular risk for serious psychological disorders (Wertheim & Paxton, 2011). Additionally, gender differences in relation to BID have been identified to emerge at 13 year of age (Rosenblum & Lewis, 1999) possibly due to physical pubertal changes that tend to have taken place around this age. The links between the growing sense of self and BID that occur during adolescence have been explored through studies looking at measures of self-esteem (Ricciardelli & McCabe, 2001) with the objective of identifying factors that make adolescents vulnerable to BID.

The current study focuses on the links between the multiple components of self-concept (not only self-esteem) and BID in Australian adolescent boys and girls
aged 14 years. This study is based on the theoretical and practical view that evaluations of the self are domain-specific (Bandura, 1982; Harter, 2012). Under this model, the self-concept is integrated by a collection of judgments or self-perceptions in relation to the self around different domains or areas (Hattie, 1992), such as physical appearance, athletic competence, social competence, close friendship, scholastic competence, and romantic appeal. This implies that individuals’ judgments are more accurate and usefully understood when made across a range of distinct components. Moreover, Harter’s multidimensional framework of the self argues that children constantly make evaluative distinctions about their competence in the various areas of their lives which integrate their self-concept, while maintaining an overall sense of their worth as a person, comparable to self-esteem (Harter, 2012). Specifically, Harter’s questionnaire contains nine domains that aim at evaluating multidimensional self-concept: Scholastic Competence, Social Competence, Athletic Competence, Physical Appearance, Job Competence, Romantic Appeal, Behavioural Conduct, Close Friendship, and Global Self-worth.

In the field of eating disorders, Stein (1996) also identified the advantages of studying the self-concept as a complex system of cognitions about the self rather than as a unidimensional construct. The importance of measuring self-concept in a multidimensional fashion has been equally noted in studies assessing intervention programs to improve body image (O’Dea & Abraham, 2000). Despite the notion of the relevance of multidimensional self-concept, the study of the associations between adolescent body image and the various components of the self has been limited. Further, gender differences and variations depending on body weight in relation to
the potential associations between BID and multidimensional self-concept warrant attention in order to inform prevention initiatives and intervention programs.

2.3.3 Body image dissatisfaction and weight status in adolescence

The link between BID and weight status, mostly measured through body mass index (BMI), is apparent in both genders (Calzo et al., 2012). Research investigating the relationship between BMI and BID suggests that adolescents with higher BMI scores have higher levels of BID (Paxton, Eisenberg, & Neumark-Sztainer, 2006a). This is especially so among girls whereas in boys the picture is less clear. One U.S. study including adolescent boys and girls of various ethnicities found that elevations in BMI predicted increases in BID, and this effect was moderated by gender (Presnell, Bearman, & Stice, 2004). Other studies have found no link between BMI and BID in boys (Rosenblum & Lewis, 1999; Jones, 2004) while others have found that both extremes of BMI (i.e., underweight and obesity) are linked to BID in boys (Kostanski, Fisher, & Gullone, 2004) through a desire to lose weight and gain or change muscle (McCabe & Ricciardelli, 2003). However, in a study looking at African American preadolescent girls, Stockton et al. (2009) did not find differences between weight and self-perception variables, including self-esteem, despite a tendency associating BID to poor self-perception. Similarly, findings from a U.S. study by Rosenblum & Lewis (1999) suggest a weak relationship between BMI and BID in adolescent boys and girls, and the need for further research linking BID, individual aspects, and BMI is raised. The study of how individual characteristics relate to BID and the potential gender differences present in this interplay merits more research; particularly concerning boys as in some aspects body image seems to be unidimensional for girls but multi-modal for boys (Kostanski et al., 2004).
2.3.4 Current Study

The current investigation examined the relationships between multidimensional self-concept, body image, and weight status in Australian adolescent boys and girls aged 14 years. To explore the relationship between BID, BMI, and multidimensional self-concept, multinomial logistic regressions and hierarchical linear regressions were conducted. Further, this study aimed to provide a context for determining gender differences in body image, which has important implications; therefore genders were analysed separately. This research extends previous findings on the importance of self-perceptions and body image and adds the multidimensional approach taking into account weight status as BMI has been found to have a key, yet confusing, role in BID. In this study, weight groups were created using BMI cut-off scores corresponding age and gender. To our knowledge, studies looking at the associations between body image satisfaction/dissatisfaction, domain-specific self-concept, and weight status in boys and girls have not been conducted. Other studies have included some aspects of the self such as the perception of physical appearance, muscularity, and self-esteem (used interchangeably with self-concept in other studies). However, a study using a broader view of the self in order to identify whether other individual aspects are linked to BID has yet to be conducted. Additionally, and based on previous research, the investigation of the potential relationships between self and BID warrants the inclusion of BMI and should comprise both genders to allow gender comparison. The central aim of the current study was to investigate the interrelationships between BID, multidimensional self-concept, and weight status with particular attention to gender differences. We hypothesised that: 1) specific self-concept domains would be negatively associated
with BID for each gender from which the most robust associations we predicted were between BID and athletic competence for boys, and between BID and global self-worth for girls; 2) the associations between self-concept domains and BID would vary according to weight status (BMI) and gender; and 3) in both genders BID would be associated with actual BMI.

2.4 METHODS

2.4.1 Study population

The Western Australian Pregnancy Cohort (Raine) Study is a longitudinal cohort study following 2,900 pregnant women recruited with gestational age between 16 and 20 weeks from King Edward Memorial Hospital (KEMH) or nearby private practices, between May 1989 and November 1991 (for further detail see Newnham, Evans, Michael, Stanley, & Landau, 1993). Criteria for enrolment included: proficiency in English, expectation of delivery at KEMH, and an intention to remain in Western Australia after the birth of their child. A range of clinical and questionnaire data was collected at pregnancy (18 and 34 weeks gestation), birth and at ages 1, 2, 3, 5, 8, 10, 14, 17, and 20 years for all available children from the original 2,868 live births. The 14-year follow-up was selected for this paper as middle adolescence was considered a key period for studying body image and self-concept. Middle adolescence has been identified as the period in which gender differences in terms of BID emerge (Rosenblum & Lewis, 1999). Only Caucasian adolescents were included since this is the dominant ethnic group (88.2%) within the Raine Study population, and it was thought that different cultural factors could be
evident within the minority ethnic groups in the sample. Consequently n = 331 were excluded due to too small sample sizes in each subgroup. From the remaining participants, only those with BMI scores were included in the analyses leaving a final sample of 1425 (50% of original cohort, 744 boys and 681 girls).

2.4.2 Measures

**Body image dissatisfaction**

The Body Figure Perception Scale used in the Raine Study is an adaptation of a scale developed by Collins (1991) to assess an individual’s perception of their body through seven gender-specific pictorial figures. Each body figure drawing has a numerical value ranging from one, at the thinner end, to seven, at the larger or bigger end, with half-points available between the 7 anchor points. The version used in the present study included two rows of seven pictorial figures each, one row containing child-like figures and the other having adult-like figures, to distinguish between large figures due to adiposity as opposed to large figures due to muscularity. Adolescents were presented with the two rows of pictorial body figures simultaneously and were asked to pick the picture that best represented their current body shape (“Which figure best represents what you currently look like?”), and the picture that represented their desired or ideal body figure (“Which body figure would you most like to look like?”). BID scores were obtained by subtracting the current body figure score from the desired body figure score: desired BI – current BI = BID (Collin, 1991; Truby & Paxton, 2002). Thus, negative values reflected BID with a desire to be thinner whilst positive values reflected a BID with a desire to be bigger or heavier. Scores of 0 together with positive and negative values of 0.5 were viewed as representing satisfaction with body figure (or lack of dissatisfaction) as these scores
are thought to indicate little or no discrepancy between perception of current body and ideal body shape (Durkin & Paxton, 2002). This approach to assessing body perception has been widely used (Dunn, Lewis, & Patrick, 2010; Wood, Becker, & Thompson, 1996) and supported (Thompson & Gray, 1995) and it is thought that these scales provide a good measure of body size perception and BID in girls and boys aged 8 years and older (Truby & Paxton, 2002). Test-retest reliability ($r = 0.71$, $p < 0.005$) with an intervening period of 3 days has been previously demonstrated, and criterion-related validity ($r = 0.37$, $p < 0.05$) has been determined through examination of verbal and pictorial comparisons of similar scales (Collins, 1991). A study assessing the validity and test-retest reliability of current body size among Chinese adolescent boys and girls using the figure drawings from the Stunkard's Figure Rating Scale concluded appropriate convergent, discriminant, and concurrent validity of this pictorial body image scale. Further, the Spearman's correlation for current body size was 0.78 for girls and 0.72 for boys, which indicates good test-retest reliability (Lo, Ho, Wong, Mak, & Lam, 2011). The images of the scale used in this study to measure BID are included in Appendix B: The Body Figure Perception Scale – Raine Study adaptation.

**Self-concept**

Harter’s Self-Perception Profile for Adolescents (Harter, 1982), which is also called the ‘What I Am Like’ Scale, was used to measure domain-specific self-concept. This questionnaire includes six items in each of nine domains: Scholastic Competence (“Some teenagers feel like they are pretty intelligent - Other teenagers question whether they are intelligent”), Social Competence (“Some teenagers know how to become popular - Other teenagers do not know how to become popular”),
Athletic Competence (“Some teenagers do not feel that they are very athletic - Other teenagers feel that they are very athletic”), Physical Appearance (“Some teenagers really like their looks - Other teenagers wish they looked different”) – omitted from the predictors due to resemblance with the outcome, Job Competence (“Some teenagers feel that they don’t have enough skills to do well at a job - Other teenagers feel that they do have enough skills to do a job well”), Romantic Appeal (“Some teenagers feel that if they are romantically interested in someone that person will like them back – Other teenagers worry that when they like someone romantically that person won’t like them back”), Behavioural Conduct (“Some teenagers usually do the right thing – Other teenagers often don’t do what they know is right”), Close Friendship (“Some teenagers wish they had a really close friend to share things with – Other teenagers do have a really close friend to share things with”), and Global Self-worth (“Some teenagers are often disappointed with themselves – Other teenagers are pretty pleased with themselves”). For each item, the adolescent is asked to first judge which of two polar statements best describes him or her and then indicates whether that description is really true or sort of true for him/herself. The responses are converted to a 4-point scale with mean item scores within each domain reported as subscale scores. Higher scores indicate greater perceived competence. Cut points for this scale have been suggested with scores 3 or higher thought to indicate strong or positive evaluations of the adolescent’s self on a specific domain, and scores below 3 indicative of poor or negative self-evaluations (Harter, 1982; Kaufman, Cook, Arny, Jones, & Pittinsky, 1994). The scale has shown internal consistency with an average Cronbach’s alpha of 0.86 and no less than 0.74 on each subscale or domain (Harter, 2012); in the current study Cronbach’s alpha being 0.66.
for boys and 0.70 for girls. Further, Harter’s Self-Perception Profile for Adolescents construct and discriminant validity have been supported (Wichstrøm, 1995).

**Body Mass Index**

Weight to the nearest 0.1 kg and height to the nearest 0.1 cm were measured twice by a Raine Study research assistant. Mean scores of height and weight were computed and body mass index (BMI) was calculated using the standard formula

\[ 	ext{BMI} = \frac{\text{weight (kg)}}{\text{height (m}^2)} \]

to account for weight status. Four BMI categories: obese; overweight (age-appropriate cut-off scores in Cole, Bellizzi, Flegal, & Dietz, 2000); healthy weight; and underweight (age-appropriate cut-off scores in Cole, Flegal, Nicholls, & Jackson, 2007) were defined using gender-specific cut-off criteria.

**Statistical analysis**

Descriptive statistics were used to compare boys and girls in relation to BMI and BID (current and ideal body image discrepancy scores). Chi-square was calculated to statistically compare the different body image categories between genders. Additionally, correlation matrices were produced to explore the intercorrelations between all self-concept domains within and between genders. Hypotheses were tested using multinomial logistic regressions to determine the relationships between self-concept (all except Physical Appearance self-concept, which was omitted due to its resemblance with the outcome variable) and BID. Categorical self-concept domains (i.e., low versus high, determined using standard cut-off points) were introduced as independent variables, and categories of BID (i.e., wanting to be thinner, and wanting to be bigger) were set as dependent variables with
reference category being body image satisfaction (consisting of scores of -0.5, 0 and +0.5). These models were executed by gender controlling for BMI scores.

To further analyse the associations between self-concept and BID in relation to weight status, weight groups were created using age-appropriate and gender-specific BMI cut-off scores. Due to the limited numbers in the obese and underweight BMI categories we collapsed near-by BMI categories resulting in two weight groups. The higher weight group comprised participants classified as overweight or obese; and the lower to normal weight group was constituted by those classified as healthy weight and underweight. Multinomial regression models were rerun for each of the weight groups by gender. Finally, to explore the independent and joint contributions of BMI and self-concept to the variance seen in BID scores (continuous BID), we ran hierarchical linear regression models. IBM SPSS Statistics version 22 was used for the data analysis.

2.5 RESULTS

2.5.1 Preliminary results

Descriptive data and some demographic details of the participants are shown in Table 2.1. Fifty-two percent of girls were dissatisfied with their body image, independent of direction (i.e., wanting to be thinner or wanting to be bigger) with the vast majority wanting to be thinner (48%). Forty-one percent of boys expressed some level of BID, with 28% of boys wanting to be thinner and 13% wanting to be bigger. Chi-square testing revealed that the distribution of boys and girls across the three categories of body image (i.e., satisfied, dissatisfied wanting to be thinner, and
dissatisfied wanting to be bigger) significantly differed ($x^2 (2) = 86.92, p < 0.001$) which suggests that the pattern of BID is statistically different for boys and girls.

Table 2.1 Demographics and descriptive data

<table>
<thead>
<tr>
<th></th>
<th>Boys (N = 744)</th>
<th>Girls (N = 681)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td>M: 14.06, SD: 0.21</td>
<td>M: 14.05, SD: 0.19</td>
</tr>
<tr>
<td><strong>BMI</strong></td>
<td>M: 21.17, SD: 0.15</td>
<td>M: 21.59, SD: 0.16</td>
</tr>
<tr>
<td><strong>Body image categories</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Satisfied (lack of dissatisfaction)</td>
<td>%: 59, n: 439</td>
<td>%: 48, n: 325</td>
</tr>
<tr>
<td>Dissatisfied wanting to be thinner</td>
<td>%: 28, n: 204</td>
<td>%: 48, n: 330</td>
</tr>
<tr>
<td>Dissatisfied wanting to be bigger</td>
<td>%: 13, n: 99</td>
<td>%: 4, n: 26</td>
</tr>
<tr>
<td><strong>BMI categories</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underweight</td>
<td>M: 5, SD: 41</td>
<td>M: 7, SD: 47</td>
</tr>
<tr>
<td>Healthy weight</td>
<td>M: 67, SD: 489</td>
<td>M: 68, SD: 464</td>
</tr>
<tr>
<td>Overweight</td>
<td>M: 19, SD: 142</td>
<td>M: 18, SD: 124</td>
</tr>
<tr>
<td>Obese</td>
<td>M: 9, SD: 63</td>
<td>M: 7, SD: 46</td>
</tr>
<tr>
<td><strong>Socioeconomic status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower</td>
<td>M: 13, SD: 94</td>
<td>M: 16, SD: 105</td>
</tr>
<tr>
<td>Middle</td>
<td>M: 47, SD: 333</td>
<td>M: 44, SD: 289</td>
</tr>
<tr>
<td>Higher</td>
<td>M: 40, SD: 279</td>
<td>M: 40, SD: 261</td>
</tr>
</tbody>
</table>

*a* Body image categories were derived from discrepancy between ideal and current body image.

*b* BMI categories were calculated using Cole et al. (2000, 2007) cut-offs scores.

*c* Socioeconomic status categories were based on family income and maternal education at year 14.

Within the underweight boys, 41.5% (n = 17) were dissatisfied and wanting to be bigger and none wanted to be thinner, while 8.5% (n = 4) of the underweight girls wanted to be thinner. Two thirds of the healthy weight boys reported satisfaction with body image (68.5%, n = 341) with roughly equal numbers of healthy weight boys who reported some level of BID wanting to be thinner (14.9%, n = 74) or wanting to be bigger (16.5%, n = 82). In contrast, almost half of the healthy weight


girls (41.2%, n = 191) wanted to be thinner and only 3.2% (n = 15) wanted their bodies to be larger. Within the overweight, 55.3% (n = 78) of boys and 77.4% (n = 96) of girls wanted to be thinner, and the vast majority of the obese adolescents also wanted to be thinner (boys 82.5%, n = 52; girls 84.8%, n = 39). There were no participants wanting to be bigger within the overweight and obese BMI categories.

2.5.2 Relationships between BID and multidimensional self-concept

To explore the degree to which self-concept domains were related to BID and identify which domains were significantly related to BID for each gender (Hypothesis 1), we ran multinomial logistic regression models including all self-concept domains with dichotomous categories as independent variables and categorical BID as outcome variable, with body image satisfied as the reference category. Models were stratified by gender given the preliminary results showing BID is statistically different for boys and girls. We found significant results exclusively for the adolescents who were dissatisfied with their bodies wanting to be thinner.

For boys, low scores on global self-worth, athletic competence, and behavioural conduct were significantly associated with higher BID scores. More specifically, boys who had low global self-worth scores were 2.4 times more likely than boys with high global self-worth scores to be dissatisfied with their body image and want to be thinner. The odds of boys with low levels of athletic competence experiencing BID and wanting to be thinner were 1.9 times higher than those of boys who reported high athletic competence. And boys with low behavioural conduct self-concept scores were 1.7 times more likely than boys with high behavioural conduct
scores to be dissatisfied with their body image wanting to be thinner. For girls, negative judgments on global self-worth were associated with higher BID scores. In other words, girls who reported low global self-worth were 2.7 times more likely to report BID and want to be thinner than those girls who reported higher global self-worth. Full results for these regression models by gender are shown in Table 2.2.
Table 2.2 Results of regressions analyses to explore associations between all self-concept domains and BID in boys and girl controlling for BMI

<table>
<thead>
<tr>
<th>Self-concept domains</th>
<th>Boys</th>
<th></th>
<th></th>
<th></th>
<th>Girls</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR</td>
<td>95% CI</td>
<td>p</td>
<td>OR</td>
<td>95% CI</td>
<td>p</td>
<td></td>
</tr>
<tr>
<td>Scholastic competence</td>
<td>0.65</td>
<td>0.40</td>
<td>1.06</td>
<td>0.08</td>
<td>1.26</td>
<td>0.84</td>
<td>1.89</td>
</tr>
<tr>
<td>Social competence</td>
<td>1.02</td>
<td>0.57</td>
<td>1.81</td>
<td>0.95</td>
<td>1.05</td>
<td>0.64</td>
<td>1.71</td>
</tr>
<tr>
<td>Athletic competence</td>
<td>1.92</td>
<td>1.19</td>
<td>3.09</td>
<td>0.007</td>
<td>1.22</td>
<td>0.82</td>
<td>1.82</td>
</tr>
<tr>
<td>Job competence</td>
<td>0.78</td>
<td>0.49</td>
<td>1.24</td>
<td>0.29</td>
<td>1.05</td>
<td>0.72</td>
<td>1.54</td>
</tr>
<tr>
<td>Romantic appeal</td>
<td>1.55</td>
<td>0.91</td>
<td>2.62</td>
<td>0.11</td>
<td>1.03</td>
<td>0.66</td>
<td>1.59</td>
</tr>
<tr>
<td>Behavioural conduct</td>
<td>1.66</td>
<td>1.02</td>
<td>2.71</td>
<td>0.04</td>
<td>1.13</td>
<td>0.76</td>
<td>1.68</td>
</tr>
<tr>
<td>Close friendship</td>
<td>0.64</td>
<td>0.37</td>
<td>1.10</td>
<td>0.11</td>
<td>1.15</td>
<td>0.64</td>
<td>2.07</td>
</tr>
<tr>
<td>Global self-worth</td>
<td>2.38</td>
<td>1.37</td>
<td>4.14</td>
<td>0.002</td>
<td>2.73</td>
<td>1.77</td>
<td>4.22</td>
</tr>
<tr>
<td>Scholastic competence</td>
<td>1.11</td>
<td>0.65</td>
<td>1.89</td>
<td>0.69</td>
<td>0.72</td>
<td>0.25</td>
<td>2.05</td>
</tr>
<tr>
<td>Social competence</td>
<td>1.38</td>
<td>0.72</td>
<td>2.64</td>
<td>0.33</td>
<td>0.64</td>
<td>0.18</td>
<td>2.29</td>
</tr>
<tr>
<td>Athletic competence</td>
<td>0.91</td>
<td>0.52</td>
<td>1.58</td>
<td>0.74</td>
<td>1.63</td>
<td>0.59</td>
<td>4.46</td>
</tr>
<tr>
<td>Job competence</td>
<td>1.46</td>
<td>0.87</td>
<td>2.46</td>
<td>0.16</td>
<td>0.73</td>
<td>0.28</td>
<td>1.91</td>
</tr>
<tr>
<td>Romantic appeal</td>
<td>1.26</td>
<td>0.71</td>
<td>2.24</td>
<td>0.43</td>
<td>1.70</td>
<td>0.54</td>
<td>5.37</td>
</tr>
<tr>
<td>Behavioural conduct</td>
<td>1.43</td>
<td>0.83</td>
<td>2.46</td>
<td>0.20</td>
<td>0.56</td>
<td>0.19</td>
<td>1.63</td>
</tr>
<tr>
<td>Close friendship</td>
<td>0.82</td>
<td>0.46</td>
<td>1.46</td>
<td>0.51</td>
<td>1.70</td>
<td>0.37</td>
<td>7.75</td>
</tr>
<tr>
<td>Global self-worth</td>
<td>1.05</td>
<td>0.53</td>
<td>2.07</td>
<td>0.89</td>
<td>3.09</td>
<td>0.89</td>
<td>10.65</td>
</tr>
</tbody>
</table>

Note.
N = 1425 (744 boys, 681 girls). OR = odds ratio; CI = confidence interval
Reference category: “body image satisfied” (scores of -0.5, 0 and 0.5)
Self-concept domains categorical (low vs. high)
*p ≤ 0.05; **p ≤ 0.01; ***p ≤ 0.001
2.5.3 Relationships between BID, weight status, and multidimensional self-concept

As described in the methods section, two weight groups were created. Models to explore the relationship between BID, self-concept, and weight status (Hypothesis 2) had BID categories as dependent variable and categorical self-concept domains as independent variables stratified by weight groups and gender (Table 2.3).

Once again, statistically significant results were evident only for those adolescents wanting to be thinner. In lower to normal weight girls, those who considered themselves to have poor overall self-worth were 2.5 times more likely than girls with more positive global self-worth to report BID and a desire to be thinner; while in the higher weight group, girls who had low scores of global self-worth were 5.6 times more likely to experience BID and want to be thinner. Only among the low to normal weight group, girls who reported poor athletic competence were 1.8 times more likely to have BID and want to be thinner than those who had a strong athletic self-concept. For the lower to normal weight boys, the odds of experiencing BID were 2.7 times higher when reporting low global self-worth scores, while poor behavioural conduct self-concept made these boys 2.1 times more likely to experience BID and want to be thinner than their counterpart low to normal weight boys. Low scores on athletic competence were significantly associated with boys’ BID, but only in the higher weight group: those overweight/obese boys who had poor athletic competence were 2.5 times more likely to want to be thinner than the boys who reported strong athletic competence.
Overall, these models show that high scores of global self-worth were strongly associated with less chances of presenting with BID for all girls wanting to be thinner, independent of their weight status. High athletic competence scores were also significantly related to less likelihood of presenting with BID among the lower to normal weight girls and the higher weight boys. And only within the lower to normal weight boys those with low scores on behavioural conduct were more likely to report BID and want to be thinner.
Table 2.3 Significant self-concept domains associated with BID by weight status and gender

<table>
<thead>
<tr>
<th>Gender</th>
<th>Weight groups</th>
<th>n</th>
<th>Self-concept domain</th>
<th>OR (95% CI)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Boys</strong></td>
<td>Higher weight</td>
<td>205</td>
<td>Athletic competence</td>
<td>2.55 (1.25, 5.19)**</td>
<td>0.010</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Global self-worth</td>
<td>2.70 (1.39, 5.26)**</td>
<td>0.003</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Behavioural conduct</td>
<td>2.06 (1.09, 3.86)*</td>
<td>0.024</td>
</tr>
<tr>
<td></td>
<td>Lower to normal weight</td>
<td>539</td>
<td>Global self-worth</td>
<td>5.59 (2.07, 15.09)**</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Athletic competence</td>
<td>2.45 (1.54, 4.01)**</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td><strong>Girls</strong></td>
<td>Higher weight</td>
<td>170</td>
<td>Global self-worth</td>
<td>2.45 (1.54, 4.01)**</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Athletic competence</td>
<td>1.81 (1.17, 2.78)**</td>
<td>0.008</td>
</tr>
<tr>
<td></td>
<td>Lower to normal weight</td>
<td>511</td>
<td>Global self-worth</td>
<td>2.45 (1.54, 4.01)**</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

*Note.*

N = 1425 (744 boys, 681 girls).
Only significant results are shown. These were for the adolescents wanting to be thinner. Low scores of self-concept domains listed had a significant negative association with BID (i.e., strong perceptions on these self-concept domains were associated with less BID).

* * p ≤ 0.05
** * p ≤ 0.01
*** * p ≤ 0.001

To investigate the independent and joint contribution of BMI and self-concept to the BID variance seen in our sample (Hypothesis 3), we ran hierarchical linear regression models where the independent effect of BMI on body image scores explored at a first step (in boys $R^2 = 0.140$, $F(1, 655) = 106.69$, $p < 0.001$; in girls $R^2$
= 0.245, F(1, 626) = 203.38, p < 0.001) where higher BMI scores were associated with higher BID levels in both genders. A second step consisted of entering all self-concept scores to find the amount of BID variance explained when BMI and the self-concept domains are considered simultaneously (in boys $R^2 = 0.238$, F(9, 646) = 9.18, p < 0.001; in girls $R^2 = 0.415$, F(9, 617) = 19.84, p < 0.001). The variance in body image scores explained by self-concept alone was also significant in both genders, although greater for girls ($R^2$ change = 0.169) than for boys ($R^2$ change = 0.097).

### 2.5.4 Exploring all self-concept domains by gender

As an additional set of analyses, and going beyond the main aim of this study in order to shed light into the inter- and intra-group differences in relation to multidimensional self-concept, we calculated correlations between self-concept domains by gender. Within our sample, the vast majority of the domains were significantly correlated. The strongest correlations for the boys’ sub-sample were between global self-worth and physical appearance, global self-worth and social competence, athletic competence and social competence, close friendship and social competence, and scholastic competence and behavioural conduct (r’s falling within the range of 0.50 to 0.60). For girls, the highest correlation was between global self-worth and physical appearance ($r = 0.70$) with moderate correlations between global self-worth and behavioural conduct, and close friendship and social competence. Self-concept domains correlations matrices are presented in Table 2.4 for boys and Table 2.5 for girls.
Table 2.4 Correlations between all self-concept domains for boys (n = 744)

<table>
<thead>
<tr>
<th>Self-concept domain</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Global self-worth</td>
<td>-</td>
<td>0.34*</td>
<td>0.59*</td>
<td>0.27*</td>
<td>0.33*</td>
<td>0.44*</td>
<td>0.37*</td>
<td>0.53*</td>
<td>0.44*</td>
</tr>
<tr>
<td>2. Athletic competence</td>
<td>-</td>
<td>0.39*</td>
<td>0.20*</td>
<td>0.32*</td>
<td>0.32*</td>
<td>0.11*</td>
<td>0.50*</td>
<td>-0.01</td>
<td></td>
</tr>
<tr>
<td>3. Physical appearance</td>
<td>-</td>
<td>0.15*</td>
<td>0.35*</td>
<td>0.29*</td>
<td>0.17*</td>
<td>0.43*</td>
<td>0.26*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Job competence</td>
<td>-</td>
<td>0.25*</td>
<td>0.24*</td>
<td>0.16*</td>
<td>0.27*</td>
<td>0.12*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Romantic appeal</td>
<td>-</td>
<td>0.39*</td>
<td>0.08*</td>
<td>0.47*</td>
<td>0.05</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Close friendship</td>
<td>-</td>
<td>0.18*</td>
<td>0.60*</td>
<td>0.18*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Scholastic competence</td>
<td>-</td>
<td>0.19*</td>
<td>0.52*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Social competence</td>
<td>-</td>
<td>0.13*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < 0.05 (2-tailed)
** p < 0.01 (2-tailed)
**Table 2.5 Correlations between all self-concept domains for girls (n = 681)**

<table>
<thead>
<tr>
<th>Self-concept domain</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Global self-worth</td>
<td></td>
<td>0.41**</td>
<td>0.70**</td>
<td>0.21**</td>
<td>0.31**</td>
<td>0.38**</td>
<td>0.45**</td>
<td>0.46**</td>
<td>0.51**</td>
</tr>
<tr>
<td>2. Athletic competence</td>
<td>0.39**</td>
<td></td>
<td>0.20**</td>
<td>0.29**</td>
<td>0.23**</td>
<td>0.27**</td>
<td>0.38**</td>
<td>0.18**</td>
<td></td>
</tr>
<tr>
<td>3. Physical appearance</td>
<td>0.09*</td>
<td>0.26**</td>
<td></td>
<td>0.23**</td>
<td>0.30**</td>
<td>0.29**</td>
<td>0.30**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Job competence</td>
<td>0.23**</td>
<td>0.17**</td>
<td>0.29**</td>
<td></td>
<td>0.25**</td>
<td>0.15**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Romantic appeal</td>
<td>0.25**</td>
<td>0.21**</td>
<td>0.40**</td>
<td>0.05</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Close friendship</td>
<td>0.20**</td>
<td>0.60**</td>
<td>0.26**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Scholastic competence</td>
<td>0.26**</td>
<td>0.44**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Social competence</td>
<td>0.22**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Behavioural conduct</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**p < 0.01 (2-tailed)**

**p < 0.05 (2-tailed)**

## 2.6 DISCUSSION

The current study investigated the relationship between body image dissatisfaction (BID), multidimensional (domain-specific) self-concept, and weight status (BMI) at middle adolescence. Our findings confirm that a high percentage of boys and girls are dissatisfied with their bodies at age 14 years. This has important
implications given that BID has been found to increase the risk for subsequent eating disorders (Stice & Shaw, 2002) and has been linked to a range of other serious psychological difficulties (Paxton et al., 2006b; Kostanski & Gullone, 1998). We sought to determine which domains of the self-concept are associated with adolescents’ BID and if the relationships between self-concept and BID vary across weight groups and between genders.

In girls, as hypothesised, positive global self-worth (i.e., the general view individuals have of themselves) was significantly associated with less chances of experiencing BID, independently of weight status. This finding is consistent with other studies looking at self-esteem and BID in females (Furnham et al., 2002; Pingitore, Spring, & Garfieldt, 1997; Tiggemann, 2005). Importantly, this relationship between overall sense of self and BID may refer to an association girls seem to make between “how good I think I am as a person” (global self-worth) and “how satisfied I am with my body” (body image satisfaction/dissatisfaction) and according to our study this relationship holds irrespective of body weight. This phenomenon could be a reflection of the objectification of the body (Tiggemann & Lynch, 2001) and evidence of a link between appearance and self-worth that may place girls at risk of developing individual and interpersonal psychological difficulties. Additionally, girls’ sense of athletic competence played a role but only for the lower to normal weight girls. Lighter weight girls with high athletic competence scores were less likely to report BID. These results were somewhat as expected with some weight-related differences. It would be of interest to know if girls in the lower to normal weight group were more inclined to participate in athletic pursuits than their heavier counterparts. If so, this participation may have reinforced
their sense of athletic competence, which in turn may have been associated with their weight status (Kimm et al., 2005) leading to lower levels of BID (Jones, 2004; Ferron et al., 1999).

The case for boys was different in a number of ways. Boys differed in terms of the direction of BID: while most boys and girls who were dissatisfied with their body figure desired a thinner body, a significant percentage of body-dissatisfied boys expressed a desire to be bigger or larger which is in accordance with the literature possibly due to a desire to be more muscular (Brunet et al., 2010; Jones, 2004; McCreary & Sasse, 2000; Presnell et al., 2004; Schaefer & Salafia, 2014). However, opposite to what we hypothesised for the boys, in this group (boys wanting to be bigger) we found no significant relationship between self-concept scores and BID which would appear to suggest that a desire to be bigger is not tied up with self-concept in the same way as a wish to be thinner. The nature of the relationship between self-concept domains and BID was also different in the boys as compared to the girls. The relationship we found between athletic competence and wanting to be thinner was present only in the higher weight boys, contrary to our prediction that athletic competence would be negatively associated with BID for all boys. Specifically, heavier boys were less likely to report a desire to be thinner if they had a more positive sense of their athletic competence. It may well be that heavier weight was seen to make a positive contribution to athletic competence and therefore was less likely to be associated with dissatisfaction. Thus, this result could partly be an artefact of BMI measurement (Calzo et al., 2012) as the weight status of this group may have been linked to musculature rather than high adiposity; in which case their musculature may have underpinned their sense of athletic competence and relative
lack of BID. Our finding regarding behavioural conduct self-concept and BID among the lower weight boys indicating that a sense of behaving appropriately relates to lower BID is an unexpected result that deserves further research.

We also examined the relationship between BMI and BID. Consistent with previous research (e.g., Kostanski et al., 2004; Paxton et al., 2006a; Presnell et al., 2004) and as predicted, BMI accounted for a significant percentage of the variance in BID among boys and girls, demonstrating that BMI is a factor strongly and consistently associated with BID in both genders. Additionally, self-concept domains also explained a significant proportion of variance in the body image of our samples. In contrast with research by Kostanski and Gullone (1998) in which BMI explained more than double the variance of adolescents’ BID than that explained by self-esteem, our study shows that although BMI largely contributed to the BID variance, self-concept domains also explained a considerable proportion of BID variance. This is possibly due to the domain-specific approach that characterizes our study given that self-concept was assessed as a collection of judgments as opposed to a unidimensional judgment. Regardless, considering BMI and multidimensional self-concept together (controlling for BMI) appears to be a better approach than looking at each variable separately, given that the relationship between self-concept and BID may be moderated by BMI. Further, our models were more successful in explaining BID variance in girls with self-concept seemingly more important in explaining BID in girls than in boys.

In addition to our research questions, we sought to investigate how closely related were the self-concept domains for each gender. Our results indicating that
most self-concept domains are highly and significantly correlated within each gender are as expected (Harter, 2012). However, the pattern of correlations can provide further insight into gender differences in terms of self-concept and its relationship with BID. The high positive correlation seen between physical appearance and global self-worth in both genders indicates how these two notions of the self (i.e., appearance and overall worth) are interlaced. Other studies have found a robust association between physical appearance and self-worth, or self-esteem, in children and adolescents (Kломsten, Skaalvik, & Espner, 2004) which raises concern as to how much of the value of the self is placed on appearance rather than in other attributes like knowledge, experience, or individual qualities. It is of note that despite the strong relationship between physical appearance and global self-worth, global self-worth was not found to be associated with BID among the boys, but was evident in both weight groups of girls which further emphasizes how these two concepts seem to be conflated in girls.

The current study has a number of limitations. Being cross-sectional, it does not allow for any causal explanations but can only point to the relationships between variables. Longitudinal research is required to investigate the temporal precedence of potential risk factors that can be identified in cross-sectional research such as the current study. Due to the small sample sizes of minority groups, this study only included Caucasian adolescents; therefore, generalization of our findings to other populations should be carried carefully. Interestingly, research has shown that differences between Caucasian and non-Caucasian women in regard to BID are small (Grabe & Hyde, 2006). An additional methodological limitation relates to the low
reliability of the Harter’s Self-Perception Profile for Adolescents, particularly for the boys.

In terms of weight status, there are some concerns related to BMI given that muscular individuals, particularly males, can potentially be categorized as overweight when using the BMI as a measure of weight status (Calzo et al., 2012). Although this is unlikely to be a major issue in children and adolescents as discussed in Pietrobelli et al. (1998) where a strong association between BMI and fatness was found in a group of healthy children of a wide range of ages. The study by Pietrobelli et al. (1998) provides empirical support for the use of BMI as a measure of adiposity in groups. However, future research would benefit from using methods of classifying weight status that allow muscularity to be distinguished from overweight (see Cafri & Thompson, 2004). Notwithstanding these classification particularities, BMI remains a convenient and broadly used measure for weight status (Cole et al., 2000; Pietrobelli et al., 1998). Further, BMI categories used in this study were constructed according to standardized international criteria based on age and gender. It is important to note that the Body Figure Perception Scale used in our study does not match standard percentile curves for BMI as do other body image scales (e.g., Truby & Paxton, 2002). However, the scale used in the present study intends to distinguish fat and muscular figures as it contains two rows of pictorial figures per gender, one being child-like and another being adult-like from which participants could freely select their current and preferred body figures. Although, this scale does not focus on the chest area exclusively and has the typical limitations of the silhouette scales described in the review of the methodology in measuring male body image by Cafri and Thompson (2004), it intends to go beyond adiposity through adding a dimension
of muscularity known to be central for the boys. We believe this to be a strength given the challenges encountered in measuring BID.

Our research findings have clinical implications. Allen, Byrne, Oddy, and Crosby (2013) reported that 5.4% of the Raine cohort met full or partial DSM-IV criteria for an eating disorder at age 14, and of these, 23% had a persistent eating disorder at 20 years old. Given that BID is one of the main predictors of eating disorders and unhealthy weight-control behaviours (Levine & Piran, 2004), further developing an understanding of the factors that contribute to BID appears crucial. Our study found 8.5% (n = 4) of the underweight girls expressed a desire to be thinner, and although this was not further explored due to the small sample size, this particular group warrants clinical attention. Not surprisingly, none of the underweight boys expressed a desire to be thinner. Based on this study, we reinforce the importance of helping teenagers to place less value on physical appearance, and specifically in girls, to loosen the connection between their sense of self-worth as persons and their evaluation of their appearance. Stimulating a positive general perception of the self and ensuring girls differentiate their self-worth from their physical appearance is paramount, as this fusion of body and self may have a negative impact in diverse areas of girls’ functioning. We consider the loosening of this nexus to be essential in the shaping of more positive and functional body image in girls, irrespective of weight. There may also be benefit gained from promoting a sense of athletic competence among heavier boys. Some sports, and especially those predominantly played by boys (e.g., football or rugby), value larger body sizes and the positive reinforcement involved in these activities (i.e., sports, fitness, and outdoor games) may offer some level of protection for those boys who are sport-
inclined. Alternatively, a sense of effectiveness through positive reinforcement of the activities of interest may help those heavier boys who are not authentically inclined to sports feel better about their bodies; however, further research is required to determine other ways of encouraging positive athletic competence among boys. The relationship between athletic competence and BID is less clear in girls, especially those in the heavy weight group where athletic competence seems to place these girls at higher risk of wanting to be thinner which was contrary to expectation. The relationship between athletic competence, BID, weight status, and gender warrants further investigation.

In a large sample of Western Australian adolescent boys and girls, we have shown that specific domains of the self-concept are associated with BID with clear gender differences and some variations according to weight status. Out of the self-concept domains investigated in this study in terms of their relationship with BID, global self-worth and athletic competence showed to be involved with adolescent body image in both gender. Taking weight status into consideration, overweight and obese boys’ BID may benefit from promoting a positive sense of athleticism. Targeting negative judgments around overall self-worth could help girls of all weight statuses and lower weight boys reduce BID.
Chapter 3 Early Life Socioeconomic Status and Adolescent Body Image: A Longitudinal Cohort Study

3.1 FOREWORD

The study presented within Chapter 3 sought to assess the longitudinal relationship between early life family socioeconomic status, adolescent BMI, and body image dissatisfaction. Using multinomial logistic regression, this paper examined the long-term impact of socioeconomic status and body image dissatisfaction, taking into account BMI. It further investigated whether BMI is associated with body image dissatisfaction across the different socioeconomic status categories. As in the study presented in the previous chapter, this study considers the direction of body image dissatisfaction (dissatisfaction due to a desire to be bigger and dissatisfaction due to a desire to be thinner). The study presented in Chapter 3 has been submitted for publication, and is currently under review in the ‘Journal of Early Adolescence’.

3.2 ABSTRACT

There is considerable research looking at the impact of socioeconomic status (SES) on general psychological wellbeing but limited research exists on the long-term impact of SES on body image dissatisfaction (BID), one of the main risk factors for eating disorders. The objective of this study was to investigate the relationship between early life SES and adolescent BID, taking into account the adolescents’ body mass index (BMI). The Western Australian Pregnancy Cohort (Raine) Study is
a prospective cohort study of 2,900 pregnant women recruited at 18 weeks gestation and their 2,868 live born children, with SES data from early life that included family income and maternal education. Perceived body image was measured at 14 years using the Body Figure Perception Scale. Multinomial logistic regression was performed to assess the relationship between SES in early life (predictor) and BID in adolescence (outcome) among boys and girls, stratifying samples by BMI. Early life SES did not significantly impact BID at adolescence, with one exception: for the underweight boys, lower SES predicted decreased likelihood of experiencing BID. Early life SES has a negligible effect on BID in middle-adolescence, which highlights the fact that adolescents of all SES backgrounds can experience BID.

Keywords: socioeconomic status, SES, body image dissatisfaction, BID, adolescence, body mass index, BMI, longitudinal, Raine Study

3.3 INTRODUCTION

Socioeconomic status (SES) is a global construct that incorporates a range of social and economic variables; typically income, education and occupation (Alwin & Wray, 2005). Health has been found to improve in relation to levels of education with higher education linked to higher SES and in turn better health (Mirowsky & Ross, 2003). SES is known to be associated not only with general health, but more specifically with cognitive and socio-emotional outcomes in children with identifiable effects along the lifespan (Bradley & Corwyn, 2004). In fact, research on SES mobility suggests that low childhood SES can have lasting direct negative effects on later physical health and emotional wellbeing (Ball & Mishra, 2006) that
are not fully alleviated through later upward mobility (Luo & Waite, 2005). The investigation of the impact of early life SES on later physical and mental health is highly important given it has the potential to inform health policy and practice.

Body image dissatisfaction (BID) is common among adolescent boys and girls. Estimated prevalence ranges from 40% to 70% in girls (Wertheim & Paxton, 2011) and 7% (Hoffmann-Müller, & Amstad, 1994) to 53% (Collins, 1991) in boys. The high prevalence of BID is particularly concerning as BID is a predictor of a number of psychological difficulties such as unhealthy weight management behaviours, dieting, eating pathology, lower levels of physical activity, depressive mood, and low self-esteem (Neumark-Sztainer, Paxton, Hannan, Haines, & Story, 2006; Paxton, Eisenberg, & Neumark-Sztainer, 2006; Stice & Whitenton, 2002). From more recent literature using large community samples, BID among adolescent girls has been shown to be between 24% and 46% and between 12% and 26% among adolescent boys (Neumark-Sztainer, Story, Hannan, Perry, & Irving, 2002; Presnell, Bearman, & Stice, 2004; Stice & Whitenton, 2002). An Australian study focusing on adolescent body size, has found that only 12% of girls and 16.6% of boys were their desired size (Ricciardelli & McCabe, 2001). Another Australian study by Kostanski & Gullone (1998), also looking at adolescents, has indicated that 80% of girls and 40% of boys have high levels of dissatisfaction with their body image as per body image perception.

Among the factors that research has identified to influence BID, weight status (measured through body mass index - BMI) is strong, with higher BMI usually linked to higher levels of BID (McCabe & Ricciardelli, 2003; Paxton et al., 2006;
Paxton et al., 1991). Previous research findings indicate that 38% of 10-year-old girls would prefer a smaller body figure than their own as their ideal figure (DeLeel, Hughes, Miller, Hipwell, & Theodore, 2009). Boys also focus on losing weight from a young age, but seem to desire a larger body as seen in the study by McCabe & Ricciardelli (2005) in which boys aged 8 years showed an interest in increasing the size of their muscles and reported receiving the message to be muscular from their environment. Further, O'Dea and Caputi (2001) demonstrated in an Australian study that SES, weight, age and gender interact significantly with adolescents’ body image perceptions. These authors found that, compared to their higher SES counterparts, low SES children, particularly boys, were more likely to be overweight while considering themselves to be “too thin”. But while most studies suggest that low SES is associated with higher levels of BID in adolescence in both longitudinal (Paxton et al., 2006; Quick, Eisenberg, Bucchianeri, & Neumark-Sztainer, 2013; van den Berg, Mond, Eisenberg, Ackard, & Neumark-Sztainer, 2010) and cross-sectional studies (Story, French, Resnick, & Blum, 1995), other studies of children report that middle to high SES is related to poorer physical self-esteem (O'Dea & Caputi, 2001), a similar concept to BID. Finally, a number of studies have found no relationship between SES and BID (Barker & Galambos, 2003; Wang, Byrne, Kenardy, & Hills, 2005). These conflicting findings highlight the need for further research. Particular implications in terms of prevention may concentrate on whether SES and BID are prospectively related. To the present, longitudinal research looking at the relationship between SES and BID in young people has only included follow-up periods of between 3 to 10 years (Barker & Galambos, 2003; Paxton et al., 2006; Quick et al., 2013; van den Berg et al., 2010). Therefore, the importance of the present study as a potential contribution to the prevention of body image problems among adolescents.
In the current study, we aimed to investigate whether family SES during pregnancy predicts body image satisfaction/dissatisfaction at middle adolescence. The early detection of a potential relationship between SES and BID is important in procuring a broader understanding of the body image phenomena to inform BID prevention and intervention programs from early years towards preventing BID-related psychopathologies such as eating disorders, depression and anxiety (Kostanski & Gullone, 1998; Leon, Fulkerson, Perry, & Cudeck, 1993; Stice & Shaw, 2002). More specifically, by knowing if specific socioeconomic groups are more likely to present with BID, these groups could be targeted as part of preventative programs, for example. Additionally, given the lack of consensus around whether SES is related to BID and the relevance of this question in terms of public health, this longitudinal study intends to add to the body image field by looking at SES (defined both by education and family income) including a large population sample and taking into account BMI.

3.4 METHODS

3.4.1 Study population

The current study uses data from the Western Australian Pregnancy Cohort (Raine) Study, commonly known as the Raine Study. The Raine Study is a prospective cohort study of 2,900 pregnant women recruited between 1989 and 1991 at a gestational age between 16 and 20 weeks from King Edward Memorial Hospital (KEMH) and nearby private practices. The full summary of recruitment methods has been published elsewhere (Newnham, Evans, Michael, Stanley, & Landau, 1993). Data were collected at recruitment (16 – 20 weeks gestation), 34 weeks gestation, at
birth, and at 1, 2, 3, 5, 8, 10, 14, 17, 20, and 22 years on all available children from the original 2,868 live births. This study utilises data from pregnancy and age 14, when body image was assessed. Only Caucasian adolescents were included in this study since this is the dominant ethnic group (88.2%) within the study population and it was thought that different cultural factors could be present within the minority ethnic groups in the sample which would affect the generalizability of the results (Wildes, Emery, & Simons, 2001); therefore 331 participants were excluded. From the remaining participants, those with BMI scores were retained for the analyses, leaving a final sample of 1425 (50% of original cohort, 744 boys and 681 girls). Previous studies using the Raine Study data have revealed that over time non-participating families as compared to participating families were more socioeconomically disadvantaged. However, attrition in the Raine Study has served to increase representativeness of the Western Australian population in terms of SES, as initially socially-disadvantaged families were over-sampled (Allen, Byrne, Oddy, & Crosby, 2013; Li et al., 2008). All data collection for the Raine Study occurred in accordance with the Australian National Health and Medical Research Council Guidelines for Ethical Conduct in Human Research. Informed consent was obtained in writing from the adolescent and their primary caregiver.

3.4.2 Measures

**Body Image Dissatisfaction**

The Body Figure Perception Scale (BFPS) used in the Raine Study is an adaptation of a scale developed by Collins (1991). The BFPS scale identifies adolescents’ perceptions of their own bodies through seven pictorial figures for each gender. Each body figure drawing has a numerical value ranging from one, at the
thinner end, to seven, at the larger or bigger end. Two rows are presented for each gender, the top one being child-like figures and the bottom one being adult-like figures, characterised by the presence of a more muscular body figure in the centre of the scale. Adolescents were asked to pick the picture that best represented their current body shape, and the picture that represented their desired or ideal body figure using the following questions: “Which figure best represents what you currently look like?” and “Which body figure would you most like to look like?”. BID scores were obtained by subtracting the current body figure score from the desired body figure score. Thus, negative values reflected BID due to a desire to be thinner whilst positive values reflected BID due to a desire to be bigger. Scores of 0 represented a lack of BID or relative satisfaction in relation to body image. We included positive and negative values of 0.5 into this category as this deviation from the ideal is marginal and may not reflect dissatisfaction. Others, such as Durkin and Paxton (2002) have taken a similar approach to these marginal ratings. Body perception scales such as this have been widely used and reported in research (Dunn, Lewis, & Patrick, 2010) and are thought to provide a good measure of BID in girls and boys aged 8 years and older (Truby & Paxton, 2002). Test-retest reliability, with an intervening period of 3 days, and concurrent validity have been satisfactory (r = 0.78, p < 0.005; and r = 0.71, p < 0.005, respectively) and criterion-related evidence of validity has been demonstrated through the examination of verbal and pictorial comparisons (Collins, 1991). In adolescent populations, similar pictorial scales assessing the perception of body size have been studied in terms of their psychometric properties, such as in the study by Lo, Ho, Wong, Mak, & Lam (2011), which concluded appropriate convergent, discriminant, and concurrent validity, and a Spearman's correlation for current body size of 0.78 for girls and 0.72 for boys.
**Socioeconomic Status**

Given that social position is difficult to measure directly, SES is usually determined by various economic, social and physical characteristics of the environments in which individuals live and work (Graetz, 1995). Most studies accounting for SES include education and income as main indicators of SES. We included both of these measures of SES.

*Household income:* Data regarding total family income during pregnancy ($AUD per annum) were collected. Family income was dichotomised using the ‘poverty line’ as the cut-off point defined by the Australian Government (i.e., less than $24,000 per annum versus $24,000 per annum or greater), which has been utilised in similar population studies (Sawyer et al., 2001).

*Maternal education:* Maternal education was collected at recruitment in pregnancy and included as a categorical variable based on completion of 12 years of high school (yes/no).

**Body Mass Index**

Weight to the nearest 0.1 kg and height to the nearest 0.1 cm was measured at age 14 by a Raine Study research assistant. Scores of height and weight were computed and BMI was calculated through the standard formulae (BMI = weight (kg) / height (m²)). Four BMI categories: obesity, overweight (Cole, Bellizzi, Flegal, & Dietz, 2000) healthy weight and underweight (Cole, Flegal, Nicholls, & Jackson, 2007) were defined using separate cut-offs for boys and girls of this age.
**Pre-pregnancy Maternal Body Mass Index**

Maternal height was measured at the initial antenatal assessment before recruitment and enrolment into the Raine Study using standardized procedures for height measurement to the nearest 0.1 cm. Pre-pregnancy weight of mothers was self-reported at baseline (between 16 and 20 weeks gestation). Pre-pregnancy BMI was calculated using the BMI standard formulae shown above.

### 3.4.3 Statistical analysis

Stratification of the sample to define three SES groups was performed based on family income and maternal education at pregnancy, in which the *lower SES* group was composed of women who came from low income families (as per the Australian poverty line cut-off for that year, i.e., $24,000 per annum) and who had completed less than 12 years of high school education; the *higher SES* group were women from families with an income above the cut-off point (i.e., more than $24,000 per annum) who had completed 12 years of high school education; and the *middle SES* group was made up of participants who met criteria for one high and one low SES category.

Descriptive statistics served to characterise the sample in terms of SES variables, BMI distribution and body image categories. Multinomial logistic regressions were performed to analyse the relationship between SES and BID. Girls and boys were examined separately. The sample was stratified by BMI groups given the important role that BMI has on BID. Multinomial logistic regressions had SES categories (i.e., lower SES, middle SES, and higher SES) as the independent variable and body image categories as the dependent variable (i.e., satisfied, dissatisfied wanting to be thinner, and dissatisfied wanting to be bigger). The regressions give rise to odds ratios (ORs) for each dissatisfied category relative to the satisfied. These
relationships were further examined in regression models in which the effect of BMI was controlled. Finally, multinomial regression models relating BMI with BID stratified by SES were generated. IBM SPSS Statistics version 22 was used for the data analysis.

3.5 RESULTS
3.5.1 Descriptive results

There were 2,337 adolescents eligible for participation at the 14-year follow-up (not deceased and not withdrawn from the study). Of these, 1,816 adolescents elected to take part (63% of the original sample), and 1,425 had BMI data available. Thus, the sample size for this research was 1,425 (744 boys, 681 girls). The adolescents were aged between 13 and 15 years at the time of assessment (boys’ mean age = 14.06, SD = 0.21 years; girls’ mean age = 14.05, SD = 0.19 years). Table 3.1 shows demographic, anthropometric and socioeconomic characteristics of the sample. The distribution across the SES variables was comparable for boys and girls with approximately two thirds of families earning more than the poverty line at pregnancy and a significant percentage of the mothers having less than 12 years of high school education. Using the composite of these two variables to determine SES groups yielded a relatively small percentage of participants in the lower SES group (13.3% boys; 16% girls) with most participants in the group termed middle SES. Girls were more likely than boys to be body dissatisfied: more girls than boys wanted to be thinner but more boys than girls wanted to be bigger. Within the boys who were satisfied with their body image, 8.4% (n = 60) were overweight, 1.4% (n = 10) were obese, and 3.2% (n = 23) were underweight. Compared to the boys, a smaller percentage of the girls who were satisfied with their body image were overweight
(4.2%, n = 27) or obese (0.9%, n = 6), and a greater percentage was underweight (4.8%, n = 31). None of the underweight boys wanted to be thinner and only three underweight girls wanted to be thinner. None of the obese adolescents wanted to be bigger.

Table 3.1 Demographic, anthropometric and socioeconomic characteristics of the Western Australian Pregnancy Cohort (Raine) Study (n = 1425)

<table>
<thead>
<tr>
<th></th>
<th>Boys (n = 744)</th>
<th>Girls (n = 681)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household income</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;$24,000 per annum</td>
<td>34.5</td>
<td>36.6</td>
</tr>
<tr>
<td>≥$24,000 per annum</td>
<td>65.5</td>
<td>63.4</td>
</tr>
<tr>
<td>Maternal education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;High school completion (&lt;Y12)</td>
<td>56.2</td>
<td>56.6</td>
</tr>
<tr>
<td>High school completion (≥Y12)</td>
<td>43.8</td>
<td>43.4</td>
</tr>
<tr>
<td>SES categories(^a)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower</td>
<td>13.3</td>
<td>16.0</td>
</tr>
<tr>
<td>Middle</td>
<td>47.2</td>
<td>44.1</td>
</tr>
<tr>
<td>Higher</td>
<td>39.5</td>
<td>39.8</td>
</tr>
<tr>
<td>Adolescent BMI categories(^b)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underweight</td>
<td>5.5</td>
<td>6.9</td>
</tr>
<tr>
<td>Healthy weight</td>
<td>66.9</td>
<td>68.1</td>
</tr>
<tr>
<td>Overweight</td>
<td>19.1</td>
<td>18.2</td>
</tr>
<tr>
<td>Obese</td>
<td>8.5</td>
<td>6.8</td>
</tr>
<tr>
<td>Adolescent body image categories(^c)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Satisfied with body image</td>
<td>59.2</td>
<td>47.6</td>
</tr>
<tr>
<td>Dissatisfied wanting to be thinner</td>
<td>27.5</td>
<td>48.5</td>
</tr>
<tr>
<td>Dissatisfied wanting to be bigger</td>
<td>13.3</td>
<td>3.8</td>
</tr>
</tbody>
</table>

Note.  
Caucasians only  
Missing data are not shown  
\(^a\)Socioeconomic status categories are based on family income and maternal education at year 14  
\(^b\)BMI categories were calculated using Cole et al. (2000, 2007) cut-offs  
\(^c\)Body image categories were derived from discrepancy between ideal and current body image and “satisfied with body image” category included values of + and - 0.5

Table 3.2 presents more detailed descriptive data on BID by SES categories, BMI groups and gender. A smaller percentage of boys wanting to be bigger were in
the lower SES group (10.7%) compared to the middle (14.9%) and higher (13.4%) SES groups. Similar proportions of girls wanting to be thinner were in the lower (49.4%) and middle SES groups (51.6%), compared to the higher SES group (44.4%). A bigger percentage of obese boys were in the lower (11.2%) SES group compared to the middle (7.8%) and higher (6.3%) SES groups. Similarly, greater percentages of overweight girls were in the lower (24.4%) and middle (18.6%) SES groups as compared to the higher group (12%). A smaller percentage of the lower SES underweight boys wanted to be bigger (8.3%) as compared to the percentage of underweight boys wanting to be bigger in the middle (43.8%) and higher (70%) SES groups. Percentages of underweight girls wanting to be bigger were comparable across SES groups although subsamples include small frequencies. Across all three SES groups, healthy weight boys were almost evenly distributed between wanting to be thinner (low SES = 15.3%, middle SES = 14.1%, higher SES = 16.2%) and wanting to be bigger (low SES = 16.2%, middle SES = 18.2%, higher SES = 15.1%). Healthy weight girls had larger percentages in the dissatisfied wanting to be thinner category (low SES = 39.4%, middle SES = 47.1%, higher SES = 37.2%) than in the wanting to be bigger category (low SES = 3.7%, middle SES = 2.9%, higher SES = 2.6%). Finally, a greater percentage of overweight girls were body satisfied in the lower (29.3%) and middle (25%) SES groups than in the higher SES group (11.5%), while percentages of overweight boys satisfied with their body image were closer across SES groups (low SES = 45.7%, middle SES = 41.2%, higher SES = 47.9%).

Table 3.3 is a summary of the percentages of boys’ and girls’ body image discrepancy results with no focus on direction; this is, only containing two categories: satisfied and dissatisfied with body image, classified by SES groups. It
shows that the majority of boys were body satisfied across all SES categories, while
the majority of the lower and middle SES girls reported BID.
### Table 3.2 Percentage and frequency data of body image categories by BMI groups at 14 years of age by early life SES categories of the Western Australian Pregnancy Cohort (Raine) Study (n = 1425)

<table>
<thead>
<tr>
<th>BMI</th>
<th>Lower SES</th>
<th>Middle SES</th>
<th>Higher SES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Underwgt 6.7 (12)</td>
<td>Underwgt 5.7 (16)</td>
<td>Underwgt 4 (10)</td>
</tr>
<tr>
<td></td>
<td>Healthy 62.4 (111)</td>
<td>Healthy 68.4 (193)</td>
<td>Healthy 70.8 (179)</td>
</tr>
<tr>
<td></td>
<td>Overwgt 19.7 (35)</td>
<td>Overwgt 18.1 (51)</td>
<td>Overwgt 19 (48)</td>
</tr>
<tr>
<td></td>
<td>Obese 11.2 (20)</td>
<td>Obese 7.8 (22)</td>
<td>Obese 6.3 (16)</td>
</tr>
</tbody>
</table>

#### Boys

<table>
<thead>
<tr>
<th>BMI</th>
<th>Satisfied</th>
<th>Dissat. thinner</th>
<th>Dissat. bigger</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower SES</td>
<td>91.7 (11)</td>
<td>0</td>
<td>8.3 (1)</td>
</tr>
<tr>
<td>Middle SES</td>
<td>56.3 (9)</td>
<td>0</td>
<td>43.8 (7)</td>
</tr>
<tr>
<td>Higher SES</td>
<td>30 (3)</td>
<td>0</td>
<td>70 (7)</td>
</tr>
</tbody>
</table>

#### Girls

<table>
<thead>
<tr>
<th>BMI</th>
<th>Satisfied</th>
<th>Dissat. thinner</th>
<th>Dissat. bigger</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower SES</td>
<td>68.5 (76)</td>
<td>15.3 (17)</td>
<td>16.2 (18)</td>
</tr>
<tr>
<td>Middle SES</td>
<td>67.7 (130)</td>
<td>14.1 (27)</td>
<td>18.2 (35)</td>
</tr>
<tr>
<td>Higher SES</td>
<td>68.7 (123)</td>
<td>16.2 (29)</td>
<td>15.1 (27)</td>
</tr>
</tbody>
</table>

Note.

Binary body image “dissatisfied” category includes adolescents who reported “wanted to be bigger” and “wanted to be thinner” combined

### Table 3.3 Percentage and frequency data of binary body image at 14 years of age by early life SES categories of the Western Australian Pregnancy Cohort (Raine) Study (n = 1425)

<table>
<thead>
<tr>
<th>Lower SES</th>
<th>Middle SES</th>
<th>Higher SES</th>
</tr>
</thead>
<tbody>
<tr>
<td>% (n)</td>
<td>% (n)</td>
<td>% (n)</td>
</tr>
<tr>
<td>Boys</td>
<td>Satisfied</td>
<td>Dissatisfied</td>
</tr>
<tr>
<td>60.7 (108)</td>
<td>39.3 (70)</td>
<td>57.7 (162)</td>
</tr>
<tr>
<td>Girls</td>
<td>Satisfied</td>
<td>Dissatisfied</td>
</tr>
<tr>
<td>47.6 (80)</td>
<td>52.4 (88)</td>
<td>45 (116)</td>
</tr>
</tbody>
</table>

Note.

Binary body image “dissatisfied” category includes adolescents who reported “wanted to be bigger” and “wanted to be thinner” combined
3.5.2 Associations between SES and BID by BMI groups

Table 3.4 and Table 3.5 show the multinomial logistic regression results from the analysis of the associations between SES categories at pregnancy and BID categories at adolescence, stratified by BMI groups, for both boys and girls. In the underweight boys (Table 3.4), lower SES at pregnancy had a significantly protective effect on BID wanting to be bigger (OR = 0.04; 95% CI = 0.01, 0.45; p = 0.01). Our models did not capture any other significant result. There was a trend suggesting middle SES predicted higher levels of BID wanting to be thinner among normal weight girls (OR = 1.53; 95% CI = 0.98, 2.38; p = 0.06; Table 3.5) but this did not reach statistical significance. We accounted for pre-pregnancy maternal BMI in further models to see if this might moderate the relationship between SES and BID; however the inclusion of this variable had no effect.

3.5.3 Associations between BMI and BID by SES groups

To assess the degree to which BMI was related to BID across the SES groups, we conducted further multinomial logistic regression analyses with a continuous measure of BMI as the predictor and body image categories as the outcome for each of the SES categories. Our results indicate that BMI was significantly associated with body image for boys and girls across all three SES categories. Higher BMI scores were associated with an increased chance to present with BID wanting to be thinner, and decreased chance of wanting to be bigger. A summary of these results is presented in Table 3.6.
Table 3.4 Multinomial logistic regression results between early life SES categories and BID categories at 14 years of age by BMI groups for boys of the Western Australian Pregnancy Cohort (Raine) Study (n = 744)

<table>
<thead>
<tr>
<th>Body image categories</th>
<th>SES categories</th>
<th>Underweight</th>
<th>Normal weight</th>
<th>Overweight</th>
<th>Obese</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low SES</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dissatisfied thinner</td>
<td></td>
<td>OR (95% CI)</td>
<td>p-value</td>
<td>OR (95% CI)</td>
<td>p-value</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.95 (0.49, 1.84)</td>
<td>0.88</td>
<td>1.09 (0.46, 2.62)</td>
<td>0.84</td>
</tr>
<tr>
<td></td>
<td>Middle SES</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.88 (0.49, 1.57)</td>
<td>0.67</td>
<td>1.31 (0.59, 2.91)</td>
<td>0.50</td>
</tr>
<tr>
<td>Dissatisfied bigger</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Low SES</td>
<td>0.04* (0.01, 0.45)</td>
<td>0.01</td>
<td>1.08 (0.56, 2.09)</td>
<td>0.82</td>
</tr>
<tr>
<td></td>
<td>Middle SES</td>
<td>0.33 (0.06, 1.78)</td>
<td>0.19</td>
<td>1.23 (0.70, 2.15)</td>
<td>0.47</td>
</tr>
</tbody>
</table>

Note.  
Outcome reference category: Body image satisfied  
Predictor reference category: Higher SES  
Unadjusted model  
*p ≤ 0.01
Table 3.5 Multinomial logistic regression results between early life SES categories and BID categories at 14 years of age by BMI groups for girls of the Western Australian Pregnancy Cohort (Raine) Study (n = 681)

<table>
<thead>
<tr>
<th>Body image categories</th>
<th>SES categories</th>
<th>Underweight</th>
<th>Normal weight</th>
<th>Overweight</th>
<th>Obese</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>OR (95% CI)</td>
<td>p-value</td>
<td>OR (95% CI)</td>
<td>p-value</td>
</tr>
<tr>
<td>Dissatisfied thinner</td>
<td>Low SES</td>
<td>-</td>
<td>1.12 (0.68, 1.87)</td>
<td>0.65</td>
<td>0.31 (0.08, 1.25)</td>
</tr>
<tr>
<td></td>
<td>Middle SES</td>
<td>0.40 (0.03, 4.96)</td>
<td>0.48</td>
<td>1.53 (0.98, 2.38)</td>
<td>0.06</td>
</tr>
<tr>
<td>Dissatisfied bigger</td>
<td>Low SES</td>
<td>0.60 (0.05, 6.79)</td>
<td>0.68</td>
<td>1.52 (0.37, 6.29)</td>
<td>0.56</td>
</tr>
<tr>
<td></td>
<td>Middle SES</td>
<td>0.64 (0.14, 2.92)</td>
<td>0.56</td>
<td>1.35 (0.35, 5.19)</td>
<td>0.66</td>
</tr>
</tbody>
</table>

Note.
Outcome reference category: Body image satisfied
Predictor reference category: Higher SES
Unadjusted model
Table 3.6 Multinomial logistic regression results between continuous BMI and BID categories at 14 years of age by SES categories for boys and girls of the Western Australian Pregnancy Cohort (Raine) Study

<table>
<thead>
<tr>
<th>BMI</th>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lower SES OR (95% CI)</td>
<td>Middle SES OR (95% CI)</td>
</tr>
<tr>
<td>Dissatisfied thinner</td>
<td>1.34*** (1.21, 1.49)</td>
<td>1.56*** (1.38, 1.75)</td>
</tr>
<tr>
<td>Dissatisfied bigger</td>
<td>0.72** (0.56, 0.92)</td>
<td>0.69*** (0.57, 0.82)</td>
</tr>
</tbody>
</table>

Note.
Reference category: Body image satisfied
Odds ratios (ORs) presented are per unit increase in BMI

* p ≤ 0.05
** p ≤ 0.01
*** p ≤ 0.001
3.6 DISCUSSION

In the current study, we examined the longitudinal relationship between SES during pregnancy and BID in adolescence using a large sample of boys and girls, and taking into account their BMI. Overall, our results suggest that early life SES does not predict BID at middle adolescence. Despite the known impact that SES can have into the future health of individuals, our study demonstrates that SES during the first years of life has virtually no relationship with later BID, and highlights that irrespective of social advantage or disadvantage, a significant percentage of adolescents experience BID.

Previous studies have shown a link between low SES and higher levels of BID in adolescence (Paxton et al., 2006; Quick et al., 2013; Story et al., 1995; van den Berg et al., 2010); other studies have reported that middle to high SES relates to poorer physical self-esteem (O’Dea & Caputi, 2001). Our study findings did not replicate the findings from these studies, but are in line with those of Wang et al. (2005), and Barker and Galambos (2003) in which no relationship between SES and BID was identified. One possible explanation for the variation of results between these studies may be the use of different measures and definitions of body image, different indices of SES, and potentially confounding factors such as culture and ethnicity. It is important to note that results from our study may be limited to Caucasian adolescents as we only included this ethnic group.

A significant association within the lower SES boys was found, showing that lower SES underweight boys are less likely to desire a bigger body than their higher
SES counterpart. O’Dea and Caputi (2001) reported that young people of low SES, in particular boys, experience enhanced body esteem despite actual body weight, which may partly help to explain this result. Further, this result may reflect some SES differences in the way psychosocial factors (i.e., peer pressure, media influence) exert an effect on BID in boys, which may vary across socioeconomic groups. Previous research has found that boys, as compared to girls, are less influenced by media sociocultural messages (Vincent & McCabe, 2000) and media body comparison (van den Berg et al., 2007) in terms of the “ideal body”.

Our descriptive results provide valuable data in terms of SES, BID and BMI. For example, lower SES adolescents tend to be heavier than higher SES adolescents; and healthy weight boys across all SES tend to desire either a bigger or a thinner body with the majority being body satisfied, whereas a large percentage of healthy weight girls of middle SES experience BID with a desire to have a thinner body as compared to the lower and higher SES girls. Addressing issues with body image among adolescents within the normal or healthy weight range is crucial for the promotion of body esteem and prevention of eating disorders.

An additional finding of our study shows that BMI is strongly associated with BID, both directions wanting to be thinner and wanting to be bigger, and for boys and girls across all three SES groups. Previous research has found that adolescents from lower SES families present with higher BMI but a lower degree of BID compared to higher SES groups (O’Dea & Caputi, 2001). The fact that lower SES adolescents tend to have higher BMI scores is a concern as overweight and obesity is linked to poorer overall physical and mental health. This result confirms the strong
and close relationship between BMI and BID, previously described by a number of studies such as the ones by McCabe and Ricciardelli (2003); Paxton et al. (2006); Paxton et al. (1991). However, it is important to note that although our descriptive data indicates lower SES adolescents have higher BMI scores, the association found between BMI and BID was significant irrespective of SES membership.

Promotion of healthy dietary habits, balanced exercising, and positive body esteem as well as avoiding messages likely to lead to BID (Neumark-Sztainer et al., 2006) may help achieve a healthy weight without negatively affecting body image and this may apply to adolescents of all SES backgrounds. Achieving a healthy weight (without creating BID) is an important matter as the presence of sustained high BMI may also influence the maintenance of low SES, for example through having fewer or poorer quality of job opportunities based on social stigma (Stunkard, 1996). There is no doubt that the causal direction of the relationship between SES and BMI is of a complex nature (Wang & Lim, 2012) and merits further research.

The overall findings of little effect of SES on adolescent BID, highlight cross-sectional (Wang et al., 2005) and longitudinal findings of previous research (Barker & Galambos, 2003), indicating no link between SES and BID among adolescents. However, our results differ from those studies that have previously identified lower SES (e.g., lower maternal education) as a predictor of higher BID in longitudinal designs (Paxton et al., 2006; Quick et al., 2013; van den Berg et al., 2010) which may be related to different methods utilised by different studies to categorise SES and the degree of SES variance taken into account (Flynn & Fitzgibbon, 1998). Another possible explanation to our results is that SES may start exerting an
influence on BID later in life, as no other longitudinal study has accounted for SES in pregnancy as we did in the present study.

The strengths of our study include its longitudinal design which allows for prediction; a large sample which generates adequate statistical power; the inclusion of both education and income as measures of SES; and the inclusion of both genders which enables the description of body image issues in boys and girls given that BID characteristics and development are known to differ by gender (Ricciardelli & McCabe, 2001). However, our study is not exempt from limitations including the difficulty in accurately accounting for SES through a unique individualised and comprehensive measure; the potential effects of confounding variables other than BMI and maternal BMI; and the sample attrition known to be more accentuated in the lower SES groups in the Raine Study (Allen et al., 2013; Whitehouse et al., 2010). Furthermore, we are mindful of the limitations related to the assessment of BID, given that the measure used to account for BID was a perceptual measure of overall body size/figure and did not include body image questionnaires to measure the other aspects of body image (i.e., cognitive, emotional). Future studies using a more comprehensive measure of SES and including other instruments to assess BID will build upon our findings.

This study is the first to investigate whether early life family SES predicts BID reported in adolescence, which adds to the body of knowledge of longitudinal research on BID with implications on prevention and intervention. We have shown that SES at pregnancy has little association with later BID, highlighting that BID is a problem that affects adolescents irrespective of SES background. These overall
findings could highlight the importance of universal intervention initiatives for the prevention of BID among adolescents. Our study provides some evidence to suggest that lower early life SES families present with adolescent boys who are less likely to experience BID than higher early life SES families, and this relationship is dependent on the adolescent’s BMI. Finally, additional findings from the present study indicate that higher BMI is associated with wanting to be thinner among boys and girls, regardless of SES background.
Chapter 4  Does early life diet influence body mass index and body image dissatisfaction in adolescence? A longitudinal study

4.1 FOREWORD

This study was designed to identify biological aspects potentially related to adolescent body image dissatisfaction (BID); in particular early life diet. To investigate how early life diet quality is related to later body image dissatisfaction, the study presented in Chapter 4 included data on breastfeeding duration and diet quality during the first three years of life. Previous research has found links between diet during the first years of life and BMI, and the literature points BMI as a key element in the experience of BID. This study sought to investigate whether early life diet is related to BID in adolescence, taking into account the role of BMI given the results obtained from the studies presented in Chapter 2 and Chapter 3. This study also included maternal and paternal BMI as a covariate. Using hierarchical binary logistic regression models, this study concentrated on binary body image dissatisfaction: it does not consider the direction of dissatisfaction (bigger or thinner) the adolescent reported. Also, as compared to the studies presented in the previous chapters in terms of categorisation of the outcome variable (body image dissatisfaction), this study had stricter criteria for the “dissatisfied” category. Two reasons underlined these decisions in terms of changes to parameters: 1) broadening the view of BID with the focus on whether adolescents were experiencing dissatisfaction with their bodies with basis on the results presented in the previous
chapters where the direction of the dissatisfaction did not yield significative intra-
gender differences; 2) having a cut-off score that allowed for the assessment of more
severe dissatisfaction versus lack of dissatisfaction or very mild dissatisfaction with
body image.

4.2 ABSTRACT

Early life diet has implications for subsequent physical and mental health. The
impact of breastfeeding duration and diet quality during the first years of life on later
body mass index (BMI) has been investigated and BMI has been shown to be
strongly related to BID. However, it is not known whether early life diet predicts
BID in adolescence and if there is a relationship whether it is direct or indirect
through BMI. The aim of this study was to investigate the relationships between
early life diet and BID in adolescence, taking into account BMI of both the
adolescent and their parents. This study used data from the Western Australian
Pregnancy Cohort (Raine) Study involving a total of 1382 (744 boys, 638 girls). BID
was measured at 14 years using the Body Figure Perception Scale discrepancy
scores. Predictors included breastfeeding duration (age at which breastfeeding was
stopped in months), early life diet (Raine Eating Assessment in Toddler Score), body
mass index (BMI) at age 14 years and pre-pregnancy maternal BMI and paternal
BMI. Hierarchical regressions were performed with dichotomous body image
(satisfied/dissatisfied) as the outcome variable. There were no significant
associations between early life diet and adolescent BID. However, there were
positive significant relationships between adolescent BMI and BID and between pre-
pregnancy maternal BMI and adolescent BID for both boys and girls. Our study
brings the focus to the weight status of both the mother and the adolescent as a
paramount factor for BID in youth. We conclude that mothers who have a healthy pre-pregnancy BMI may be less likely to have offspring with high BMI and BID.

Keywords: breastfeeding, early life diet, body image dissatisfaction, body mass index, maternal BMI, adolescence, Raine Study

4.3 INTRODUCTION

Connections between a child’s diet early in life and later body mass index (BMI) have been drawn with findings indicating that breastfed infants have a slightly lower risk for obesity later in life (Horta, Bahl, Martines, & Victoria, 2007). However, prolonged exposure to breast milk (i.e., beyond 8 months) has been associated with high body fat in adult life possibly due to maternal hormones found in breast milk and lipid metabolism (O’Tierney, Barker, Osmond, Kajantie, & Eriksson, 2009). Although the relationship between breastfeeding and BMI is not completely clear (Cope & Allison, 2008) there is considerable evidence that breastfeeding may be associated not only with BMI but also with overall measures of mental health. For example, Oddy et al. (2010) studied the effect of breastfeeding duration on child and adolescent mental health, and found that shorter breastfeeding duration negatively impacted child psychological development and was associated with adverse outcomes in adolescence. Another study of the same cohort determined that infants breastfed for more than four months had higher adaptability and communication scores in the first 3 years of life than those who were not breastfed past four months (Oddy et al., 2011).
The duration of breastfeeding may also influence later dietary patterns. Meyerkort, Oddy, O'Sullivan, Henderson, and Pennell (2012) found that longer periods of breastfeeding were related to improved diet quality in infancy. Other studies have also shown how early life diet has implications on later physical (Mølgaard, Larnkjær, Mark, & Michaelsen, 2011) and mental health problems (Jacka et al., 2013). The evidence suggests that children with a healthy diet have better physical health, mood and cognition (Rogers, 2001). Healthier diets (e.g., that include fruit, vegetables, cereals, fish) during childhood and adolescence have also been linked to less overweight and obesity in youth (Dietz & Gortmaker, 2001; McNaughton, Ball, Mishra, & Crawford, 2008; Popkin & Gordon-Larsen, 2004), which in turn are strongly related to greater BID in both males and females (Calzo et al., 2012; Kostanski, Fisher, & Gullone, 2004; Paxton, Eisenberg, & Neumark-Sztainer, 2006a).

Body image dissatisfaction (BID) is a multifaceted construct referring to a preference or desire for body characteristics that differ from the way the body is currently perceived by the person (Wertheim & Paxton, 2011). BID is highly prevalent among adolescent boys and girls (Collins, 1991; Hoffmann-Müller & Amstad, 1994), which is of concern as BID is one of the major predictors of eating disorders, especially among females (Attie & Brooks-Gunn, 1989; Leon, Fulkerson, Perry, & Cudeck, 1993; Stice, Marti, & Durant, 2011). Additionally, BID has been related to a number of negative psychological and physical outcomes including depressive mood, low self-esteem, dieting, disordered eating, weight gain, reduced physical activity, and poor fruit and vegetable intake (Neumark-Sztainer, Paxton,
While it appears that there may be links between early diet and a range of outcomes including BMI, the relationship between early diet and BID has received scant attention. The aim of our study was therefore to investigate, using a prospective population birth cohort of term infants, the association between early life diet, including duration of breastfeeding and early life diet quality, and BID in adolescence, taking into account maternal and paternal BMI and the adolescent’s own BMI.

### 4.4 METHODS

#### 4.4.1 Study population

The Western Australian Pregnancy Cohort (Raine) Study is a longitudinal cohort study following 2,900 pregnancies recruited with gestational age between 16 and 20 weeks from King Edward Memorial Hospital (KEMH) or nearby private practices, between May 1989 and November 1991. The full summary of recruitment methods has been published elsewhere (Newnham, Evans, Michael, Stanley, & Landau, 1993). Criteria for enrolment included: proficiency in English, expectation of delivery at KEMH, and an intention to remain in Western Australia after the birth of the child. A range of clinical and questionnaire data was collected at pregnancy (18 and 34 weeks gestation). The women of our cohort delivered at the hospital, and babies were examined at 2 days of age. Follow-ups at 1, 2 and 3 years involved a structured interview and clinical examination of all children in the cohort. Further follow-ups took place at ages 5, 8, 10, 14, 17, 20 and 22 years for all available
children from the original 2,868 live births. We concentrated on the perinatal, 1, 2 and 3 year follow-ups for the predictor variables and the 14-year follow-up for the outcome variable as middle adolescence is known to be a susceptible developmental period for BID. Only Caucasian adolescents were included in this study since this is the dominant ethnic group (88.2%) within the Raine Study population and it was thought that cross-cultural factors could impact BID within the different ethnic groups in the sample (Anderson-Fye, 2009). As a consequence 331 participants were excluded. From the remaining participants, only those with available data on variables of interest were included in the analyses, leaving a sample of 1382 (approximately 50% of original cohort, 744 boys and 638 girls). All data collection for the Raine Study occurred in accordance with the Australian National Health and Medical Research Council Guidelines for Ethical Conduct in Human Research. Ethics were approved and informed consent was obtained in writing from the adolescent and their primary caregiver.

4.4.2 Variables and measures

**Predictors**

*Early life diet*

*Breastfeeding*

The duration of breastfeeding was defined as the age at which breastfeeding was stopped in months; however, breastfeeding did not need to be exclusive and we did not preclude the intake of other milks and solid foods (Oddy et al., 2010). We gathered information from questionnaires completed by the mothers of the Raine Study at the follow-ups year 1, 2 and 3 regarding the age at which breastfeeding stopped to produce a continuous variable of the duration of breastfeeding. From these data we produced a 3-level categorical variable: never breastfed (0 months),
breastfed for $\leq 4$ months, and breastfed for $> 4$ months. Further detail on the breastfeeding data in the Raine Study can be seen in Oddy et al. (2003).

**Diet quality during first three years of life**

The Raine Eating Assessment in Toddler Score (EAT score) is a diet quality index developed by Meyerkort et al. (2012) that provides a measure of overall diet at 1, 2 and 3 years old. Information on the type of all food and drinks consumed for breakfast, lunch, dinner and snacks in one day was recorded by the primary caregiver on a 24-hour dietary recall. The EAT score was constructed based on seven component food groups: 1) whole grains, 2) vegetables, 3) fruit, 4) meat, 5) dairy, 6) snack food, and 7) soda and drinks. Breast milk and other milk substitutes were not included in the EAT score. Components one to five were defined as “healthy”, while components six and seven were defined as “unhealthy”. A score out of 10 was assigned for each component. Greater frequency of consumption of foods from the “healthy” components resulted in scores closer to 10. Greater frequency of consumption of foods from the “unhealthy” components resulted in scores closer to zero. The total score for an individual was calculated by the sum of the seven component scores, ranging from 0 to 70 with better dietary quality reflected by higher EAT scores and poorer dietary quality by lower EAT scores. As indicated by the authors, the EAT score formulation was based on a previously published paediatric dietary index (Feskanich, Rockett, & Colditz, 2004). This study used an average EAT score derived from the EAT scores calculated at the year 1, 2 and 3 follow ups which reflects dietary quality over the ages of 1 to 3 years (the EAT in Toddlers score).
**Covariates**

*Adolescent, maternal and paternal body mass index*

Anthropometric assessment included weight to the nearest 0.1 kg and height to the nearest 0.1 cm measured twice by a Raine Study research assistant. Mean scores of height and weight were computed and BMI scores were obtained through the calculation of the ratio between weight divided by height squared, \( \text{BMI} = \frac{\text{weight (kg)}}{\text{height (m}^2\text{)}} \). Our study uses BMI data measured at 14 years of age for the adolescents. Maternal BMI scores were calculated from data collected at pregnancy where mothers were asked to recall pre-pregnancy weight and current height. Paternal BMI was calculated using reported data on weight and height for fathers during pregnancy. Continuous BMI was used throughout this study to reflect adiposity (Pietrobelli et al., 1998).

**Outcome variable**

*Body image dissatisfaction*

*The Body Figure Perception Scale*

Adolescents’ BID was measured at age 14 using a pictorial scale that identifies adolescents’ perceptions of their own bodies through seven body figure drawings for each gender. The Body Figure Perception Scale (BFPS) used in the Raine Study is an adaptation of a scale developed by (Collins, 1991). Each body figure on the BFPS has a numerical value ranging from one, at the thinner end, to seven at the larger or bigger end. The scale includes half-points which do not correspond to a specific body figure picture but to the body figure that would be represented between two given pictorial figures. Two rows are presented for each gender, the top one being child-like figures and the bottom one being adult-like figures.
Adolescents were asked to pick the picture that best represented their current body shape, and the picture that represented their desired or ideal body figure using the following questions: “Which figure best represents what you currently look like?” and “Which body figure would you most like to look like?”. Participants recorded the number matching the images they selected. BID scores were obtained by subtracting the current body figure score from the desired body figure score. Thus, negative values reflected BID due to a desire to be thinner whilst positive values reflected BID due to a desire to be bigger. To categorise BID we used a classification system similar to the one reported by Durkin & Paxton (2002). Scores of 0, 0.5 and 1 were seen to represent no discrepancy or only a small discrepancy between current and ideal body image and hence these scores were considered to reflect lack of BID. Scores indicating a discrepancy between current and ideal body image greater than 1 were seen to represent BID.

Body perception scales such as the BFPS used in the Raine Study have been widely used and reported in research and are thought to provide a good measure of BID in girls and boys aged 8 years and older (Truby & Paxton, 2002). Test-retest reliability, with an intervening period of 3 days, and concurrent validity of similar scales have been satisfactory (r = 0.78, p < 0.005; and r = 0.71, p < 0.005, respectively) and criterion-related evidence of validity has been demonstrated through the examination of verbal and pictorial comparisons (Collins, 1991).
4.4.3 Statistical analysis

Descriptive statistics were calculated for predictors, covariates and outcome variables. Means and standard deviations are presented for continuous variables, and percentages and numbers of participants are presented for categorical variables. To assess whether diet during early life was associated with body image at 14 years of age, hierarchical (or sequential) binary logistic regressions were performed. Boys and girls were examined separately.

Hierarchical regressions concentrated on dichotomous body image (satisfied/dissatisfied) as the outcome variable with reference category being “satisfied” with body image (consisting of scores of -1, -0.5, 0, 0.5, and 1). Using this criterion, only one girl was dissatisfied wanting to be bigger, and therefore was excluded from the analyses leaving only girls wanting to be thinner. The boys subsample included boys wanting to be thinner and boys wanting to be bigger as it was deemed that BID was evident and in both groups and in this study the direction of dissatisfaction was not taken into account. Hierarchical regressions were constructed in five steps. The first step included breastfeeding duration; second step added the EAT in Toddlers score; steps three included pre-pregnancy maternal BMI and in step 4 paternal BMI was added; and finally step five adjusted the model for the adolescent’s BMIs. Our models did not adjust for SES variables since previous research using this cohort did not find a significant relationship between family SES and adolescent BID. To identify whether maternal BMI was stable through the time, correlations were calculated for maternal BMI pre-pregnancy and at the year 14 follow-up. Statistical significance was defined at the customary p ≤ 0.05 level. Statistical analyses were performed using IBM SPSS Statistics version 22.
4.5 RESULTS

4.5.1 Descriptive statistics

Of the 1382 participants with data on body image at 14 years and meeting our study criteria (boys = 744; girls = 638), 8.5% were never breastfed, 31.5% were breastfed for 4 months or less, and 60% were breastfed for longer than 4 months. This group was not necessarily breastfeeding exclusively past 4 months, according to the World Health Organization definition of exclusive breastfeeding (WHO, 2003) as it is possible that they were continuing to breastfeed with the addition of solid food (Oddy et al., 2010). The mean age reported by mothers for stopping breastfeeding was when babies were 8 months old (Mean = 8.1; Median = 6; S.E. = 7.2) with 5.8% of offspring were still breastfeeding at 18 months and maximum range of breastfeeding at 37 months for boys and 38 months for girls.

Out of the maximum 70 points which can be obtained by an individual on the EAT in Toddlers score (higher scores reflecting a better dietary quality than lower scores), boys obtained a mean of 40 (S.D. = 0.4) and girls obtained a mean of 41 (S.D. = 0.4). BID was more frequent among girls than boys (21.8% and 11.5% respectively). Table 4.1 shows further details on demographic and anthropometric characteristics of participants from this study. Pearson Chi-square performed on body image categories indicated a significant difference between gender (value = 22.10, df = 1, p ≤ 0.001).
Table 4.1 Demographics and descriptive data of the Western Australian Pregnancy Cohort (Raine) Study (n = 1382)

<table>
<thead>
<tr>
<th></th>
<th>Boys (n = 744)</th>
<th></th>
<th>Girls (n = 638)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Age</td>
<td>14.06</td>
<td>0.21</td>
<td>14.05</td>
<td>0.19</td>
</tr>
<tr>
<td>Maternal BMI (pre-pregnancy)</td>
<td>22.47</td>
<td>0.18</td>
<td>22.42</td>
<td>0.19</td>
</tr>
<tr>
<td>Maternal BMI (year 14)</td>
<td>27.28</td>
<td>0.28</td>
<td>26.84</td>
<td>0.27</td>
</tr>
<tr>
<td>Paternal BMI (perinatal)</td>
<td>24.55</td>
<td>0.15</td>
<td>24.77</td>
<td>0.15</td>
</tr>
<tr>
<td>Adolescents’ BMI</td>
<td>21.08</td>
<td>0.19</td>
<td>21.77</td>
<td>0.19</td>
</tr>
<tr>
<td>EAT&lt;sup&gt;a&lt;/sup&gt; in Toddlers score</td>
<td>40.25</td>
<td>0.37</td>
<td>40.94</td>
<td>0.39</td>
</tr>
<tr>
<td>Body image categories&lt;sup&gt;b,c&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Satisfied</td>
<td>88.5</td>
<td>657</td>
<td>78.2</td>
<td>499</td>
</tr>
<tr>
<td>Dissatisfied (≥ 1.5)</td>
<td>11.5</td>
<td>85</td>
<td>21.8</td>
<td>139</td>
</tr>
<tr>
<td>Breastfeeding&lt;sup&gt;c&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>8.8</td>
<td>62</td>
<td>8.3</td>
<td>51</td>
</tr>
<tr>
<td>≤ 4 months</td>
<td>31.7</td>
<td>225</td>
<td>31.6</td>
<td>193</td>
</tr>
<tr>
<td>&gt; 4 months</td>
<td>59.5</td>
<td>421</td>
<td>60.1</td>
<td>369</td>
</tr>
</tbody>
</table>

<sup>a</sup>The Raine Eating Assessment in Toddler Score (EAT score)

<sup>b</sup>Body image categories were derived from discrepancy between ideal and current body image

<sup>c</sup>Sample based on available data for BMI at 14 years; Body image categories and breastfeeding data based on available cases

4.5.2 Associations between early life diet and adolescent BID

Table 4.2 and Table 4.3 present the hierarchical regression results for analyses looking at breastfeeding, diet quality during the first three years of life, and BID in adolescence. Our results show that there were no significant associations between early life diet and adolescent BID in boys or girls.

4.5.3 The role of BMI

Our hierarchical regressions included maternal and paternal BMI to control for the potential confounding effect these variables may have on the relationships between early diet and BID. Results indicated that, in both genders, pre-pregnancy
maternal BMI had a significant positive effect on their children’s BID in adolescence. More specifically, higher maternal pre-pregnancy BMI was associated with increased chances of their offspring presenting with BID at age 14 (boys OR = 1.12, 95% CI = 1.04, 1.20, p = 0.002, see Table 4.2; girls OR = 1.10, 95% CI = 1.04, 1.17, p = 0.001, see Table 4.3). However, this relationship attenuated and was no longer significant when the adolescent’s BMI was taken into account. Paternal BMI did not show a significant relationship with adolescent BMI for either gender. To explore the longitudinal stability of maternal BMI, we looked at the correlation between maternal BMI before pregnancy and maternal BMI measured at follow-up year 14. A strong and significant correlation between these variables resulted from the Pearson correlation calculation (boys’ mothers: r = 0.78, p ≤ 0.001; girls’ mothers: r = 0.73, p ≤ 0.001). We also correlated pre-pregnancy maternal BMI and adolescent BMI with significant results for both boys (r = 0.34, p ≤ 0.001) and girls (r = 0.31, p ≤ 0.001).
### Table 4.2 Hierarchical binary logistic regression results for boys of the Western Australian Pregnancy Cohort (Raine) Study (n = 744) predicting early life diet influences on adolescent BID

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Coefficient beta</th>
<th>OR (95% C.I. for OR)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breastfeeding</td>
<td>-0.54</td>
<td>0.59 (0.31 - 1.09)</td>
<td>0.09</td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breastfeeding</td>
<td>-0.41</td>
<td>0.66 (0.34 - 1.29)</td>
<td>0.23</td>
</tr>
<tr>
<td>EAT in Toddlers score</td>
<td>-0.02</td>
<td>0.98 (0.94 - 1.02)</td>
<td>0.29</td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breastfeeding</td>
<td>-0.31</td>
<td>0.73 (0.37 - 1.44)</td>
<td>0.37</td>
</tr>
<tr>
<td>EAT in Toddlers score</td>
<td>-0.02</td>
<td>0.98 (0.94 - 1.02)</td>
<td>0.31</td>
</tr>
<tr>
<td>Maternal BMI</td>
<td>0.11**</td>
<td>1.12 (1.04 - 1.20)</td>
<td>0.002</td>
</tr>
<tr>
<td><strong>Step 4</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breastfeeding</td>
<td>-0.31</td>
<td>0.74 (0.37 - 1.45)</td>
<td>0.38</td>
</tr>
<tr>
<td>EAT in Toddlers score</td>
<td>-0.02</td>
<td>0.98 (0.94 - 1.02)</td>
<td>0.34</td>
</tr>
<tr>
<td>Maternal BMI</td>
<td>0.11**</td>
<td>1.11 (1.04 - 1.19)</td>
<td>0.004</td>
</tr>
<tr>
<td>Paternal BMI</td>
<td>0.03</td>
<td>1.03 (0.94 - 1.12)</td>
<td>0.55</td>
</tr>
<tr>
<td><strong>Step 5</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breastfeeding</td>
<td>-0.14</td>
<td>0.87 (0.42 - 1.82)</td>
<td>0.71</td>
</tr>
<tr>
<td>EAT in Toddlers score</td>
<td>-0.01</td>
<td>0.99 (0.94 - 1.03)</td>
<td>0.58</td>
</tr>
<tr>
<td>Maternal BMI</td>
<td>0.02</td>
<td>1.02 (0.93 - 1.11)</td>
<td>0.72</td>
</tr>
<tr>
<td>Paternal BMI</td>
<td>-0.05</td>
<td>0.95 (0.86 - 1.06)</td>
<td>0.35</td>
</tr>
<tr>
<td>Adolescents’ BMI</td>
<td>0.24***</td>
<td>1.27 (1.17 - 1.37)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

**Note.**

Body image binary categories utilised in this model included values of 0, 0.5 and 1 for “satisfied” and ≥ 1.5 for “dissatisfied”. Reference category: “satisfied”.

Breastfeeding categories were never, ≤ 4 months, > 4 months. Reference category: never. All other predictors were continuous.

Maternal BMI measured at pre-pregnancy. Paternal BMI measured at perinatal follow-up. EAT scores was composed from diet at years 1, 2 and 3. Adolescents’ BMI measured at same time as outcome variable (14 years).

Results are per unit change in the score for continuous variables.

* p ≤ 0.05; ** p ≤ 0.01; *** p ≤ 0.001
### Table 4.3 Hierarchical binary logistic regression results for girls of the Western Australian Pregnancy Cohort (Raine) Study (n = 638) predicting early life diet influences on adolescent BID

<table>
<thead>
<tr>
<th>Step</th>
<th>Predictors</th>
<th>Coefficient beta</th>
<th>OR</th>
<th>95% C.I. for OR</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lower</td>
<td>Upper</td>
</tr>
<tr>
<td>Step 1</td>
<td>Breastfeeding</td>
<td>-0.20</td>
<td>0.82</td>
<td>0.48</td>
<td>1.40</td>
</tr>
<tr>
<td>Step 2</td>
<td>Breastfeeding</td>
<td>-0.19</td>
<td>0.83</td>
<td>0.48</td>
<td>1.44</td>
</tr>
<tr>
<td></td>
<td>EAT in Toddlers score</td>
<td>-0.01</td>
<td>0.99</td>
<td>0.96</td>
<td>1.03</td>
</tr>
<tr>
<td>Step 3</td>
<td>Breastfeeding</td>
<td>-0.06</td>
<td>0.94</td>
<td>0.53</td>
<td>1.67</td>
</tr>
<tr>
<td></td>
<td>EAT in Toddlers score</td>
<td>0.01</td>
<td>1.01</td>
<td>0.97</td>
<td>1.04</td>
</tr>
<tr>
<td></td>
<td>Maternal BMI</td>
<td>0.10***</td>
<td>1.10</td>
<td>1.04</td>
<td>1.17</td>
</tr>
<tr>
<td>Step 4</td>
<td>Breastfeeding</td>
<td>-0.06</td>
<td>0.94</td>
<td>0.53</td>
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<tr>
<td></td>
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<tr>
<td></td>
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<td>1.04</td>
<td>1.17</td>
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<tr>
<td></td>
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</tr>
<tr>
<td>Step 5</td>
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<td>1.04</td>
<td>0.56</td>
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<tr>
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<tr>
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<td>1.21</td>
<td>1.43</td>
</tr>
</tbody>
</table>

**Note.**

- Body image binary categories utilised in this model included values of 0, 0.5 and 1 for “satisfied” and ≥ 1.5 for “dissatisfied”. Reference category: “satisfied”.
- Breastfeeding categories were never, ≤ 4 months, > 4 months. Reference category: never. All other predictors were continuous.
- Maternal BMI measured at pre-pregnancy. Paternal BMI measured at perinatal follow-up. EAT scores were composited from diet at years 1, 2 and 3. Adolescents’ BMI measured at same time as outcome variable (14 years).
- Results are per unit change in the score for continuous variables.

\*p ≤ 0.05; \**p ≤ 0.01; \***p ≤ 0.001
4.6 DISCUSSION

Our results indicate that there is no significant link between breastfeeding, early life dietary quality, and adolescent BID, in either boys or girls. Further, no significant relationship was evident between early life diet and BID when considering maternal and paternal BMI and the adolescents’ own BMI. However, our study shows a strong positive relationship between maternal pre-pregnancy BMI and adolescent BID: experiencing BID in adolescence is more likely to happen if the adolescent’s mother has a high BMI prior to pregnancy.

In line with our findings, it has been argued that weight-related issues experienced by parents are most likely transmitted to children (Field et al., 2001; Lowes & Tiggemann, 2003; Vincent & McCabe, 2000) in an objective/physical and subjective/psychological way. Additionally, early life dietary practices may mostly reflect parents’ food-related choices and behaviours which may be also partly related to maternal and paternal BMI, while being overweight may also be associated with a range of biological, inherited and family factors (Jääskeläinen et al., 2011). However, despite the idea that maternal BMI influences offspring BMI and offspring BMI is strongly associated with offspring BID, relatively little attention has been paid to the relationship between early maternal BMI and later offspring BID. This is surprising as maternal and paternal weight status provides a direct model that may be reasonably thought to have an influence on BID given that parents serve as role models to their children; also because BMI is partly biologically determined so this may be a factor communicated from generation to generation. Keery, Eisenberg, Boutelle, Neumark-Sztainer, and Story (2006) explored the relationship between maternal BMI, maternal body dissatisfaction, and adolescent weight control.
behaviours. These authors found that over half of the mothers in the study were overweight or obese and nearly all mothers were dissatisfied with their bodies, but reported that adolescent girls’ weight concerns were not related to maternal self-report of BMI or body dissatisfaction. In contrast, boys’ weight concerns were significantly associated with maternal report of own BMI but unrelated to maternal body dissatisfaction. Our results for boys are in line with those of Keery et al. (2006) for maternal BMI; however, their study is of a cross-sectional nature and therefore limited to that timeframe, whereas our study demonstrates that mothers of higher BMI before conception are at an increased risk of having adolescents presenting with BID.

Interestingly, our study did not capture an effect of paternal weight status on boys’ BID. It might reasonably be assumed that fathers’ BMI may have some level of influence on boys’ BID through same sex identification, but based on our study, mothers’ BMI has a more influential role on adolescent BID for both genders. In fact, previous research has shown that maternal weight is more inter-generationally transmitted than paternal weight (Whitaker, Jarvis, Beeken, Boniface, & Wardle, 2010). Alternatively, it may be that fathers had a higher degree of comfort with their weight status than mothers, and rather than the BMI per se it may be that it is the level of satisfaction/dissatisfaction with the body (observed through comments made around body appearance, for example) that impacts on the adolescents’ BID. In line with this possible explanation, Field et al. (2001) found that children were more influenced by their mother’s weight related concerns and behaviours than by their mother’s actual weight. Additionally, it is important to note that the effect of maternal BMI on boys’ and girls’ BID disappeared when our models accounted for
the adolescents’ BMI which reflects the direct role that own BMI plays on BID (Rodgers, Paxton, & McLean, 2014).

This study is the first to explore the role of breastfeeding duration and early life diet on adolescent BID, and although results were non-significant for these relationships, it provides some light into the study of BID, particularly given the inclusion of BMI. Not many studies have included adolescent BMI, and none have looked at pre-pregnancy maternal and perinatal paternal BMI. These characteristics of our study design allow for the interpretation of the long-term effects that maternal BMI has on adolescent BID, although this was not the main objective of the present study but an artefactual finding. Some other strengths of this study are related to the sample size, being a large community sample, which generates good statistical power. Another strength is related to the nature of the measures utilised; for example, the EAT in Toddlers score representing the diet quality during 3 years of life which has been meticulously developed by Meyerkort et al. (2012). We are equally aware of our study’s limitations. Additional body image measures may have provided a more comprehensive view of BID. Also, having data on maternal BID would have allowed the amplification of our results in this regard by adding information on the link between maternal BMI and maternal level of body satisfaction/dissatisfaction and the link between maternal BID and offspring BID. In this regard, data on maternal BID would have enriched our interpretation from a psychological perspective.

In summary, in this study we aimed to investigate the relationship between early life diet and body image satisfaction/dissatisfaction in adolescence, taking into
account maternal, paternal, and adolescent BMI. Early life diet was defined by the duration of breastfeeding and dietary quality during the first three years of life. We included maternal and paternal pre-pregnancy BMI as a covariate given the influence parents’ body weight and size may have on our predictors and the outcome. Our study has shown that there is no significant relationship between early life diet and adolescent BID. However, a strong association exists between pre-pregnancy maternal BMI and adolescent BID for both boys and girls, which is overwritten by the relationship between adolescent BMI and BID. Our study suggests that maternal weight status may be an important factor for body image in adolescence. This suggests that efforts to encourage a healthy weight prior to conception may be of some benefit but issues related to body weight are complex and need to be managed with sensitivity. Through our study it is seen that the benefits of procuring a ‘healthy weight’ can have long-lasting effects on offspring physical and psychological wellbeing regarding body image.
Chapter 5  Associations between psychosocial factors and adolescent body image dissatisfaction: The roles of family functioning, maternal mental health, and peer teasing

5.1 FOREWORD

The study presented in Chapter 5 assessed the psychosocial environment of the adolescent and its associations with body image dissatisfaction. A cross-sectional design was used to investigate family and peer influences on adolescent body image dissatisfaction. Binary logistic regression models were tested including variables that accounted for family functioning, maternal mental health, and peer teasing about weight or shape. As in the studies presented in the previous chapters, the effect of BMI was also examined and models were run by gender. This study also used binary body image dissatisfaction as the outcome variable in which the “satisfied” category included slight changes on the scale to capture more pronounced body image dissatisfaction in the “dissatisfied” category as detailed in Chapter 4.

5.2 ABSTRACT

Body image dissatisfaction (BID) is highly prevalent among adolescents and is one of the major predictors of eating disorders. A number of psychosocial factors have been linked with BID including family characteristics, parental behaviours, and teasing; however, some gaps remain in the literature. We sought to further investigate the relationship between psychosocial factors including family
functioning, maternal mental health, and teasing about weight or shape, and adolescent BID taking into account body mass index (BMI). This study used data from the Western Australian Pregnancy Cohort (Raine) Study involving a total of 1382 (744 boys, 638 girls). BID was measured at 14 years using the Body Figure Perception Scale discrepancy scores. Findings from this study indicate that poor family functioning and recent experience of stressful life events were related to higher BID for girls. Maternal anxiety was associated with higher BID for boys, irrespective of BMI. Both boys and girls who had been teased about their weight or shape were more likely to have BID, independently of their BMI. This study highlights the importance of the psychosocial environment in relation to adolescent BID and provides insights into body image issues for boys and girls separately. Findings have implications for prevention initiatives, intervention programs, and school policies tackling BID.

Keywords: body image dissatisfaction, family functioning, maternal mental health, teasing, psychosocial environment, body mass index, gender differences, Raine Study

5.3 INTRODUCTION

Body image dissatisfaction (BID) is highly prevalent among adolescents, ranging from 24 to 46% in adolescent girls and 12 to 26% in adolescent boys, with clear gender differences in terms of development and presentation (Neumark-Sztainer, Story, Hannan, Perry, & Irving, 2002; Presnell, Bearman, & Stice, 2004; Stice & Whitenton, 2002). A large population-based study from the UK looking at
adolescents aged 14 years shows that 40% of girls and 12% of boys report dieting, 7.5% of girls and 3.5% of boys expressed engaging in bingeing while 2.4% of girls and 0.8% of boys declared purging behaviours (Micali, De Stavola, Ploubidis, Simonoff, Treasure, & Field, 2015). The high prevalence of BID among adolescents is particularly worrying as BID has been found to be associated with a number of negative outcomes including depressive mood, low self-esteem, dieting, disordered eating, weight gain, reduced physical activity, and poor fruit and vegetable intake (Neumark-Sztainer, Paxton, Hannan, Haines, & Story, 2006; Paxton, Neumark-Sztainer, Hannan, & Eisenberg, 2006). For these reasons, BID has lately been considered a public health concern (Bucchianeri & Neumark-Sztainer, 2014). There is a need for further investigation around factors thought to be associated with BID as these may provide targets for prevention initiatives, treatment programs, and public health policies. The psychosocial environment, in particular, represents an area where interventions and prevention efforts have a great potential in the treatment of BID (Paxton, 2002), as psychosocial factors can be a target of change.

Families play a crucial role in the development of their children with long-term effects that extend to adulthood (Aquilino & Supple, 2001). In fact, family functioning has been recognised as a major contributor to adolescent wellbeing (McFarlane, Bellissimo, & Norman, 1995). During the last three decades, a great deal of attention has been allocated to familial influences on body image disturbances and eating disorders (Hodges, Cochrane, & Brewerton, 1998; Minuchin, Rosman, & Baker, 1978; Vincent & McCabe, 2000). Whilst it is established that families alone do not cause eating disorders (le Grange, Lock, Loeb, Nicholls, 2010), research has identified the crucial role played by parents in shaping their children’s
weight-related concerns and eating behaviours (Jones, 2011; Keery, Eisenberg, Boutelle, Neumark-Sztainer, & Story, 2006; Rodgers & Chabrol, 2009). Moreover, treatment programs for eating disorders highlight the role parents can play in their child’s recovery (Le Grange & Eisler, 2009). This underlines the importance of efforts to better understand the family environment of young people struggling with BID in order to include parents in prevention and intervention. Phares, Steinberg, and Thompson (2004) suggest that familial influences can be both implicit and explicit: dysfunctional eating attitudes and behaviours can be modelled by parents or more directly transmitted through weight-related opinions, criticisms or comments. Mothers in particular seem to play a direct influence in weight-related issues of adolescent girls via encouragement, discussions and modelling of weight loss behaviours, whereas the role of fathers, whilst important, has been less clearly delineated (Vincent & McCabe, 2000). In research focused on girls, there is also evidence to suggest that high quality family relationships may be protective for body image; in contrast, conflictual family relationships have been found to increase body image problems (Byely, Archibald, Graber, & Brooks-Gunn, 2000).

Another psychosocial aspect known to play a crucial role in children’s psychological development is parental mental health. Parents’ own mental health has been identified as one of the most important family risk factors in relation to child emotional development (Maughan, 2011). For instance, depressed mothers tend to be less caring and sensitive to their infants, and as their children grow older they seem to react more negatively to them when compared to non-depressed mothers (Beardselee, Versage, & Giadstone, 1998). Stressful life events have been linked to the development and course of depression (Fried, Nesse Guille, & Sen, 2015;
Kendler, Thornton, & Prescott, 2014; Kessler, 1997) and anxiety conditions (Francis, Moitra, Dyck, & Keller, 2012). Stressful life events may account for some maternal mental health difficulties, emphasising the importance of considering maternal stress in the study of child psychological development (Anderson & Hammen, 1993; Robinson et al., 2008). There is also evidence of links between stress experienced by parents and child health outcomes, so consideration of stressful life events and stressful situations within the family is important (Goodyer, 1990). A longitudinal study by Robinson et al. (2008) investigated the pre- and postnatal maternal influences on children’s mental health and found that prenatal maternal stress was a significant risk factor for child behavioural problems and general wellbeing.

Within the psychosocial environment it is not only the role of the family that is important, as children and adolescents spend long hours interacting with peers. Unfortunately, these interactions are not always positive. Research has focused on the negative impact of some types of peer interaction. For example, there has been considerable attention paid to the impact of teasing on a range of behaviours with teasing about weight or shape found to be consistently related to BID (Gleason, Alexander, & Somers, 2000; Menzel et al., 2010). In body image research, teasing is most commonly defined as negative appearance-related feedback such as specific insults, cruel comments, or disparaging remarks (Thompson & Heinberg, 1999). The relationship between teasing and BID in girls has been extensively reported (Levine, Smolak, & Hayden, 1994; van den Berg, Wertheim, Thompson, & Paxton, 2002; Wertheim, Paxton, Schutz, & Muir, 1997) and shown to have long-term negative effects such as restrictive eating practices, bulimic symptoms, and poorer psychological functioning (Cattarin & Thompson, 1994). Conversely, relatively little
attention has been paid to the incidence and impact of this type of teasing on boys. Few studies have looked at both genders when investigating teasing; those that have reported that girls are more subjected to teasing than boys. For example, Neumark-Sztainer et al. (2002) found that girls experience more weight-related teasing than boys and seem to be more disturbed by the teasing than boys. Further, in a meta-analysis by Menzel et al. (2010), teasing was found to play a significant role in the development and presence of BID in children and adolescents and, similarly to findings from Neumark-Sztainer et al. (2002), the association between teasing and BID was found to be stronger in girls than in boys.

The overall aim of the current study was to investigate whether a set of psychosocial factors were related to BID in a large sample of adolescent boys and girls, taking into account the role of BMI. We sought to further investigate the relationship between family functioning and adolescent BID focusing on the family as a complex system where the overall effects of interaction, communication, problem solving, and overall functioning between family members were explored. Additionally, and in view of the links between the psychological health of mothers and broad measures of offspring wellbeing, we sought to extend the research in body image by looking at the relationship between maternal mental health and adolescent BID. Specifically, we explored the relationship between maternal mental health and BID in adolescence, as while the relationship between maternal mental health and eating disorders in offspring has been established, the link between maternal mental health and offspring BID has been largely ignored. We also sought to extend previous research on family functioning, teasing about weight or shape, and adolescent BID by investigating the effect of BMI. We hypothesised that a less
functional family environment, poorer maternal mental health, and teasing about weight or shape would be associated with a greater likelihood of presenting with BID in both genders with BMI as a potential moderator.

5.4 METHODS

5.4.1 Study population

The Western Australian Pregnancy Cohort (Raine) Study is a longitudinal cohort study following 2,900 pregnancies recruited with gestational age between 16 and 20 weeks from King Edward Memorial Hospital (KEMH) or nearby private practices, between May 1989 and November 1991. The full summary of recruitment methods has been published elsewhere (Newnham, Evans, Michael, Stanley, & Landau, 1993). Participants had to meet the following criteria for enrolment in the Raine Study: proficiency in English, expectation of delivery at KEMH, and an intention to remain in Western Australia after the birth of the child. A range of clinical and questionnaire data was collected at pregnancy (18 and 34 weeks gestation), birth and at ages 1, 2, 3, 5, 8, 10, 14, 17, and 20 years for all available children from the original 2,868 live births. The 14-year follow-up was selected for this study as middle adolescence is known to be a susceptible developmental period for BID (Wertheim & Paxton, 2011) and age 13 has been identified by research as the period in which gender differences in relation to BID emerge (Rosenblum & Lewis, 1999). This study included Caucasian adolescents only since this is the dominant ethnic group (88.2%) within the Raine Study population and it was thought that cross-cultural factors could impact BID within the different ethnic groups in the sample (Anderson-Fye, 2009). As a consequence 331 participants were excluded. From the remaining participants, only those with body mass index (BMI) scores were
included in the analyses, leaving a final sample of 1425 (50% of original cohort, 744 boys and 681 girls). All data collection for the Raine Study occurred in accordance with the Australian National Health and Medical Research Council Guidelines for Ethical Conduct in Human Research. Informed consent was obtained in writing from the adolescent and their primary caregiver.

5.4.2 Measures

**Body image dissatisfaction**

*The Body Figure Perception Scale*

Adolescent BID was measured at age 14 using a pictorial scale that identifies adolescents’ perceptions of their own bodies through seven body figure drawings for each gender. The Body Figure Perception Scale (BFPS) used in the Raine Study is an adaptation of a scale developed by Collins (1991). Each body figure on the BFPS has a numerical value ranging from one, at the thinner end, to seven, at the larger or bigger end. The scale includes half-points which do not correspond to a specific body figure picture but to the body figure that would be represented between two given pictorial figures. Two rows are presented for each gender, the top one being child-like figures and the bottom one being adult-like figures (characterised by the presence of a more muscular body figure in the centre of the scale). Adolescents were asked to pick the picture that best represented their current body shape, and the picture that represented their desired or ideal body figure using the following questions: “Which figure best represents what you currently look like?” and “Which body figure would you most like to look like?”. Participants wrote the number matching their answers in a given box. BID scores were obtained by subtracting the current body figure score from the desired body figure score. Thus, negative values
reflected BID due to a desire to be thinner whilst positive values reflected BID due to a desire to be bigger. Scores of 0 reflected a match between current and ideal body figure and was seen to represent body image satisfaction and hence participants with these scores comprised the “satisfied” with body image category. We also included positive and negative values of 0.5 and 1 in this category as this level of discrepancy between ideal and current figures was considered to represent relative body image satisfaction (or lack of significant dissatisfaction). Discrepancies greater than one between current and ideal figures were considered to reflect BID and hence participants with these scores comprised the “dissatisfied” with body image category. Similar methodological procedures where slight movements on the measurement of body image are considered as “no change” and therefore remain in one category have been described by Durkin and Paxton (2002). Body perception scales such as the BFPS have been widely used and reported in research (Dunn, Lewis, & Patrick, 2010) as they provide a good measure of body size perception and BID in girls and boys aged 8 years and older (Truby & Paxton, 2002). Test-retest reliability, with an intervening period of 3 days, and concurrent validity of similar scales have been satisfactory (r = 0.78, p < 0.005; and r = 0.71, p < 0.005, respectively) and criterion-related evidence of validity has been demonstrated through the examination of verbal and pictorial comparisons (Collins, 1991). These psychometric characteristics support the use of pictorial body figure scales as a measure of perceptual BID (Thompson & Gray, 1995).
Family functioning

The McMaster Family Assessment Device

Overall family functioning at age 14 was assessed via the primary caregiver self-report on The McMaster Family Assessment Device (MFAD) (Epstein, Baldwin, & Bishop, 1982) General Functioning scale. The General Functioning scale is one of 7 scales within the MFAD and provides an overall measure of the health/pathology of the family. Six of the 12 items are intended to describe healthy functioning of the family, and the other six items describe unhealthy family functioning. Primary caregivers of our study participants were asked: “This is called the Family Assessment Device; it was developed to give an idea of how families work together. Below are statements about families and family relationships. Circle the category which best describes your family - the people living in your house”. Each of the 12 items is rated on a 4-point Likert-type scale ranging from 0 (strongly disagree) to 3 (strongly agree). Answers to items were tallied to produce a total score where higher scores reflected unhealthier family functioning. The psychometric characteristics of the General Functioning scale suggest that this subscale is a brief version of the full version of the MFAD (Byles, Byrne, Boyle, & Offord, 1988). The other dimensions of the MFAD are designed to measure a series of properties and patterns within the family such as problem solving; communication; roles; affective responsiveness; affective involvement; and behaviour control. The General Functioning scale has shown high validity (r = 0.92) and test-retest reliability (r = 0.71) (Boterhoven de Haan, Hafekost, Lawrence, Sawyer, & Zubrick, 2014; Byles et al., 1988; Epstein, Baldwin, & Bishop, 1983).
**Parent relationship degree of happiness**

To assess the degree of happiness in the parental couple at the 14-year follow-up, a single item rated on a 7-point Likert-type scale ranging from 0 (extremely unhappy) to 6 (perfect) was used. Primary caregivers were asked: “The dots on the following lines represent different degrees of happiness in your relationship. Please circle the dot which best describes the degree of happiness, all things considered, of your relationship”. This item measuring dyadic satisfaction was extracted from the Dyadic Adjustment Scale (Spanier, 1976), which is a 32-item scale measuring quality of marriage with an overall reliability of 0.96 using Cronbach’s coefficient alpha. The Dyadic Adjustment Scale has been broadly used in the study of marriage, divorce and quality of dyad relationships.

**Maternal mental health**

*Depression-Anxiety-Stress Scale*

As part of the 14-year follow-up, mothers completed the Depression-Anxiety-Stress Scale 21 (DASS-21), which is a short version of the 42-item self-report measure created by Lovibond and Lovibond (1995). Three subscales are derived from each of the summed item scores for depression, anxiety, and stress. Each subscale comprises seven items rated on a 4-point Likert-type scale ranging from 0 (did not apply to me at all) to 3 (applied to me very much, or most of the time) so that higher scores reflect poorer mental health. The Depression subscale consists of questions relating to feelings of helplessness and hopelessness, dysphoric mood states and anhedonia; the Anxiety subscale contains questions relating to worries, panic, and physical symptoms of anxiety; and the Stress subscale reports on negative effect of stressors and general tension. The DASS has shown adequate construct validity and good reliability in the general adult population (Crawford & Henry,
Studies have reported good estimates of internal consistency for the DASS-21 (range = 0.82 to 0.97) in clinical and non-clinical samples (Henry & Crawford, 2005; Lovibond & Lovibond, 1995).

*Number of stressful events experienced by mothers*

Eleven major life stressful events were drawn from the 67-item life stress inventory developed by Tennant and Andrews (1976) as part of the Raine Study 14 year follow-up. Mothers were asked whether they had experienced any of these 11 events during the previous 12 months (yes/no). The stressful events listed were: pregnancy problems, death of a relative, death of a close friend, separation or divorce, marital problems, problems with children, involuntary job loss, involuntary partner’s job loss, money problems, residential move, and other stressful event. We computed a total stressful life events score by summing the number of “yes” responses to the listed events, with equal weight (1 point) given to each.

*Teasing about weight or shape*

Adolescents at age 14 were asked to answer “yes” or “no” to the following question: “Have you ever been teased about your weight or shape?” Those who answered “yes” to this question were asked to specify if the teasing was by children from same school, children from outside the school, brothers or sisters, parents, teachers, or other adults.

*Adolescent body mass index*

Weight at age 14 to the nearest 0.1 kg and height to the nearest 0.1 cm were measured twice by a Raine Study research assistant. Mean scores of height and
weight were computed and BMI was calculated using the standard formula BMI = weight (kg) / height (m²). Continuous BMI was used throughout this study.

5.4.3 Statistical analysis

Descriptive statistics were used to compare boys and girls in relation to BID (current minus ideal body image discrepancy scores). Hypotheses were tested using binary logistic regressions to determine the relationships between psychosocial variables and BID in our sample of adolescents. Boys and girls were examined separately. Models had dichotomous BID as the outcome variable with the reference category being “satisfied” with body image. BID was defined as a score greater than 1 irrespective of the direction of the discrepancy between current and ideal body figures (i.e., wanting to be bigger or thinner). Following this criterion, from the totality of girls only one (1) was dissatisfied wanting to be bigger, therefore was excluded from the analyses leaving only girls wanting to be thinner. The boys subsample included both boys wanting to be thinner and boys wanting to be bigger.

Independent variables introduced in our binary logistic regressions were: continuous family functioning scores (the General Functioning scale of the MFAD scores, and the parental couple degree of happiness responses); maternal mental health scores (the DASS subscales scores, and the number of stressful events); and categorical teasing about weight or shape (yes/no). Models were run with and without adjustment for BMI in order to control for the effect of BMI as a covariate and further explore its potential mediating role. The results were considered as statistically significant at p-values of 0.05 or less. Statistical analyses were performed using IBM SPSS Statistics version 22.
5.5 RESULTS

5.5.1 Descriptive statistics

A higher percentage of adolescent girls had scores reflecting BID than did adolescent boys (BID in girls = 21.8%, n = 139; BID in boys = 11.5%, n = 85). Figure 5.1 represents the distributions of body image discrepancy scores for adolescent boys and girls with negative values indicating dissatisfaction due to a desire to be thinner and positive values dissatisfaction due to a desire to be bigger or larger. The descriptive results for continuous predictor variables are shown in Table 5.1. These include the median and interquartile ranges given that all distributions of predictor variables were skewed. Boys and girls reported similar rates of having been teased about weight or shape (no = 80.8%, n = 595; yes = 19.2%, n = 141) and girls (no = 78.5%, n = 498; yes = 21.5%, n = 136). The vast majority of those who reported teasing about weight or shape, had been teased by children/peers at school while a very small number reported being teased by their parents (boys n = 5; girls n = 8). Given that teasing was almost solely perpetrated by other children/peers, we looked only at incidence of teasing rather than the sources of the teasing; thus, data on teasing perpetrated by parents was excluded.
Figure 5.1 Body image scores distribution for boys and girls at 14 years.

Boys mean = -0.21, SD = 0.87, n = 744; Girls mean = -0.73, SD = 0.90, n = 681
Table 5.1 Descriptive statistics for boys and girls on continuous predictor variables

<table>
<thead>
<tr>
<th></th>
<th>Boys (n = 742)</th>
<th></th>
<th></th>
<th>Girls (n = 638)</th>
<th></th>
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<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Median</td>
<td>IQR</td>
<td>Range</td>
<td>Skewness</td>
<td>Mean</td>
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<td>Family functioning (MFAD)</td>
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<td>22</td>
<td>7</td>
<td>37</td>
<td>0.25 (SE=0.09)</td>
<td>21.37</td>
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<tr>
<td>Happiness in parental couple</td>
<td>2.30</td>
<td>2</td>
<td>2</td>
<td>6</td>
<td>0.45 (SE=0.10)</td>
<td>2.33</td>
</tr>
<tr>
<td>Number stress events</td>
<td>1.70</td>
<td>1</td>
<td>1</td>
<td>8</td>
<td>0.92 (SE=0.09)</td>
<td>1.71</td>
</tr>
<tr>
<td>DASS Depression (maternal)</td>
<td>1.91</td>
<td>1</td>
<td>2</td>
<td>21</td>
<td>2.93 (SE=0.09)</td>
<td>1.86</td>
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<tr>
<td>DASS Anxiety (maternal)</td>
<td>1.10</td>
<td>0</td>
<td>1</td>
<td>17</td>
<td>3.31 (SE=0.09)</td>
<td>1.14</td>
</tr>
<tr>
<td>DASS Stress (maternal)</td>
<td>3.09</td>
<td>2</td>
<td>3</td>
<td>19</td>
<td>1.75 (SE=0.09)</td>
<td>3.02</td>
</tr>
</tbody>
</table>

Note.
IQR = Interquartile range. SE = Standard error of skewness.
Missing data are not shown.
Caucasians only.

5.5.2 Associations between family functioning, maternal mental health, and adolescent BID

Family functioning was associated with BID, but only in girls. Poor family functioning, as defined by a higher MFAD General Functioning scale score, was related to a greater likelihood of girls reporting BID in models adjusted and not adjusted for BMI (OR = 1.08; 95% CI = 1.02, 1.15; p = 0.009 results from adjusted model, Table 5.; OR = 1.07; 95% CI = 1.01, 1.13; p = 0.01 results from unadjusted model, Table 5.). Specifically, girls coming from families with less functional family
relationships had greater chance to present with BID as compared to girls coming from families with more functional relationships. Similarly, as the number of stressful events experienced by mothers during the last year increased, the likelihood of their daughters reporting BID also increased (OR = 1.24; 95% CI = 1.04, 1.50; p = 0.01). However, this relationship was not significant when the model was adjusted for BMI.

Maternal anxiety was significantly associated with boys’ BID (OR = 1.24; 95% CI = 1.02, 1.51; p = 0.03) in the model controlling for BMI (Table 5.). Specifically, boys were more likely to experience BID if their mothers reported more symptoms of anxiety as compared to boys whose mothers reported less symptoms of anxiety. Maternal depressive symptoms and subjective stress, as per the DASS-21 scores, were not significantly associated with BID in either gender. None of the subscales of the DASS (i.e., depression, anxiety, and stress) had a significant relationship with BID in girls when controlling for BMI. The parent relationship degree of happiness reported by mothers was not significantly associated with BID in either gender and across models.

5.5.3 Associations between teasing about weight or shape and adolescent BID

Having been teased about weight or shape was significantly associated with increased chances of presenting with BID in boys and girls, and in both models (controlling and not controlling for BMI). Specifically, the odds of an adolescent who had been teased about weight or shape being dissatisfied with his/her body image were 5.17 times higher in boys and 4.81 times higher in girls compared to adolescents who reported never being teased about their weight or shape. Results
remained highly significant when controlling for adolescent BMI but odd ratios decreased in size by approximately half. Further detail of regression results for both models, BMI unadjusted and adjusted, by gender are presented in Table 5.2 and Table 5.3.
Table 5.2 Binary logistic regression examining psychosocial factors on adolescent boys’ and girls’ BID at age 14 unadjusted for BMI

<table>
<thead>
<tr>
<th>Predictors</th>
<th>OR</th>
<th>95% C.I. for OR</th>
<th>p-value</th>
<th>OR</th>
<th>95% C.I. for OR</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lower</td>
<td>Upper</td>
<td></td>
<td>Lower</td>
<td>Upper</td>
</tr>
<tr>
<td>Family functioning (McMaster)</td>
<td>0.99</td>
<td>0.94</td>
<td>1.06</td>
<td>0.92</td>
<td>1.07**</td>
<td>1.01</td>
</tr>
<tr>
<td>Happiness in parental couple</td>
<td>1.19</td>
<td>0.91</td>
<td>1.56</td>
<td>0.21</td>
<td>0.88</td>
<td>0.69</td>
</tr>
<tr>
<td>Number of stressful events</td>
<td>1.13</td>
<td>0.92</td>
<td>1.39</td>
<td>0.26</td>
<td>1.24**</td>
<td>1.04</td>
</tr>
<tr>
<td>DASS – Depression</td>
<td>0.84</td>
<td>0.68</td>
<td>1.04</td>
<td>0.11</td>
<td>1.09</td>
<td>0.93</td>
</tr>
<tr>
<td>DASS – Anxiety</td>
<td>1.19</td>
<td>0.98</td>
<td>1.45</td>
<td>0.08</td>
<td>0.84*</td>
<td>0.70</td>
</tr>
<tr>
<td>DASS – Stress</td>
<td>0.91</td>
<td>0.76</td>
<td>1.08</td>
<td>0.26</td>
<td>0.98</td>
<td>0.85</td>
</tr>
<tr>
<td>Ever teased about weight or shape</td>
<td>5.17***</td>
<td>2.90</td>
<td>9.20</td>
<td>&lt;0.001</td>
<td>4.81***</td>
<td>2.92</td>
</tr>
</tbody>
</table>

Note.
Body image binary categories utilised in this model include values of 0, 0.5 and 1 for “satisfied” and >1 for “dissatisfied”.
All predictors are continuous, except for Teasing (dichotomous yes/no, reference category: no).
Results are per unit change in the score.
*p ≤ 0.05; **p ≤ 0.01; ***p ≤ 0.001
Table 5.3 Binary logistic regression examining psychosocial factors on adolescent boys’ and girls’ BID at age 14 adjusted for BMI

<table>
<thead>
<tr>
<th>Predictors</th>
<th>OR</th>
<th>95% C.I. for OR</th>
<th>p-value</th>
<th>OR</th>
<th>95% C.I. for OR</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lower</td>
<td>Upper</td>
<td></td>
<td>Lower</td>
<td>Upper</td>
</tr>
<tr>
<td>Family functioning (McMaster)</td>
<td>1.01</td>
<td>0.94</td>
<td>1.08</td>
<td>0.83</td>
<td>1.09**</td>
<td>1.02</td>
</tr>
<tr>
<td>Happiness in parental couple</td>
<td>1.17</td>
<td>0.88</td>
<td>1.55</td>
<td>0.29</td>
<td>0.87</td>
<td>0.69</td>
</tr>
<tr>
<td>Number of stressful events</td>
<td>1.11</td>
<td>0.89</td>
<td>1.38</td>
<td>0.38</td>
<td>1.19</td>
<td>0.99</td>
</tr>
<tr>
<td>DASS – Depression</td>
<td>0.82</td>
<td>0.65</td>
<td>1.02</td>
<td>0.07</td>
<td>1.08</td>
<td>0.92</td>
</tr>
<tr>
<td>DASS – Anxiety</td>
<td>1.24*</td>
<td>1.02</td>
<td>1.51</td>
<td>0.03</td>
<td>0.89</td>
<td>0.75</td>
</tr>
<tr>
<td>DASS – Stress</td>
<td>0.89</td>
<td>0.74</td>
<td>1.07</td>
<td>0.23</td>
<td>0.94</td>
<td>0.81</td>
</tr>
<tr>
<td>Ever teased about weight or shape (yes/no)</td>
<td>2.14*</td>
<td>1.07</td>
<td>4.27</td>
<td>0.03</td>
<td>2.87***</td>
<td>1.65</td>
</tr>
<tr>
<td>Adolescent’s BMI</td>
<td>1.22***</td>
<td>1.13</td>
<td>1.30</td>
<td>&lt;0.001</td>
<td>1.26***</td>
<td>1.18</td>
</tr>
</tbody>
</table>

*Note.*

Body image binary categories utilised in this model include values of 0, 0.5 and 1 for “satisfied” and >1 for “dissatisfied”.

All predictors are continuous, except for Teasing (dichotomous yes/no, reference category: no).

Results are per unit change in the score.

*p ≤ 0.05; **p ≤ 0.01; ***p ≤ 0.001
5.6 DISCUSSION

The present study assessed the relative importance of psychosocial factors on BID in adolescent boys and girls. We expanded on previous research looking at the psychosocial environment by considering the overall functioning of the family, maternal mental health (including symptoms of depression, anxiety, and stress), and the occurrence of teasing about weight or shape reported by the adolescent. Our study also investigated whether these relationships depended on adolescent BMI, which has not always been included in previous research on this topic.

5.6.1 Family functioning

Our results indicate that poor family functioning is associated with higher probabilities of experiencing BID in girls but not in boys. Additionally, in our study, the relationship between family functioning and BID does not seem to vary according to the girls’ BMI, meaning that this relationship remains true independently of how big or small adolescent girls are in their body composition/weight. Benninghoven, Tetsch, Kunzendorf, and Jantschek (2007) have also reported that maternal perception of family functioning is associated with higher body dissatisfaction of their daughters. We found no association between family functioning and BID in boys. This was unexpected, as previous research has shown family to be influential on BID in both genders (Rodgers & Chabrol, 2009). One possible explanation for our results is that boys are in fact less vulnerable to the effects of overall familial relationships on body image possibly because they see these two elements as independent from each other whereas girls may tend to interconnect these issues. Alternatively, it may be that more specific family influences, such as comments around weight, shape, and looks within the family, are
more relevant to BID for boys than general family functioning, as it has been shown among girls (Neumark-Sztainer et al., 2010). As suggested by Kluck (2008), less functional families may be more likely to display negative family food-related experiences, resulting in a greater likelihood of children presenting with BID and related eating problems. However, specific food- and appearance-related communication was not covered in the present study.

Interestingly, our findings indicate that the degree of happiness in the parental couple is not associated with adolescent BID in either gender. We included this variable as a proxy measure of family functioning, in addition to the General Functioning scale of the MFAD, under the idea that parents who are more satisfied about their couple relationship would be more likely to have positive, healthier, general family dynamics than those who were unhappy in their couple relationship, and that levels of happiness in the parental couple would ultimately be associated with their adolescent’s body satisfaction/dissatisfaction. However, it may be that the degree of happiness in the parental couple relationship is too remote with respect to the adolescent BID status.

5.6.2 Maternal mental health

In terms of maternal mental health, higher levels of anxiety reported by mothers were associated with increased chances of boys presenting with BID. This was the case independent of the influence of boys’ BMI. A possible explanation for this result is that mothers who are more anxious model worry leading their children to also worry about multiple situations, including body image. An alternative explanation may be that anxious mothers are more critical of their children’s
appearance, weight, and/or shape, leading to increased body image concerns in their adolescent children. Although this situation may be applicable for both genders, our study saw significant results in this respect only among boys. No other maternal mental health indicator was found significant for boys.

For girls, our findings indicate that a higher number of stressful events experienced by mothers during the past year relates to increased chances of presenting with BID, when the effect of BMI is not considered. Taking into account our results on family functioning among girls, it may be that families who are experiencing more stressful life events tend to have less healthy family dynamics, which negatively affects their daughters’ body image. As proposed by Webster-Stratton (1990), life stressors can lead to more irritable, critical, and punitive parents, and resulting parenting dynamics may increase the likelihood that children develop problems. However, we cannot conclude any causal relationship from our study given its cross-sectional, observational design. The fact that in the adjusted models, levels of maternal self-reported depression, anxiety, and stress were not found to be significantly related to girls’ BID may suggest that it is stressful events, rather than maternal mental health, that is more important for girls’ BID. Alternatively, this may be reflecting measuring problems related to self-report known to be particularly problematic in mental health (Shedler, Mayman, & Manis, 1993). In this sense, the result linking number of stressful life events with girls’ BID may be not only connected to poor family dynamics, as discussed above, but may account for overall mental health as previous research has shown stress to be associated with greater risk for mental health problems, depression in particular (Kessler, 1997; Tennant, 2002; Fried et al., 2015). This result may have also been influenced by the potential
confounding effect of socioeconomic status, which was not taken into account in the present study. It is important to note that previous research looking at eating pathology has found that maternal depressive and anxiety symptoms do not predict child eating disorder symptoms; however family stress has been identified as a longitudinal predictor of emotional eating (Allen, Gibson, McLean, Davis, and Byrne, 2014) which is somewhat in line with our findings for the girls.

5.6.3 Teasing about weight or shape

Our results concerning teasing were comparable for boys and girls. We showed that teasing about weight or shape significantly and markedly increased the chances of boys and girls to experience BID, and that this relationship was independent of BMI. These results are in line with previous research that has consistently found a strong link between teasing and BID (Ata, Ludden, & Lally, 2007; Barker & Galambos, 2003; Jones, 2004; Menzel et al., 2010; Paxton, Eisenberg, & Neumark-Sztainer, 2006; Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999; Webb & Zimmer-Gembeck, 2013), although previous models have not always included BMI (Keery, van den Berg, & Thompson, 2004). Our findings of relative equal occurrence of teasing about weight or shape in both genders and the comparable importance of the association between teasing and BID among girls and boys, contrast with results from Neumark-Sztainer et al. (2002) and Menzel et al. (2010) in which it was found that girls experience teasing related to weight more frequently than boys and that the association between teasing and BID is stronger among girls.

In terms of the mechanism through which teasing may affect BID, previous research has suggested that this effect is entirely mediated by internalisation of the
thin ideal figure and appearance comparison (Rodgers, Paxton, & McLean, 2014); and have found adolescents who are teased about their weight to be at higher risk for social comparison, internalisation of the thinness figure, disordered eating, depression, and low self-esteem (Keery et al., 2004). Teasing about weight or shape may direct adolescents’ attention to appearance, based on societal standards of beauty, by bringing the focus to the looks rather than to other individual characteristics. Interestingly, a longitudinal study by Rayner, Schniering, Rapee, & Hutchinson, (2013) found that BID precedes perceived pressure from peers about meeting the societal standards of beauty. The authors of this study hypothesise that girls with greater BID may have: 1) an attentional bias for weight and shape messages in their social environment making them more likely to perceive peer pressure on body weight and shape, or to misinterpret events in the peer environment as being reflective of pressure to look a certain way; 2) some personal contribution to the peer environment in which body image is important putting them in situations where friends reinforce the thin ideal. Although our study did not aim to investigate the mechanisms through which teasing about weight or shape relates to adolescent BID, our findings not only show the equal importance of peer teasing for boys’ and girls’ body image but that this relationship does not depend on BMI, despite previous research showing that overweight and obese adolescents report more teasing than healthy weight adolescents (van der Berg, Neumark-Sztainer, Eisenberg, & Haines, 2008).

Finally, our descriptive data indicate that teasing about weight or shape is performed by peers more frequently than by parents or other subjects, which is in line with findings by Rieves and Cash (1996). The negative effect that teasing exerts...
on body image is of concern and has implications for prevention and intervention initiatives in the school environment. It is pertinent to consider that it may not be teasing alone that negatively affects body image but its frequency, longevity and the emotional impact it has on the adolescent (Cash, 1995).

This study has a number of strengths. It included a large sample of adolescent boys and girls, which allows for the translation of findings into health and wellbeing policies with separate applications to each gender given the gender differences seen in this study. We looked at a set of psychosocial variables, including maternal mental health, which has not received a great deal of attention in the study of adolescent BID. Furthermore, our models were adjusted for BMI, known to play an important role in body image concerns (Paxton, Eisenberg, et al., 2006) and allowing for comparisons.

We are also aware of this study’s limitations. Firstly, being cross-sectional it does not allow for causal explanations. Secondly, in relation to our methods, a more specific measure of family communication around physical appearance may be more appropriate to capture parents’ influence on BID. Thirdly, only maternal variables and family variables reported by the mothers were used as predictors in the models. This could be seen to place the focus of attention and the inference of blame on the mothers. The choice of predictors was limited to the variables included in the Raine Study but it is acknowledged that this places an arguably undue emphasis on the role of the mothers. And finally, although our teasing variable provided significant results in our study, measuring teasing about weight or shape with a single item can underestimate the strength of the relationship between teasing and BID due to the
limited variance found in a single item (Menzel et al., 2010), therefore the use of a wider measure of teasing is recommended for future research.

From a research and clinical perspective, the findings of the present study could inform prevention and early intervention programs in the body image and eating disorders fields. The significant, detrimental role of teasing raises the importance of addressing this key factor in schools in order to prevent it from happening. However, it also appears crucial to help children and adolescents to be more resilient to teasing as negative commentary are unlikely to disappear completely from their environment. Psychotherapy directed to adolescents struggling with BID should aim at building coping mechanisms based on self-confidence, resilience, and assertiveness. Continuing research in terms of factors associated to BID for boys and girls is crucial in extending our understanding of such a complex issue (Smolak, 2004).

In summary, BID is a multifactorial psychological difficulty associated with a series of biopsychosocial factors and determinants. The findings of this study, in particular those related to teasing and BID, underline the influence of the psychosocial environment on adolescent BID, and how the psychosocial environment may contribute to the biopsychosocial model of body image by highlighting the influence of the psychosocial environment. Given that correlational data do not indicate causality, we cannot conclude from our research that a negative/unhealthy psychosocial environment causes BID, and nevertheless it is likely that these relationships are more complex than simple linear relationships as some theoretical models suggest (Rayner et al., 2013). Irrespective, bringing the
focus to the role families and peers play in adolescents’ body image concerns can contribute to the identification of key factors in order to help families to be more conscious about the power they hold in the development of their children. The focus on the family environment should serve as a source of insight to learn more about how parents can help their affected children and instrument them to do so without blaming them or placing guilt (Berge et al., 2014).
Chapter 6  Integrative study of cross-sectional and longitudinal influences on body image dissatisfaction

6.1  FOREWORD

The study presented in Chapter 6 consists of an integrative analysis using data from the studies presented in Chapters 2 to 5. These studies, framed within a broad psychosocial model, investigated relationships between psychological, social, and biological variables and adolescent body image dissatisfaction (BID). The specific aim of this final study was to examine the relative contribution of variables found significant in relation to adolescent BID using binary logistic regression and looking at each gender separately.

6.2  ABSTRACT

Body image is a multidimensional concept including psychological, social, and biological determinants. Body image dissatisfaction (BID) is frequent among adolescents of both genders and it has been associated with a range of health outcomes including negative affect, disordered eating, and risky weight-control behaviours. The aim of this study was to investigate the relative importance of longitudinal and cross-sectional biological, psychological, and social factors to BID in a sample of Western Australian adolescents. This study used data from the Western Australian Pregnancy Cohort (Raine) Study involving a total of 1382 adolescents (744 boys, 638 girls). Perceptual BID was measured at 14 years using the Body Figure Perception Scale discrepancy scores. The predictors included in this
study were: early life family socioeconomic status, pre-pregnancy maternal BMI, family functioning, maternal anxiety, stressful events, behavioural conduct self-concept, athletic competence self-concept, global self-worth, peer teasing about weight or shape, and adolescent BMI. Binary logistic regression models were performed with dichotomous body image (satisfied/dissatisfied) as the outcome variable. It was found that higher pre-pregnancy maternal BMI, poorer self-perceptions of behavioural conduct and athletic competence, and teasing about weight or shape were significantly associated with increased likelihood of BID in boys. For girls, poor self-perceptions of athletic competence and global self-worth, plus teasing about weight or shape were related to increased chances of experiencing BID. After adjusting for BMI, only self-perceptions of behavioural conduct and athletic competence remained significant for boys, while athletic competence and global self-worth self-perceptions remained significant for girls. This study highlights the importance of judgements adolescents make of certain aspects of the self in terms of the impact those judgements have on their experience of BID above and beyond the influence of other predictors. The focus of this study was on the relative contribution of a series of biological, psychological, and social variables. Out of the variables previously found by this thesis to be associated to adolescents’ BID, specific domains of the self-concept (i.e., strong self-perceptions of athletic competence, for both genders; positive behavioural conduct self-perceptions, for boys; and positive self-worth, for girls only), a history of peer teasing about weight and shape (dependent on BMI influence), and higher BMI show to be the strongest contributors to boys’ and girls’ experience of BID.
Keywords: body image dissatisfaction, BID, biopsychosocial model, BMI, adolescence, Raine Study

6.3 INTRODUCTION

Biological, psychological, and sociocultural factors are thought to be relevant in understanding the development and presentation of BID (Presnell, Bearman, & Stice, 2004; Ricciardelli, McCabe, Holt, & Finemore, 2003; Rodgers, Paxton, & McLean, 2014). So far, this thesis has included the study of variables representing each of the three components of the Biopsychosocial model. The main findings of the studies conforming Chapter 2 to 5 are summarised below as they set the basis for this final, integrative study encircling a biopsychosocial approach to the study of BID.

A range of intrapersonal variables have been found to be related to BID with low self-esteem, depression, and feelings of ineffectiveness linked to greater BID among adolescents (Furnham, Badmin, & Sneade, 2002; Grossbard, Lee, Neighbors, & Larimer, 2009; Kostanski & Gullone, 1998; Paxton, Eisenberg, & Neumark-Sztainer, 2006a; Stice, Hayward, Cameron, Killen, & Taylor, 2000; Tiggemann, 2005). In this thesis, individual/psychological characteristics of the adolescents were investigated in a cross-sectional study looking at the relationship between multidimensional self-concept, weight status, and BID (Chapter 2). Multidimensional self-concept was measured using the Harter’s Self-Perception Profile for Adolescents (Harter, 1982). Negative self-perceptions of athletic competence were related to increased likelihood of presenting with BID among overweight and obese boys. A
negative opinion of self-worth was related to a greater chance of experiencing BID among all girls, independently of their weight status, and lower weight boys. This study highlighted the link between specific psychological factors (self-concept) and adolescent BID.

One of the social variables described in the literature in relation to adolescent BID is the socioeconomic status (SES) of the family (O’Dea & Caputi, 2001; Paxton et al., 2006a; van den Berg et al., 2010). The impact of SES was investigated through a longitudinal study looking at the relationship between family SES during early life and BID in adolescence (Chapter 3). The study presented in Chapter 3 showed that early life SES does not significantly impact later BID. However, this study considered BMI by stratifying the sample in weight groups. In doing so, underweight boys of lower SES showed to be less likely to desire a bigger body than underweight boys from higher SES families. The study presented in Chapter 3 also provided evidence that BMI is strongly related to BID, independently of early life family SES with higher BMI related to increased likelihood of reporting adolescent BID.

Considerable attention has been paid to the relationships between aspects of the psychosocial environment and adolescent BID (Jones, 2011; Keery et al., 2006; Rodgers & Chabrol, 2009; Gleason et al., 2000; Menzel et al., 2010). The study reported in Chapter 5 focused on a number of family- and peer-related variables: family functioning; the parental relationship; stressful events experienced by mothers, the mental health of mothers, and teasing about weight or shape. This study indicated that maternal anxiety is related to increased chances of presenting with BID, for boys. For girls, family dysfunction and a higher number of stressful life
events experienced by their mothers were related to increased chance of experiencing BID. Boys and girls who had experiencing teasing about weight or shape had increased likelihood of reporting BID and this was independent of BMI. Findings from this study are in line with those of Benninghoven et al. (2007) for family functioning and maternal stress. This study also brings attention to maternal anxiety and its role on BID among boys; and reinforces the important influence that teasing about weight or shape has on adolescent BID (Ata et al., 2007; Barker & Galambos, 2003; Jones, 2004; Menzel et al., 2010).

The impact of biological variables on BID has received less attention than psychosocial and psychological variables. BMI has been proposed as a major biological predictor of BID in studies testing the Biopsychosocial model (Rodgers et al., 2014). The study reported in Chapter 4 sought to investigate the impact of early life diet and its potential relationship with BID through BMI. The biological factors proposed in the biopsychosocial model framing this thesis are breastfeeding, early life diet, and BMI. These factors were investigated by looking at the long-term associations between quantity and quality of early life diet, BMI and adolescent BID. The inclusion of pre-pregnancy maternal and paternal BMI and adolescent BMI as potential co-variables was a key element of this study. Although this study did not find a significant association between early life diet and later BID, a strong relationship was found between pre-pregnancy maternal BMI and BID for both boys and girls. Mothers of higher BMI before pregnancy had children more likely to experience BID in adolescence, which may be explained both biologically and psychologically (Whitaker et al., 2010; Field et al., 2001).
As stated earlier, the research reported in this thesis has been guided by the Biopsychosocial model of body image. Thus, psychological, social, and biological aspects thought to be related to BID have been selected for study. These components have been studied separately but to investigate their relative contribution to BID, integrative models are needed.

### 6.4 METHODS

#### 6.4.1 Study population

The Western Australian Pregnancy Cohort (Raine) Study is a longitudinal cohort study following 2,900 pregnant women recruited with gestational age between 16 and 20 weeks from either King Edward Memorial Hospital (KEMH) or nearby private practices, between May 1989 and November 1991. The full summary of recruitment methods can be read in Newnham, Evans, Michael, Stanley, & Landau, (1993). For enrolment, women had to meet the following criteria: proficiency in English, expectation of delivery at KEMH, and an intention to remain in Western Australia after the birth of the child. A range of clinical and questionnaire data was collected at pregnancy (18 and 34 weeks gestation). The women of our cohort delivered at the hospital, and babies were examined at 2 days of age. Follow-ups at 1, 2 and 3 years involved a structured interview and clinical examination of all children in the cohort. Further follow-ups took place at ages 5, 8, 10, 14, 17, 20 and 22 years for all available children from the original 2,868 live births. We concentrated on the perinatal, 1, 2 and 3 year follow-ups for the predictor variables and the 14-year follow-up for the outcome variable as middle adolescence is known to be a susceptible developmental period for BID. Only Caucasian adolescents were included in this study since this is the dominant ethnic group (88.2%) within the
Raine Study population and it was thought that cross-cultural factors could impact BID within the different ethnic groups in the sample (Anderson-Fye, 2009) also given that minority groups had small sample sizes and therefore statistical power was not going to be strong enough for the type of analyses executed. As a consequence 331 participants were excluded. From the remaining participants, only those with available data on variables of interest were included in the analyses, leaving a sample of 1382 (approximately 50% of original cohort, 744 boys and 638 girls). All data collection for the Raine Study occurred in accordance with the Australian National Health and Medical Research Council Guidelines for Ethical Conduct in Human Research. Informed consent was obtained in writing from the adolescent and their primary caregiver.

### 6.4.2 Variables and measures

**Predictors**

*Global self-worth*

Adolescent’s reports on their judgments around their global self-worth were collected through the Harter’s Self-Perception Profile for Adolescents (Harter, 1982). The Global Self-worth subscale of the Harter’s questionnaire is one of the 9 subscales included in this instrument. It contains five items exploring the adolescents’ judgements on the level of acceptance, happiness, and esteem in relation to themselves. Example items are: “Some teenagers are often disappointed with themselves BUT other teenagers are pretty pleased with themselves”, and “Some teenagers like the kind of person they are BUT other teenagers often wish they were someone else”. The adolescent must judge which of the two polar statements best describes him or her and then indicates whether that description is really true or sort
of true for him/herself. The responses are converted to a 4-point scale with mean item scores within each domain reported as subscale scores. Higher scores indicate greater perceived competence. Cut points for this scale have been suggested with scores 3 and 4 thought to indicate strong or positive evaluations of the adolescent’s self on a specific domain, and scores below 3 indicative of poor or negative self-evaluations (Kaufman, Cook, Arny, Jones, & Pittinsky, 1994; Harter, 1982). The scale has shown internal consistency with an average Cronbach’s alpha of 0.86 and no less than 0.74 on each subscale or domain (Harter, 2012). Further, its construct and discriminant validity have been supported (Wichstrøm, 1995).

**Athletic competence self-perceptions**

To measure the adolescents’ descriptions on their athletic competence, the Athletic Competence subscale of the Harter’s Self-Perception Profile for Adolescents (Harter, 1982) was used. Adolescents reflected their judgments on their athletic competence by answering five items designed to explore how true for them a set of statements are in relation to how good teenagers are at sports, athletic activities, and outdoor games. Example items are: “Some teenagers feel that they are better than others their age at sports BUT other teenagers don’t feel they can play as well”, and “Some teenagers do not feel that they are very athletic BUT other teenagers feel that they are very athletic”. To determine whether the adolescent has a poor or strong self-perception in terms of athletic competence, scoring is performed following the same directions as explained in the previous variable description.
Behavioural conduct self-perceptions

Also part of the Harter’s Self-Perception Profile for Adolescents (Harter, 1982), the behavioural conduct subscale assessed the adolescents’ judgments on their behavioural conduct though five items designed to explore the degree to which they like the way they behave, whether they do the “right thing”, act the way one is supposed to act, and avoid getting into trouble. Example items are: “Some teenagers usually do the right thing BUT other teenagers often don’t do what they know is right”, and “Some teenagers do things they know they shouldn’t do BUT other teenagers hardly ever do things they know they shouldn’t do”. The scoring of this subscale follows the same directions as in the global self-worth and athletic competence subscales described above.

Early life socioeconomic status

Three SES groups were defined based on family income and maternal education data collected at pregnancy. The lower SES group was composed of women who came from low income families (as per the Australian ‘poverty line’ cut-off for that year, i.e., $24,000 per annum) and who had completed less than 12 years of high school education. The higher SES group were women from families with an income above the cut-off point (i.e., equal or more than $24,000 per annum) and who had completed 12 years of high school education. The middle SES group contained participants who met criteria for one high and one low SES category.
Pre-pregnancy maternal BMI

Maternal height was measured at the initial antenatal assessment before recruitment and enrolment into the Raine Study using standardized procedures for height measurement to the nearest 0.1 cm. Pre-pregnancy weight of mothers was self-reported at baseline (between 16 and 20 weeks gestation). Pre-pregnancy BMI was calculated using the BMI standard formulae BMI = weight (kg) / height (m²).

Family functioning

To assess the overall functioning of the adolescents’ family the primary caregiver completed the General Functioning scale of The McMaster Family Assessment Device (MFAD) (Epstein, Baldwin, & Bishop, 1982) at the 14 year follow-up. The General Functioning scale provides an overall measure of the health/pathology of the family. Six of the 12 items included in this scale are intended to describe healthy functioning of the family, while the other six items (reverse-scored) describe unhealthy family functioning. Some example items are: “In times of crisis we can turn to each other for support”, “There are lots of bad feelings in our family”, “Individuals in the family are accepted for what they are”. Each of the 12 items is rated on a 4-point Likert-type scale ranging from 0 (strongly disagree) to 3 (strongly agree). Answers to items were tallied to produce a total score where higher scores reflected unhealthier family functioning. The General Functioning scale is a brief version of the full version of the MFAD (Byles, Byrne, Boyle, & Offord, 1988); this scale has shown high validity (r = 0.92) and test-retest reliability (r = 0.71) (Epstein, Baldwin, & Bishop, 1983; Byles et al., 1988; Boterhoven de Haan, Hafekost, Lawrence, Sawyer, & Zubrick, 2014).
**Maternal anxiety**

Symptoms of maternal anxiety were collected through mothers’ self-report on the Depression-Anxiety-Stress Scale 21 (DASS-21) (Lovibond & Lovibond, 1995) at the 14 year follow-up. The anxiety subscale is one of three subscales comprising seven items. Each item is rated on a 4-point Likert-type scale ranging from 0 (did not apply to me at all) to 3 (applied to me very much, or most of the time) so that higher scores reflect poorer mental health. The anxiety subscale contains questions relating to worries, panic, and physical symptoms of anxiety. Some of the items assessing anxiety are: “I felt I was close to panic”, “I felt scared without any good reason”. The DASS has shown adequate construct validity and good reliability in the general adult population (Crawford & Henry, 2003). Studies have reported good estimates of internal consistency for the DASS-21 (range = 0.82 to 0.97) in clinical and non-clinical samples (Henry & Crawford, 2005; Lovibond & Lovibond, 1995).

**Number of maternal stressful events**

As part of the Raine Study 14 year assessment, mothers were asked whether they had experienced any of 11 major life stressful events (yes/no) during the previous 12 months. These major life stressful events are part of the life stress inventory developed by Tennant and Andrews (1976). The stressful events listed were: pregnancy problems, death of a relative, death of a close friend, separation or divorce, marital problems, problems with children, involuntary job loss, involuntary partner’s job loss, money problems, residential move, and other stressful event. We computed a total stressful life events score by summing the number of “yes” responses to the listed events, with equal weight (1 point) given to each item.
**Teasing about weight or shape**

To find out whether adolescents were ever teased in relation to their weight or shape the following question was asked: “Have you ever been teased about your weight or shape?” (yes/no).

**Adolescent’s BMI**

Weight to the nearest 0.1 kg and height to the nearest 0.1 cm was measured by a Raine Study research assistant. Scores of height and weight were computed and BMI was calculated through the standard formulae, which consists of the ratio between weight divided by height squared (BMI = weight (kg) / height (m$^2$)). This study used continuous BMI data measured at 14 years follow-up to account for adiposity (Pietrobelli et al., 1998).

**Outcome variable**

**Body image dissatisfaction**

Adolescents’ BID was measured at age 14 using the Body Figure Perception Scale (BFPS), a pictorial scale that identifies the perceptions adolescents have of their own bodies through seven body figure drawings for each gender. The BFPS used in the Raine Study is an adaptation of the scale developed by Collins, (1991). Each body figure on the BFPS has a numerical value ranging from one, in the thinner end, to seven in the larger or bigger end. The scale includes half-points which do not correspond to a specific body figure picture but to the body figure that would be represented between two given pictorial figures. Two rows are presented for each gender, the top one being child-like figures and the bottom one being adult-like.
figures, characterised by the presence of a more muscular body figure in the centre of the scale. Adolescents were asked to pick the picture that best represented their current body shape, and the picture that represented their desired or ideal body figure using the following questions: “Which figure best represents what you currently look like?” and “Which body figure would you most like to look like?”. Participants wrote the number matching their answers in a given box. BID scores were obtained by the operation resulting from desired body figure score minus current body figure score. Thus, negative values reflected BID due to a desire to be thinner whilst positive values reflected BID due to a desire to be bigger. Scores of 0 represented a lack of BID or relative satisfaction in relation to body image and therefore comprised the “satisfied” category. We included in this category positive and negative values of 0.5 and 1 to have a clearer distinction between body image satisfaction and dissatisfaction with the intention to investigate genuine BID. This decision was made on the basis of consideration that scores of -1, -0.5, 0, 0.5 and 1 may reflect mild body discomfort and as a consequence a clouding effect could occur if these were included in the “dissatisfied” category. Similar methodological procedures to assess the extent of BID have been used in previous research (Durkin & Paxton, 2002; Furnham et al., 2002). Test-retest reliability and concurrent validity of the BFPS have been satisfactory (r = 0.78, p < 0.005; and r = 0.71, p < 0.005, respectively) and criterion-related evidence of validity has been demonstrated through the examination of verbal and pictorial comparisons (Collins, 1991).

6.4.3 Statistical analysis

Analyses for this study consisted of binary logistic regressions by gender with dichotomous body image (satisfied vs. dissatisfied) at 14 years as the dependent
variable and variables found to be significant in previous models as independent variables. The variables included in the integrative models differed by gender; and were, for boys: early life family SES categories; pre-pregnancy maternal BMI; maternal anxiety scores at 14 years; global self-worth self-concept domain at 14 years; athletic competence self-concept domain at 14 years; behavioural conduct self-concept domain at 14 years; teasing about weight or shape during lifetime; and their BMI at age 14. And for girls: pre-pregnancy maternal BMI; family functioning at 14 years; number of stressful events reported by mothers at 14 years; athletic competence self-concept domain at 14 years; global self-worth self-concept domain at 14 years; teasing about weight or shape during lifetime; and BMI ate age 14. These models were executed with and without the inclusion of adolescent BMI as done in the other studies reported in this thesis to further explore the role of BMI in relation to the variables of interest. Statistical significance was defined at the customary p ≤ 0.05 level. Statistical analyses were performed using IBM SPSS Statistics version 22.

6.5 RESULTS

6.5.1 Boys

Perception of behavioural conduct at 14 years, pre-pregnancy maternal BMI, and a history of being teased about weight or shape were significantly associated with BID in the integrative model unadjusted for BMI. Once BMI was included in the model, positive perceptions of behavioural conduct remained negatively associated with BID, and positive perceptions of athletic competence resulted significant as well in this model. Maternal BMI and peer teasing about weight and shape may have a relationship with BID but these effects appear to be attenuated by
the effect of BMI. Table 6.1 shows further details on the results of the integrative models for boys.

### 6.5.2 Girls

Perceptions of athletic competence and global self-worth at 14 years and a history of being teased about weight or shape by peers were significantly associated with the girls’ BID in the integrative models not including BMI. In the adjusted model (where BMI was entered), only positive perceptions of athletic competence and global self-worth remained significant with both exerting a protective effect on BID. The effect of BMI on BID appears to dilute the relationships between peer teasing about weight or shape and BID. Table 6.2 presents further details on the results of the integrative models for girls.
Table 6.1 Binary logistic regression examining relative contribution of all significant variables from previous chapters (Biopsychosocial model) on adolescent boys’ BID at age 14 adjusted and unadjusted for BMI

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Unadjusted</th>
<th></th>
<th></th>
<th></th>
<th>Adjusted</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>OR</td>
<td>95% C.I.</td>
<td>p-value</td>
<td>OR</td>
<td>95% C.I.</td>
<td>p-value</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Lower</td>
<td>Upper</td>
<td></td>
<td>Lower</td>
<td>Upper</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Early life socioeconomic status (lower SES)</td>
<td>1.42</td>
<td>0.78</td>
<td>3.02</td>
<td>0.30</td>
<td>1.34</td>
<td>0.74</td>
<td>3.01</td>
<td>0.41</td>
</tr>
<tr>
<td>Pre-pregnancy maternal BMI</td>
<td>1.06</td>
<td>0.99</td>
<td>1.11</td>
<td>0.02*</td>
<td>1.00</td>
<td>0.94</td>
<td>1.06</td>
<td>0.94</td>
</tr>
<tr>
<td>Maternal anxiety at 14</td>
<td>0.97</td>
<td>0.89</td>
<td>1.05</td>
<td>0.46</td>
<td>0.97</td>
<td>0.89</td>
<td>1.05</td>
<td>0.40</td>
</tr>
<tr>
<td>Global self-worth self-concept domain at 14</td>
<td>0.67</td>
<td>0.80</td>
<td>1.02</td>
<td>0.22</td>
<td>0.65</td>
<td>0.80</td>
<td>1.03</td>
<td>0.21</td>
</tr>
<tr>
<td>Athletic competence self-concept domain at 14</td>
<td>1.95</td>
<td>0.86</td>
<td>2.49</td>
<td>0.13</td>
<td>1.79</td>
<td>0.80</td>
<td>1.92</td>
<td>0.04*</td>
</tr>
<tr>
<td>Behavioural conduct self-concept domain at 14</td>
<td>1.98</td>
<td>0.90</td>
<td>2.01</td>
<td>0.02*</td>
<td>1.84</td>
<td>0.80</td>
<td>2.00</td>
<td>0.04*</td>
</tr>
<tr>
<td>Ever teased about weight or shape at 14</td>
<td>2.61</td>
<td>1.50</td>
<td>4.55</td>
<td>0.001***</td>
<td>1.42</td>
<td>0.76</td>
<td>2.68</td>
<td>0.28</td>
</tr>
<tr>
<td>Adolescent’s BMI</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1.19</td>
<td>1.11</td>
<td>1.27</td>
<td>&lt;0.001***</td>
</tr>
</tbody>
</table>

Note. Body image binary categories utilised in this model include values of 0, 0.5 and 1 for “satisfied” and >1 for “dissatisfied”

All predictors are continuous, except for Teasing (dichotomous yes/no, reference category: no); Self-concept domains (dichotomous low/high, reference category: high); and Socioeconomic status (higher vs lower, reference category: higher SES)

*p ≤ 0.05
**p ≤ 0.01
***p ≤ 0.001
Table 6.2 Binary logistic regression examining relative contribution of all significant variables from previous chapters (Biopsychosocial model) on adolescent girls’ BID at age 14 adjusted and unadjusted for BMI

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Unadjusted</th>
<th></th>
<th>p-value</th>
<th>Adjusted</th>
<th></th>
<th>p-value</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>OR</td>
<td>95% C.I. for OR</td>
<td></td>
<td>OR</td>
<td>95% C.I. for OR</td>
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<tr>
<td></td>
<td>Lower</td>
<td>Upper</td>
<td></td>
<td>Lower</td>
<td>Upper</td>
<td></td>
</tr>
<tr>
<td>Pre-pregnancy maternal BMI</td>
<td>1.05</td>
<td>0.99</td>
<td>1.09</td>
<td>0.07</td>
<td>1.00</td>
<td>0.95</td>
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<tr>
<td>Family functioning at 14</td>
<td>1.01</td>
<td>0.96</td>
<td>1.04</td>
<td>0.94</td>
<td>1.00</td>
<td>0.96</td>
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<td></td>
</tr>
<tr>
<td>Number of maternal stressful events at 14</td>
<td>1.14</td>
<td>0.98</td>
<td>1.033</td>
<td>0.10</td>
<td>1.12</td>
<td>0.95</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Athletic competence self-concept domain at 14</td>
<td>2.14</td>
<td>1.09</td>
<td>3.60</td>
<td>0.003**</td>
<td>1.74</td>
<td>0.87</td>
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<tr>
<td>Global self-worth self-concept domain at 14</td>
<td>2.81</td>
<td>1.30</td>
<td>3.28</td>
<td>&lt;0.001***</td>
<td>2.85</td>
<td>1.31</td>
</tr>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ever teased about weight or shape at 14</td>
<td>2.49</td>
<td>1.56</td>
<td>3.99</td>
<td>&lt;0.001***</td>
<td>1.49</td>
<td>0.88</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Adolescent’s BMI</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1.21</td>
<td>1.14</td>
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</table>

Note.
Body image binary categories utilised in this model include values of 0, 0.5 and 1 for “satisfied” and >1 for “dissatisfied”
All predictors are continuous, except for Teasing (dichotomous yes/no, reference category: no) and Self-concept domains (dichotomous low/high, reference category: high)

*p ≤ 0.05
**p ≤ 0.01
***p ≤ 0.001
6.6 DISCUSSION

The results from the present study suggest that there are psychological (self-concept), psychosocial (teasing), and biological (BMI) factors influencing adolescents’ BID. These factors fit the biopsychosocial model of BID, which is in line with previous research findings (Ricciardelli, McCabe, Holt, & Finemore, 2003; Rodgers, Paxton, & McLean, 2014), and reflect the dynamic associations between these variables. For example, the impact of psychosocial factors such as peer teasing about weight and shape appears to be attenuated by own BMI in that if a girl is overweight and experiences teasing about the way her body looks this will negatively impact her satisfaction levels with her body, but it may not have such a negative impact if she was thinner. The same results in respect to peer teasing were found for boys in the BMI adjusted and BMI unadjusted models. The effect that judgements on specific components of the self have on BID remains above and beyond the influence of BMI. For boys, behavioural conduct self-perception has a protective effect on BID; meaning that boys who considered themselves to be well behaved are less likely to present with BID, independently of their weight status. In the girls the way they see themselves more broadly in terms of their general self-worth plays a crucial role in the presentation of BID as discussed in Chapter 2. Also in this integrative model, positive self-perception of athletic competence has an independent relationship to less chances of presenting with BID in both boys and girls, even when BMI is considered. In sum, these final models show that behavioural conduct self-concept, athletic competence self-perceptions, and BMI, for boys, and global self-worth, athletic competence self-perceptions, and BMI, for girls, have a unique contribution to body image variance; whereas the experience of being teased about weight and shape, for both genders, and pre-pregnancy maternal BMI for boys are
not significantly influential once BMI is considered, suggesting that these relationships get diluted by the significant effect that BMI has on adolescent BID. In other words, these variables do not account for a significant amount of unique variance in the presence of BMI and the other predictors. Furthermore, these models indicate that SES, family functioning, and maternal mental health have no significant influence on adolescent BID. Although these variables were associated with BID in certain sub-groups of adolescents (e.g., weight groups, BID direction groups) only global self-worth, athletic competence, and behavioural conduct (with gender differences) and BMI, in both genders, consistently predicted adolescent BID, which is in line with previous research (Muris et al., 2005; Paxton et al., 2006a; Rodgers et al., 2014). This study has the limitations of not examining the statistical models in terms of their fit, and that the effects of mediation and moderation were not examined. In the next chapter (Chapter 7) a comprehensive general discussion of these findings and their implications will be covered.
7.1 OVERVIEW

The final chapter of this thesis reviews the main findings of the previous chapters and integrates them in a general discussion. As each chapter has covered individual study results addressing specific research questions, objectives, and methods with a detailed coverage of analyses and discussion, this chapter draws together key findings and contextualises them in relation to the existing literature. The implications and limitations of this thesis are also presented in this final chapter as are future research directions proposed following the execution of this research.

7.2 OVERALL AIM OF THIS THESIS

Body image is a biopsychosocial construct. Concerns with body image are common among adolescents and can contribute to a range of mental and physical complications. Body image dissatisfaction (BID) is defined as the level of discomfort a person experiences as a result of comparing his or her actual body to an introspected ideal body. This thesis investigated psychological, social, and biological factors either known to be related to BID (in which case the study of such relationships included aspects of these variables that have not been previously studied), or hypothesised to have a relationship with BID. A population cohort sample of adolescents aged 14 years was used and studies included cross-sectional and longitudinal designs. Most existing studies looking at BID include one gender only, do not take BMI into account, or are limited to cross-sectional data only.
7.3 SUMMARY OF THE MAIN FINDINGS

7.3.1 The relationship between body image dissatisfaction, multidimensional self-concept, and weight status in adolescent boys and girls

Chapter 2 investigated the relationships between multidimensional self-concept, weight status, and BID in a cross-sectional design that included adolescent boys and girls. Of the self-concept domains in the Harter’s Self-Perception Profile for Adolescents (Harter, 1982), the global self-worth self-concept domain showed a strong, negative association with BID in all weight groups and both genders, except among the higher weight boys where this relationship was not strong enough and did not meet significance. Overweight and obese boys who had negative perceptions of their athletic competence had more chances of presenting with BID than those in similar weight categories but who had positive self-perception of their athleticism.

Independent of weight status, all girls who had negative judgments of their global self-worth presented with greater chances of experiencing BID. Girls’ BID was also associated with their sense of athletic competence but this association differed by weight group. Lighter girls, as per their BMI, with high athletic competence perceptions were less likely to report BID than the lighter girls with low athletic competence, while higher weight girls with high athletic competence perceptions had greater probabilities of experiencing BID than the heavy girls with low athletic competence perceptions. The study presented in Chapter 2 provided evidence for the association between poor global self-worth and BID among girls of all BMIs and lower weight boys, which adds to previous findings showing self-esteem to relate to BID in both girls and boys (Kostanski & Gullone, 1998; Ricciardelli & McCabe, 2004) by considering in more detail the weight status situation.
7.3.2 Early life socioeconomic status and adolescent body image: A longitudinal cohort study

Chapter 3 investigated whether family SES during pregnancy predicted BID in adolescence. SES was thought to be of interest in the investigation of risk factors of BID since it is known to be associated with health, cognitive, and socio-emotional outcomes in youth, with effects beginning prior to birth and continuing into adulthood. The impact of SES on children and adolescents is at multiple levels, potentially affecting physical health and emotional wellbeing, and therefore, when studying developmental systems the inclusion of SES allows a broader understanding of the issues researched (Bradley & Corwyn, 2002). Results from this study showed that early life SES did not significantly impact BID at adolescence. This chapter analysed the role of BMI as a potential moderator (through subgroup analysis) of the relationship between SES and BID. In doing so, one exception was found for the underweight boys, in which those from the lower SES group had a decreased likelihood of experiencing BID. Underweight boys of lower SES were also less likely to want to be bigger than underweight boys from higher SES. Overall, this chapter highlighted the fact that BID is evident in adolescents of all socioeconomic backgrounds. This study also provided strong evidence that BMI is related to BID across all SES groups. While there has been a suggestion that anorexia nervosa is linked to higher SES (Bray, 1997; Godart, Legleye, Huas, Coté, Choquet, Falissard, & Touchette, 2013), findings from this chapter suggest that dissatisfaction with body image which is often at the core of anorexia is evident at all SES levels and in both genders.
7.3.3 Does early life diet influence body mass index and body image dissatisfaction in adolescence?

Chapter 4 investigated whether early life diet, including duration of breastfeeding and diet quality during the child’s first three years of life, was related to adolescent BID taking into account pre-pregnancy maternal and paternal BMI. There is evidence supporting a relationship between early life diet and BMI (Horta, Bahl, Martines, & Victoria, 2007; O'Tierney, Barker, Osmond, Kajantie, & Eriksson, 2009), and connections with self-esteem and general wellbeing have also been drawn (Oddy et al., 2010). However, the study of the potential long-term influence of early life diet quality on later BID has not been previously addressed. Results from this chapter indicated that there is no significant association between early life diet and adolescent BID. However, a strong relationship was found between pre-pregnancy maternal BMI and adolescent BID for both boys and girls, with higher maternal BMI before pregnancy associated with greater likelihood of adolescent BID. This relationship was attenuated by the powerful relationship between the adolescent’s BMI and BID found in our sample in which higher weight was related to increased chances of experiencing BID for both genders. This study highlighted the important role that maternal weight status has on the psychological and physical wellbeing of adolescents, and reinforces the importance of the adolescent’s BMI on his or her body image.

7.3.4 Associations between psychosocial factors and adolescent body image dissatisfaction: The roles of family functioning, maternal mental health, and teasing

Chapter 5 investigated the relationship between the psychosocial environment of the adolescent and BID using a cross-sectional design. This study included maternal ratings of family functioning, the level of happiness in the parental couple,
the number of stressful events experienced during the previous year, and maternal mental health. This study also investigated the impact of peer teasing experienced by the adolescent in relation to weight or shape. Findings from this study suggest that poor family functioning and an increased maternal experience of stressful life events are related to a higher likelihood of experiencing BID for girls. Higher maternal anxiety was related to increased chances of presenting with BID for boys, irrespective of BMI. For both boys and girls, teasing about weight or shape was associated with an increased likelihood of having BID, independently of BMI. This study highlighted the influence of the psychosocial environment on the development of BID, and in particular the relationship between maternal mental health and adolescent BID. The relationship between maternal mental health and adolescent BID has not been covered by previous research.

7.3.5 Integrative results

Chapter 6 is an integrative chapter in which the relative contribution of factors found to be significantly associated with BID (presented in the previous chapters) were further explored in a final model. These analyses were performed separately by gender including only relevant variables and were performed in two sets of models: controlling for adolescent BMI and not controlling for adolescent BMI. These analyses sought to clarify the influence on BID of variables studied in the separate studies drawn together under the Biopsychosocial model that frames this thesis. Results from this chapter suggest that specific domains of the self-concept remain significantly and strongly related to BID, independently of BMI. Additionally, teasing at 14 years for both genders and the weight status of mothers before their pregnancy remained significant. However, these relationships seemed to be
secondary to the adolescent’s weight status as these findings became non-significant when adolescent BMI was included.

7.4 OVERALL DISCUSSION

From the main findings presented as part of this thesis, there are several key ideas to highlight and discuss: 1) the prevalence of BID among adolescent boys and girls; 2) the differences in the direction of BID (i.e., wanting to be thinner versus wanting to be bigger) with respect to gender; 3) the importance of psychological, social, and biological factors; 4) the key role of adolescent BMI.

7.4.1 The prevalence of BID among Western Australian adolescent boys and girls

The results of this thesis show that more girls than boys present with BID. This was true for both measurement scenarios: when BID discrepancy scores resulted from the subtraction of current versus ideal body figure perceptions considering BID as any score different from zero (as in Chapters 2 and 3) and when BID was defined using more stringent cut-offs (as in Chapters 4, 5 and 6). In other words, irrespective of the cut-off score used, girls reported BID more frequently (criterion one: BID among girls = 52%, BID among boys = 41%; and criterion two: BID among girls = 21.8%, BID among boys = 11.5%). These percentages also indicate that when the stricter criterion is used to define BID the prevalence difference between the genders increases (i.e., more girls than boys experience BID) which suggests that girls appear to be more susceptible than boys to the more serious levels of BID. It also suggests that BID in boys is likely to be less severe and therefore may not carry the same implications as the more severe levels. Boys may see their bodies as other than ideal.
but at lower levels of dissatisfaction and hence with less risk of problems arising. This could help explain why girls present with more weight and shape problems than boys even though BID is common in both genders.

Other studies in Australia and New Zealand have documented the prevalence of BID among adolescents. Between 71% and 76% of high school girls choose an ideal figure thinner than their own (Fear, Bulik, & Sullivan, 1996; Paxton et al., 1991) while a third of adolescent boys wished to be thinner and over a third wished to be larger than their current size (Paxton et al., 1991). However, a study by Tiggemann & Pennington (2007) found that adolescent girls but not boys rated their current figure as significantly larger than their ideal figure, showing substantial BID among girls but not so among boys. Reports by Paxton et al. (1991) regarding weight loss behaviours in Australian samples suggest these to be comparable to U.S. samples. Other prevalence data from industrialised countries, England specifically, present similar figures than the ones presented for Australian samples in relation to girls but a higher prevalence for boys, seen in Furnham et al. (2002). This English study indicated that 81.7% of girls and 79.9% of boys selected an ideal figure different from their current figure.

BID prevalence data for the sample used in this thesis is slightly lower than prevalence data shown by other studies possibly due to variations in the instruments used to account for BID. However, these findings equally reflect that a large percentage of adolescent boys and girls experience BID. Additionally, it has been clearly established that although both genders experience BID, female populations experience (or perhaps tend to report) BID more frequently than males (Calzo et al.,
2012; Pingitore, Spring, & Garfield, 1997) with a marked tendency to prefer a thinner body (Wertheim et al., 2009). The findings of the studies presented in this thesis are in line with previously reported gender differences. This is the case particularly once puberty is reached given that studies looking at children aged 8 to 11 years have found no difference in the prevalence of BID among boys and girls (Ricciardelli, McCabe, Holt, & Finemore, 2003). In the adolescent years, individuals tend to focus more on physical appearance, go through body comparison, and are often more susceptible to sociocultural messages or pressure to fit the ideal body. Moreover, BID may be higher among girls given two known processes that operate within this gender: self-objectification and a strong relationship between girls’ sense of self and their judgement of their physical appearance (as shown in Chapter 2). It has been argued that the female body has been objectified by society and as a consequence females may come to evaluate themselves based on their physical appearance; this phenomenon has been described as self-objectification (Tiggemann & Lynch, 2001).

How BID operates in boys seems to be less well understood. Although there is evidence of the importance of drive for muscularity, also seen through findings from Chapter 2 on athletic competence self-concept, and weight concerns among boys (Jones et al., 2008) a more extensive body of research exists in relation to girls, leaving a greater gap in understanding of boys’ BID. Interestingly, a meta-analysis on gender differences in body image by Feingold and Mazzella (1998), from 20 years ago, favours a biosocial model to explain BID in males, in which mate selection preferences have been suggested to underlie concerns with body image among males. This includes an evolutionary view in which it is hypothesized that,
progressively, males have found that physical attractiveness may convey various advantages related to the capacity to draw the attention of an attracting mate. According to this model, the perceived advantages to be attractive to a mate may partially underpin the concerns about physical appearance that are associated with BID (Feingold & Mazzella, 1998). However, more research concerning boys is needed to extend our understanding of the mechanisms underlying BID in males.

7.4.2 The differences in the direction of BID with respect to gender

The nature of the dissatisfaction experienced by adolescents in relation to their body image also differs by gender. As seen in Chapters 2 and 3, the vast majority of the girls expressed a desire to be thinner whereas boys selected ideal body figures on both ends of the scale (i.e., the thin and the bigger/bulkier ends). This finding supports previous knowledge on gender differences regarding the ideal body figure that underlies BID.

Broadly, adolescents are concerned with thinness and muscularity (McCabe & Ricciardelli, 2003; Ricciardelli et al., 2003); however, this phenomenon differs by gender. It has been well-documented that girls’ BID responds to the internalisation of the thin ideal and the drive for thinness (Stice & Bearman, 2001; Stice & Whitenton, 2002); while BID in boys is more often related to drive for muscularity (Brunet et al., 2010; Jones, 2004; McCreary & Sasse, 2000; Schaefer & Salafia, 2014) although this type of drive can also be seen among girls (Brunet, Sabiston, Dorsch, & McCreary, 2010). In fact, McCreary & Sasse (2000) found that drive for muscularity was stronger in boys than girls but existent in both genders, and that a high drive for muscularity is linked to negative consequences such as exercise with the use of
weight lifting and adopting diets to increase bulk and muscle. Although drive for muscularity was not directly measured, as presented in Chapter 2, self-judgements of athletic competence may tap on similar aspects than the drive for muscularity. Chapter 2 shows a significant relationship between athletic competence and BID among both boys and girls. In the final, integrative models presented in Chapter 6, the relationship between judgements on athleticism and BID was no longer present for boys (possibly because initially it was only significant for the overweight and obese boys, as seen in Chapter 2). The judgements on athletic competence were found significant in girls but only in relation to their BMI.

In regard to the drive for thinness, the fact that girls predominantly selected ideal body figures from the thinner end of the BFPS reflects the known drive for thinness of the female population. The desire to be thin among the girls may be due to the value placed on thinness while the desire to be muscular or lean among the boys may underlie the idea of a muscular body being synonymous of strength and/or virility. These aspects are important given their implications when the pursuit of body ideals is taken to extremes. In girls, the engagement in unhealthy compensatory behaviours, and in boys, the use of steroids and the excessive practice of physical activity.

7.4.3 The importance of psychological, social, and biological factors

Most authors agree that BID is multifactorial and associated with a number of negative outcomes, but depending on the approach taken to studying BID, different factors are included. For example, the Tripartite model takes into account parental, peer, and media influences (Thompson et al., 1999). Under the theoretical model
underpinning this thesis, a series of psychological, social, and biological factors and determinants were investigated with indication that all three aspects of the Biopsychosocial model are relevant to BID.

**Psychological**

Several specific self-concept domains were found to be significantly related to BID for boys and girls. Most salient relationships were between negative judgments or self-perception in relation to global self-worth and BID, and this was found in both genders, while there was a close association between global self-worth and BID in girls only. Interestingly, previous research looking at younger children (8-11 years) has found no relationship between self-esteem and BID among girls (Ricciardelli et al., 2003), which suggests that this connection may only develop as the girls get older. Results presented in Chapters 2 and 6 of this thesis show that the views adolescent girls have about themselves (global self-worth) make a unique and strong contribution to the BID they experience. One possible explanation for the link between BID and global self-worth is that adolescent girls tend to be more involved in peer and broader social comparison with weight, shape, and appearance more generally representing salient factors in these comparisons. The emphasis females tend to place on appearance and the overreliance on weight and shape in judging self-worth has been discussed in the literature on self-objectification (Tiggemann & Lynch, 2001) and is also a key feature of woman presenting with eating disorders (Stein, 1996).
Social

Socioeconomic characteristics, family functioning, maternal mental health, and peer teasing about weight or shape were the psychosocial factors investigated in this thesis. The relationship between SES and BID was studied through a longitudinal design with results suggesting that early life SES had a negligible effect on later BID (Chapter 3). Other studies of cross-sectional design have also found no relationship between SES and BID among adolescents (Barker & Galambos, 2003; Wang, Byrne, Kenardy, & Hills, 2005). The overall objective of the SES study was to investigate whether early family SES predicted subsequent BID among adolescents with the potential implication of informing public health interventions. The longitudinal findings presented in Chapter 3 in relation to SES support the idea that individuals from all socioeconomic backgrounds can experience BID.

In terms of the psychosocial family (family functioning and maternal mental health) and personal (teasing about weight or shape) factors studied in this thesis, poor family functioning (predominance of negative relationships and feelings within the family) and more family stressful events were related to greater chances of experiencing BID for girls, while maternal anxiety was associated with more likelihood of experiencing BID for boys. Previous research has found family dynamics and functioning to have an impact on BID in both genders (Rodgers & Chabrol, 2009). In line with findings from this thesis, evidence also exists that the relationship between family functioning and BID is more evident among girls (Benninghoven et al., 2007 – Chapter 5). Other studies suggest that parental support and perceived pressure from family are not related to BID (Presnell, Bearman, & Stice, 2004). Family dynamics are so complex and multilayered that it is likely that
methodological problems such as unreliable self-reporting, differences between measures utilised, and the participant answering the measures (i.e., adolescent vs. parent) may have contributed to the conflicting results seen in the literature with respect to this topic. Additionally to the family-related findings, results from teasing about weight and shape, also presented in Chapter 5, highlight the importance of the psychosocial environment in BID among boys and girls. In line with previous research, peer teasing about weight and shape represents an important factor in adolescent BID. As noted by previous research, teasing about weight and shape may trigger social comparison in order to gather information on cultural appearance standards and such comparisons have been shown to be linked to more BID (Schaefer & Salafia, 2014). Further, the results presented in Chapter 6 indicating that the relationship between peer teasing about weight and shape and BID is attenuated by BMI highlight how, for example, the overweight adolescents are an easy target for teasing which may expose them to more teasing and in turn higher BID (Wertheim et al., 2001). Additionally, it is also possible that teasing is more problematic when global self-worth is low making those adolescents more vulnerable to BID. Peer negative commentary and, specifically, teasing about weight and shape show to have a strong influence on body image and, further, can be linked to eating disturbance (Menzel et al., 2010) which highlights the decisive role that peer group acceptance can have in early adolescence. Although attenuated by BMI, the relationship between peer teasing about weight and shape and adolescent BID was significant independently of BMI, which highlights the role of the social component in the biopsychosocial model.
Biological

Adolescent BMI, maternal and paternal BMI, breastfeeding duration, and diet quality during the first three years of life were included as the biological factors investigated in this thesis. Results presented in Chapter 4 indicate that early life diet is not a predictor of later BID, even after considering adolescents’ BMI. This hypothesis was tested given that early life diet has been shown to have connections with weight status later in life, and that weight status is closely linked to BID. However, as part of the study of potential biological factors, the relationship between maternal BMI before pregnancy and adolescent BID was tested and found to be significant. This result suggests that parental model/genetics could influence offspring BMI which in turn influences offspring BID. The transmission of BMI can potentially operate at two levels: biological (inter-generational transmission of BMI) and psychological (identification process). Although these two pathways may be interrelated, the inter-generational transmission of BMI where, for example, all members of a family (or members of an ethnic group) have a big body built or on the contrary are slim, is a difficult aspect to alter; while the psychological aspect may be more malleable. Interestingly, in the final models presented in Chapter 6, pre-pregnancy maternal BMI was only significantly related to BID for the boys, but this effect was reduced by the strong association between adolescent BMI and BID. Previous research has also found BMI to significantly predict BID among adolescent boys and girls (Kostanski & Gullone, 1998) which suggests that the intra-individual aspects of BMI overwrite the inter-individual (e.g., mother-child) association.

Although not many studies have included factors representing all three aspects of the Biopsychosocial model, the ones existing in the literature provide strong
evidence that interpersonal, sociocultural, and biological factors increase the risk for BID (Presnell et al., 2004; Ricciardelli et al., 2003; Rodgers, Paxton, & McLean, 2014) which is in accordance with this thesis.

7.4.4 The key role of adolescent BMI

Across all studies presented in this thesis, BMI has a strong, powerful, and consistent association with BID, and this is true for both genders. However, gender differences are apparent in the relationship between BMI and BID. Most girls prefer a thinner body figure so it is not surprising that overweight girls tend to report BID more frequently than underweight girls. Conversely, boys appear inclined to be unhappy with their body if they are either underweight (too thin) or overweight (too fat or big). In accordance with this finding, Calzo et al. (2012) reported a curvilinear association between BMI and BID among boys. This suggests that boys who are either underweight or overweight are more likely to report BID. In contrast, the relationship between BMI and BID appears to be linear among girls.

Past research has found BMI to be strongly associated to BID in both genders (Holt & Ricciardelli, 2002; Paxton, Eisenberg, & Neumark-Sztainer, 2006; Stice & Whitenton, 2002). Pingitore et al. (1997) found that BMI explained 14% of the variance in body image, with higher BMI values related to greater BID in both genders, meaning that body satisfaction among boys and girls decreased as BMI increased, particularly among girls. Further, and in line with findings presented in Chapter 5 that BMI seemed to moderate some relationships between psychosocial factors and BID, Ricciardelli et al. (2003) showed that BMI moderated the relationship between sociocultural influences and the strategies children adopted to
change their body and weight. Another negative effect of higher BMI is the increased frequency of teasing which in turn contributes to higher BID (Wertheim et al., 2001) as previously discussed and presented in Chapter 5. These findings set the focus of body image disturbance on the sociocultural context. Special considerations must be made in regards to the modern weight-related attitudes and pressures and how these have an impact of actual weight, body image, eating disorders, and disordered eating.

Despite the strong connection between actual BMI and BID, BID is not restricted to those who are overweight (Kostanski, Fisher, & Gullone, 2004); healthy weight youth also experience BID, as shown in this thesis (Chapter 2). This is a group that merits special attention as they may be within a healthy weight range but can still be internally struggling with body image. Further, although this thesis did not investigate how accurate adolescents are at perceiving their weight (or their current body figure), previous research has found that children and adolescents appear to perceive their weight independently of actual weight status (O'Dea & Caputi, 2001). Adolescents who perceive their weight in an altered way (i.e., not corresponding to their actual weight) may have greater chances of experiencing BID.

7.5 IMPLICATIONS

The findings reported in this thesis shed light into biological, psychological, and social aspects related to BID and therefore have implications for prevention and intervention programs tackling BID. The prevention and intervention initiatives tackling adolescent body image are important as BID is potentially related to negative outcomes such as depressive symptoms, low self-esteem, increased dieting,
weight gain, reduced physical activity, poor eating habits, disordered eating, and eating disorders (Ata, Ludden, & Lally, 2007; Neumark-Sztainer, Paxton, Hannan, Haines, & Story, 2006; Paxton, Neumark-Sztainer, Hannan, & Eisenberg, 2006; Stice, Marti, & Durant, 2011).

Further, research has shown that adolescents who are excessively focused on appearance and tend to continuously compare their bodies to others are more likely to report dangerous sexual behaviours and substance use (Gillen, Lefkowitz, & Shearer, 2006; Palmqvist & Santavirta, 2006). Due to the multiple and dangerous consequences associated to BID, prevention and intervention programs are needed. Paxton (2002) noted that the majority of prevention and intervention programs for BID evaluated to date have focused on reducing individual risk factors such as the value placed on extreme thinness, the internalisation of the beauty ideals, and low self-esteem, instead of changing social and environmental factors such as modifying school values or increasing parental support. However, some research groups have endeavoured to extend the preventative efforts into these arenas and have included consideration of individual and environmental risk factors in their programs (Hart, Cornell, Damiano, & Paxton, 2015).

The inclusion of the psychosocial environment in the prevention of BID is key, as noted in Chapter 5. One example of the recognition that programs tackling individual characteristics and parent education/involvement are needed can be found in McVey & Davis (2002). The authors of this Canadian study investigated the effectiveness of a program to promote positive body image among preadolescent girls. They found that there were no differences between the prevention and control
groups probably due to a health curriculum covering healthy eating, active living, and body image that was provided to all participants by the school. Further, in this study, all parents of the girls from both the intervention and control groups received information on the signs typically seen in people suffering from BID and eating problems.

The suggestion that future programs aiming at promoting positive body image include the participants’ parents is made in order to improve the effectiveness of prevention efforts. As highlighted by McVey and Davis (2002), research aiming at identifying factors related to BID adds necessary information to ongoing efforts in prevention of BID. These efforts should aim for positive body image in the long-term and may have the potential to positively affect adolescents beyond body image per se by promoting a healthy sense of self (as described in Chapter 2), functional relationships (suggested in Chapter 5), and realistic thinking styles.

Unfortunately, the modern context in which children are developing to become adolescents and later adults is filled with challenges and enormous pressure to fit into standards which include the cultural ideals of being “successful” and looking good. Such environment does not serve to promote positive youth outcomes; on the contrary, it seems to set up children and adolescents for mental health difficulties such as experiencing BID. One example of the pressure that the modern social environment can exert on the wellbeing of young people appears evident in the use of social media, specifically, online photo sharing and manipulation of photos for online posting. This was shown in a recent study by McLean, Paxton, Wertheim, and Masters (2015) in which Australian adolescent girls who regularly shared image of
themselves on social media reported significantly higher body-related concerns than those girls who were less engaged in social media-related self-photo activities.

The data reported in this thesis extend knowledge on BID in boys and girls and have the potential to inform prevention and intervention programs to promote body image satisfaction. The findings in relation to the negative influence that peer teasing has on BID, for example, reinforce the need to include bullying management policies in schools and foster awareness among parents in relation to this issue. Some of the findings of this thesis could be influential in terms of clinical practice by reinforcing the importance of clinicians’ efforts to promote a healthy sense of self (globally and in specific components of the self) among adolescents. Another finding of this thesis that could have implications in terms of prevention and treatment initiatives relates to weight status (BMI) and BID as the association between these two is strong and consistent. However, changes in weight do not necessarily result in decreased BID and may lead to other problems. This is a complex relationship that requires careful and mindful management based on what is already known. Certainly, more research is needed to guide best practice in this regard.

Overall, the advantage of adopting a biopsychosocial model to understand and change BID stems from the multifactorial nature of body image. Adolescents will benefit from a family environment that provides constructive guidance and support from adults and significant others, but they will also prosper in a broader social environment that works towards reducing or preventing concerns with body image and promoting body satisfaction and body acceptance. There is also a need to recognise the challenges associated with maintaining gains from intervention.
programs designed to foster positive body image (McVey, Davis, Tweed, & Shaw, 2004).

7.6 STRENGTHS AND LIMITATIONS

Specific limitations and strengths in relation to each of the studies contained in this thesis have been covered in each chapter. However, the overall limitations and strengths of this thesis are presented in this section.

First, this study included a large sample of adolescent boys and girls, which provided the advantage of having enough statistical power for the analyses. In the Raine Study, limitations in terms of attrition have not been of concern in terms of representativeness of the Western Australian population given that although attrition involved mostly disadvantaged families, as seen in most cohort population studies (Wolke et al., 2009), it has been shown that in the Raine Study this actually served to increase population representativeness over time as the Raine Study initially oversampled socioeconomically disadvantaged women (Allen et al., 2013; Whitehouse et al., 2010). Previous analyses using the Raine Study data have shown that participants who remained in the Study until adolescence are broadly comparable to the Western Australian population on a range of sociodemographic indicators (Li et al., 2008). Despite this, replication of our results in other cohorts is important and would help to strengthen the findings observed here. It is important to note that the use of cross-sectional and longitudinal designs to test the hypotheses included in this thesis were based on the research questions of interest, the nature of the variables, the research questions considered, and the availability of the data
within the Raine Study. Additionally, also in regard to the sample, a limitation is that only Caucasian adolescents were included in the studies of this thesis since Caucasian ethnicity was the dominant ethnic group (88.2%) within the Raine Study population and, as known, cross-cultural factors could impact BID within the different ethnic groups (Anderson-Fye, 2009). Also, minority groups in the overall sample were of small sizes and, therefore, statistical power would have been an issue for the type of analyses executed.

Second, body image dissatisfaction was measured using the Body Figure Perception Scale (BFPS) for which there is reasonably good evidence of test-retest reliability in young people (Hill, 2011). However, this thesis did not include other measures of BID to further explore emotional and cognitive aspects of BID, considering BID can be measured perceptually (How do you perceive your body?), cognitively (What do you think about your body?), and emotionally (How do you feel about your body?). Moreover, the criteria utilised to define BID in this thesis (i.e., cut-point on the BFPS) vary with prevalence rates determined by the cut-points used (Paxton et al., 1991). For example, Chapters 4, 5 and 6 considered higher scores on the BFPS to account for BID in order to concentrate on more intense BID. Additionally, the scale utilised to assess BID in this thesis does not correspond to any mathematical or proportional calculations in relation to weight, contrary to the more sophisticated body figures developed by Truby & Paxton (2002). While it would have been preferable to have used a measure that allowed more sensitive measure of BID, we were limited to the measures used in the Raine Study. However, scales using body figure drawings with gradual increases in size such as the one utilised in this thesis have been extensively used and supported in BID research (Dunn, Lewis,
& Patrick, 2010; Thompson & Gray, 1995; Wood, Becker, & Thompson, 1996). Another limitations respect to how BID was measured in the Raine Study is related to the timescale for the collection of the data. The Raine Study data utilised in this thesis is from approximately 10 years ago for BFPS and cross-sectional variables. The sociocultural context surrounding appearance has changed relatively rapidly and this may have an impact on generalization.

Third, although this thesis included a range of psychological, social, and biological variables in the study of BID, it was clearly not exhaustive in its coverage of potential risk/associated factors. For example, variables such as negative affect (Presnell et al., 2004), and pubertal development have both been associated with BID (Jaffe & Singer, 1989). Nevertheless, this thesis added to the literature by exploring the association between multidimensional self-concept and BID, the potential effects of early life SES, diet during the first years of life, and maternal mental health; all variables which have not been investigated in the past. This thesis also paid particular attention to the role of BMI on BID and included both genders.

Finally, the findings of this thesis require replication. There has been little or no study of the impact of early diet on BID and while there were no associations found using the Raine data it would be premature to dismiss the potential for early diet to cast an influence on BID. More specifically, research looking at diet quality and BID should incorporate a more extensive investigation of dietary patterns throughout childhood. Future research may also use more detailed measures of maternal anxiety in relation to adolescent BID and eating behaviour. Additionally, the inclusion of other variables such as maternal BID; family communications in
relation to weight, shape and appearance; parental body/weight surveillance; and maternal body checking would be of interest to procure more detail and increase specificity in the study of these factors.

7.7 GENERAL CONCLUSIONS

General conclusions listed below have been drawn from the findings of this thesis. A summary of the conclusions presented below can be found in Table 7.1.

7.7.1 Both genders

- Forty-one percent of boys and 52% of girls are, to some degree, dissatisfied with their body image. Twenty-eight of boys wanted to be thinner and 13% wanted to be bigger, while 48% of girls wanted to be thinner.

- Early life SES has a negligible effect on BID.

- Adolescents of all SES backgrounds are equally at risk of experiencing BID.

- Early life diet has no significant relationship with adolescent BID, even after taking into account adolescent BMI.

- A strong relationship exists between higher pre-pregnancy maternal BMI and increased adolescent BID for both boys and girls.

- The relationship between adolescent BMI and BID overwrites the influence of pre-pregnancy maternal BMI.
- Boys and girls who have ever been teased about weight or shape by their peers are more likely to experience BID.

- Of all the variables studied as part of this thesis, adolescents’ judgements on specific areas of their self-concept remain significantly related to BID independently of their BMI.

### 7.7.2 Boys

- Positive self-perception of athleticism is related to less likelihood of experiencing BID among heavy boys.

- Strong self-views of behavioural conduct and positive global self-worth is associated with less chances of presenting with BID among lighter boys.

- Underweight boys from low SES backgrounds have decreased chances of experiencing BID.

- Maternal anxiety is associated with greater likelihood of presenting with BID for boys, irrespective of BMI.

- Integrative results indicate that the influence of pre-pregnancy maternal BMI becomes non-significant when adolescent BMI is taken into account.

- Integrative results indicate that peer teasing about weight or shape is significantly associated with increased chances of experiencing BID but this relationship becomes non-significant when adolescent BMI is taken into account.
• Of all significant findings, poor athletic competence and behavioural conduct self-concept are related to more chances of presenting with BID, independently of BMI.

7.7.3 Girls

• Poor overall self-worth is related to a greater likelihood of experiencing BID among all girls, independent of their weight status.

• Negative athletic competence self-perception is associated with greater likelihood of presenting with BID for all girls.

• Poor family functioning during adolescence and a higher number of stressful life events, as per report of mothers, are related to increased chances of presenting with BID.

• Integrative results indicate that the effect of peer teasing on girls’ BID is no longer apparent when BMI is taken into account.

• Of all significant findings, low global self-worth is related to increased experience of BID for all girls, independent of BMI.
Table 7.1 Summary table of the General Conclusions based on the empirical findings of this thesis

<table>
<thead>
<tr>
<th></th>
<th>Boys</th>
<th>Girls</th>
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</thead>
<tbody>
<tr>
<td>Body image dissatisfaction</td>
<td>41% experience some degree of BID</td>
<td>52% experience some degree of BID</td>
</tr>
<tr>
<td>Athletic competence self-concept</td>
<td>Negative relationship for heavy boys</td>
<td>Negative relationship for lighter/normal girls</td>
</tr>
<tr>
<td>Global self-worth</td>
<td>Negative relationship for lighter/normal boys</td>
<td>Negative relationship for all</td>
</tr>
<tr>
<td>Early life socioeconomic status</td>
<td>Positive relationship for the underweight boys</td>
<td>No relationship found</td>
</tr>
<tr>
<td>Early life diet</td>
<td>No relationship found</td>
<td>No relationship found</td>
</tr>
<tr>
<td>Pre-pregnancy maternal BMI</td>
<td>Positive relationship attenuated by own BMI</td>
<td>Positive relationship attenuated by own BMI</td>
</tr>
<tr>
<td>Family functioning</td>
<td>No relationship found</td>
<td>Negative relationship</td>
</tr>
<tr>
<td>Maternal experience of stressful life events</td>
<td>No relationship found</td>
<td>Positive relationship</td>
</tr>
<tr>
<td>Maternal anxiety</td>
<td>Positive relationship for all</td>
<td>No relationship found</td>
</tr>
<tr>
<td>Teasing about weight or shape</td>
<td>Positive relationship attenuated by own BMI</td>
<td>Positive relationship attenuated by own BMI</td>
</tr>
<tr>
<td>Adolescent BMI</td>
<td>Positive relationship</td>
<td>Positive relationship</td>
</tr>
</tbody>
</table>
7.8 FUTURE DIRECTIONS

Body image is a gendered issue in which girls have received a lot more attention than boys (Smolak, 2004), and although the work by authors such as Ricciardelli, McCabe, Paxton, Jones, and Neumark-Sztainer, among others, have greatly enriched the BID field by including males, further research is needed to develop a better understanding of the underlying mechanisms of BID in males. In this sense, the present thesis has shown that a focus on body function as well as appearance could be useful for males. Therefore, the measures utilised should focus on athletic competence (i.e., strength, athletic abilities) and muscularity when studying BID in males (Cafri & Thompson, 2004; Smolak & Cash, 2011).

More longitudinal studies are needed to determine the course of adolescents’ BID and identify causal relationships to inform intervention. Longitudinal studies, such as those included in the current thesis, can address causal questions and help clarify long-term associations (whether actual significant relationships are found or not). They also allow the identification of changes presenting in the course of a due time. In terms of self-concept and BMI; for example, knowing whether adolescents with poor physical appearance continue to experience BID despite potential weight change over time would be useful as prevention of obesity is closely related to BID and eating disorders, and managing these two issues with caution is crucial in this area. It would be also useful to know whether weight loss behaviours and changes, disordered eating, and unhealthy practices in relation to BID (e.g., over-exercising, compensatory behaviours, body comparison) are more extreme among adolescents with poor self-worth as they progress through adolescence and enter adulthood. For
this, as highlighted in Smolak & Cash (2011), longitudinal studies across more than five years are needed and the inclusion of repeated measures of BID is fundamental.

The focus of this thesis was on BID, but future research could benefit from investigating the same sample (or other population cohort studies) in terms of the outcomes on BID-related areas; for example, physical health status, exercise frequency, diet quality, and overall nutrition. Studies looking at the prevalence of eating disorders among the Raine Study exist (Allen et al., 2013) as noted in Chapter 2. It would be of interest to investigate some of the hypotheses tested in this thesis among the Raine Study eating disorder clinical sub-sample.

The study of BID has been heavily focused on psychological and sociocultural factors; however, the field has lately seen an expansion with the inclusion of genetic and evolutionary explanations (Smolak & Cash, 2011) for which population studies can be extremely useful. The Raine Study provides the opportunity to include other biological variables not included in this thesis. Apart from the suggestion that pubertal timing may have an impact on BID (Siegel, Yancey, Aneshensel, & Schuler, 1999), more recently, genetic and neurobiological studies have indicated that specific genes, chromosomal regions, and increased activation in some brain areas such as the fusiform gyrus, the amygdala and anterior cingulate cortex may contribute to individual differences in body image, making some individuals more vulnerable to BID and eating disorders (Suisman & Klump, 2011). Biological studies of this type are few and so far have tended to focus on clinical samples. The inclusion of these biological factors in the study of BID has the potential to strengthen the Biopsychosocial model.
Broadly, more research on this fascinating topic of body image is needed to inform educational programs and intervention strategies in order to make these more appropriate and effective in relation to gender, age, and weight status. Programs should target both risk and protective factors so that a positive body image is promoted tackling those factors known to exacerbate BID but reinforcing those positive aspects of the self that ultimately strengthen the person overall.

7.9 CONCLUDING REMARKS

The studies presented in this thesis are encompassed by the Biopsychosocial model of body image and tested different hypotheses in relation to BID in adolescent boys and girls. This thesis provides evidence that adolescents from all SES backgrounds can present with BID. It was also found that psychosocial factors such as prenatal maternal BMI, family functioning, maternal mental health, and teasing about weight or shape have an impact on BID but when brought together in integrative analyses, these effects are attenuated by adolescent BMI. This thesis further emphasises the importance of the way adolescents relate to their bodies, cognitively and emotionally. The judgements adolescents make in certain arenas or competences have a powerful impact on the way they perceive their bodies in relation to the ideal body they have in mind. Finally, the adolescents’ actual BMI plays a key role in how satisfied boys and girls are with their body image.
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Whitaker, K. L., Jarvis, M. J., Beeken, R. J., Boniface, D., & Wardle, J. (2010). Comparing maternal and paternal intergenerational transmission of obesity...


Appendices

Appendix A
Stunkard, Sorenson, and Schulsinger (1983)
Appendix B
The Body Figure Perception Scale – Raine Study adaptation

Q21. Please select the figure from the list of numbers and letters A and B provided.

Which figure best represents what you currently look like?

Which figure would you most like to look like?
Q21. Please select the figure from the list of numbers and letters A and B provided.

Which figure best represents what you currently look like?

[Diagram showing various figures with numbers and letters]

Which figure would you most like to look like?
Appendices

Appendix C
Questionnaires and Items of interest from the Raine Study protocols

<table>
<thead>
<tr>
<th>Name or ID</th>
<th>Age</th>
<th>Grade</th>
</tr>
</thead>
</table>

**How Important Are These Things to How You Feel about Yourself as a Person?**

<table>
<thead>
<tr>
<th>Really True for me</th>
<th>Sort of True for me</th>
<th>Truly True for me</th>
<th>BUT</th>
<th>Other teenagers think it is important to be intelligent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
<td>BUT</td>
<td>Other teenagers don't think it is important to be intelligent</td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
<td>BUT</td>
<td>Other teenagers think that having a lot of friends is important</td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td></td>
<td>BUT</td>
<td>Other teenagers don't care much about being good at sports</td>
</tr>
<tr>
<td>4.</td>
<td></td>
<td></td>
<td>BUT</td>
<td>Other teenagers think that their physical appearance is important</td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td></td>
<td>BUT</td>
<td>Other teenagers feel it's important that they do well on a paying job</td>
</tr>
<tr>
<td>6.</td>
<td></td>
<td></td>
<td>BUT</td>
<td>Other teenagers don't really care that much whether someone they are interested in likes them</td>
</tr>
<tr>
<td>7.</td>
<td></td>
<td></td>
<td>BUT</td>
<td>Other teenagers think that doing the right thing is important</td>
</tr>
<tr>
<td>8.</td>
<td></td>
<td></td>
<td>BUT</td>
<td>Other teenagers think making close friends is all that important</td>
</tr>
<tr>
<td>9.</td>
<td></td>
<td></td>
<td>BUT</td>
<td>Other teenagers think that doing well in school is really that important</td>
</tr>
<tr>
<td>10.</td>
<td></td>
<td></td>
<td>BUT</td>
<td>Other teenagers don't care that much about whether they are popular</td>
</tr>
<tr>
<td>11.</td>
<td></td>
<td></td>
<td>BUT</td>
<td>Other teenagers think that being athletic is important</td>
</tr>
<tr>
<td>12.</td>
<td></td>
<td></td>
<td>BUT</td>
<td>Other teenagers don't care that much about how they look</td>
</tr>
<tr>
<td>13.</td>
<td></td>
<td></td>
<td>BUT</td>
<td>Other teenagers think that doing their best on a job is all that important</td>
</tr>
<tr>
<td>14.</td>
<td></td>
<td></td>
<td>BUT</td>
<td>Other teenagers think it's important to be dating someone they are romantically interested in</td>
</tr>
<tr>
<td>15.</td>
<td></td>
<td></td>
<td>BUT</td>
<td>Other teenagers don't care that much whether they are acting the way they are supposed to</td>
</tr>
<tr>
<td>16.</td>
<td></td>
<td></td>
<td>BUT</td>
<td>Other teenagers think it's important to have a really close friend you can trust</td>
</tr>
</tbody>
</table>
35. What was your total family income before tax, per year, at the time you became pregnant? [INCOME]:

1. Less than $7,000
2. $7,000 - $11,999
3. $12,000 - $23,999
4. $24,000 - $35,999
5. $36,000 or more
6. Family income unknown (e.g. adolescent at home)

Number it supports [PEOPLE]: ____/____ (Adults/Children)

If you don’t know the total income before tax, what is the actual family ‘take home’ income per week: $ ________

10. How old were you when you left school? [M_SCHAGE]: ____

11. What was the last class at school that you completed? [M_SCHYR]:

Year ____ e.g. Year 10
OR equivalent ______________

12. Since leaving school have you completed any further education? [M_SCHLVL]:

0 = None
1 = Trade certificate or apprenticeship
2 = Professional registration (non-degree) e.g. Nursing, police
3 = College Diploma or Degree eg. TAFE / WAIT / WACA
4 = University degree
5 = Other.

What type of education: ____________________
These are questions about your child after **12 months of age**. If you are not sure of the answer, observe your child for a couple of days or try out the activity.

**REMEMBER: ALL ANSWERS ARE STRICTLY CONFIDENTIAL**

Q45. Did you breast feed your child **after 12 months of age**?
   - **N** No  Go to Q49
   - **Y** Yes

Q46. Are you still breast feeding?
   - **0** Yes, regularly
   - **1** Yes, on occasions
   - **2** No

Q47. At what age did you stop breast feeding? ...... months
   - **88** Haven't stopped

Q48. At what age did you first give your child any milk other than breast milk? ...... months
   - **88** Haven't yet

Q49. What milks does your child drink now? *(Please circle any appropriate answers.)*
   - **0** Breast
   - **1** Formula. Which one? .................
   - **2** Cow's milk
   - **3** Soy milk
   - **4** Goat's milk
   - **5** Other. *Describe:* ........................
   - **6** None

Q50. Have you noticed any chewing or swallowing difficulties with your child?
   - **N** No
   - **Y** Yes. *Describe:* ........................

Q51. Do you restrict your child's diet in any way?
   - **N** No
   - **Y** Yes. *Describe:* ........................
Appendices

Q52. Does your child have any unusual reactions to certain foods?
   N No
   Y Yes. *Describe:* ............................................................

Q53. Please describe what food and drink your child has eaten in the past 24 hours. *(Please specify type of food/drink and quantity.)*

   Breakfast............................................................................
   Morning snack ......................................................................
   Lunch................................................................................
   Afternoon snack ..................................................................
   Dinner ..............................................................................
   Evening Snack ....................................................................

Q54. How often does your child soil his/her nappy *(have a bowel action)?*
   0 Less than once a week
   1 Less than twice a week
   2 Every couple of days
   3 Once daily
   4 Twice daily
   5 Three times a day
   6 More than 3 times daily
   7 Don't know

Q55. Can you describe what your child's bowel actions *(pooh)* are usually like now? *(Please circle the single best response.)*
   0 Very small and hard, passed with difficulty
   1 Soft and brown
   2 Soft, with undigested food
   3 Loose *(sloppy)* with undigested food
   4 Watery
   5 Very pale *(almost white)* and oily
   6 Don't know

Q56. Is your child still in nappies by day?
   N No
   Y Yes
Q80. Please read each statement and circle a number 0, 1, 2 or 3 which indicates how much the statement applied to you over the past week. There are no right or wrong answers. Do not spend too much time on any one statement.

The rating scale is as follows:
- 0. Did not apply to me at all.
- 1. Applied to me to some degree, or some of the time.
- 2. Applied to me a considerable degree, or a good part of the time.
- 3. Applied to me very much, or most of the time.

1. I found myself getting upset by quite trivial things. 
2. I just couldn't seem to get going. 
3. I had a feeling of faintness. 
4. I experienced breathing difficulties (eg. excessively rapid breathing, in the absence of physical exertion). 
5. I felt sad and depressed. 
6. I found it hard to calm down after something else. 
7. I perspired noticeably (eg. hands sweaty) in the absence of high temperatures or physical exertion. 
8. I found myself getting impatient when I was delayed in any way (eg. liffs, traffic lights, being kept waiting). 
9. I found myself in situations which made me so anxious I was most relieved when they ended. 
10. I tend to over-react to situations. 
11. I found myself getting upset rather easily. 
12. I felt that I had nothing to look forward to. 
13. I couldn't seem to experience any positive feelings at all. 
14. I found that I was very irritable. 
15. I was aware of dryness in my mouth. 
16. I felt that I had lost interest in just about everything. 
17. I could see nothing in the future to be hopeful about. 
18. I was aware of the action of my heart in the absence of physical exertion (eg. heart rate increase, missing a beat). 
19. I felt scared without any good reason. 
20. I felt that life wasn't worthwhile. 
21. I felt that I was rather touchy. 
22. I felt that I was using a lot of nervous energy. 
23. I couldn't seem to get enough enjoyment out of the things I did. 
24. I had a feeling of shakiness (eg. legs going to give way).
The rating scale is as follows:

0. Did not apply to me at all.
1. Applied to me to some degree, or some of the time.
2. Applied to me a considerable degree, or a good part of the time.
3. Applied to me very much, or most of the time.

25. I felt down-hearted and blue. 0 1 2 3
26. I found it difficult to work up the initiative to do something. 0 1 2 3
27. I found it hard to wind down. 0 1 2 3
28. I was intolerant of anything that kept me from getting on with what I was doing. 0 1 2 3
29. I had difficulty in swallowing. 0 1 2 3
30. I feared that I could be “thrown” by some trivial but unfamiliar task. 0 1 2 3
31. I felt I was pretty worthless. 0 1 2 3
32. I was unable to become enthusiastic about anything. 0 1 2 3
33. I was worried about situations in which I might panic and make a fool of myself. 0 1 2 3
34. I was in a state of nervous tension. 0 1 2 3
35. I felt I was close to panic. 0 1 2 3
36. I felt I wasn’t much as a person. 0 1 2 3
37. I found it difficult to relax. 0 1 2 3
38. I felt tired. 0 1 2 3
39. I experienced trembling (e.g., in the hands). 0 1 2 3
40. I found myself getting agitated. 0 1 2 3
41. I felt that life was meaningless. 0 1 2 3
42. I found it difficult to tolerate interruptions to what I was doing. 0 1 2 3

Q81. Have any of the following happened to you in the last year? (Please circle Yes or No for each item)

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Yes</td>
<td>No</td>
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<tr>
<td>Yes</td>
<td>No</td>
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<tr>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>
Appendices

Q65. This is called the Family Assessment Device; it was developed to give an idea of how families work together. (Please circle one answer only for each item)

**Item 1**
Below are statements about families and family relationships. Circle the category which best describes your family - the people living in your house.

<table>
<thead>
<tr>
<th></th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Planning family activities is difficult because we misunderstand each other</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>b. In times of crisis we can turn to each other for support</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>c. We cannot talk to each other about sadness we feel</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>d. Individuals (in the family) are accepted for what they are</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>e. We avoid discussing our fears and concerns</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>f. We express feelings to each other</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>g. There are lots of bad feelings in our family</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>h. We feel accepted for what we are</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>i. Making decisions is a problem in our family</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>j. We are able to make decisions about how to solve problems</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>k. We don't get on well together</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>l. We confide in each other</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>m. Drinking is a source of tension or disagreement in our family</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

**Item 2**
The following list describes some of the ways people feel at different times. During the past few weeks, how often have you felt:

<table>
<thead>
<tr>
<th></th>
<th>Always</th>
<th>Sometimes</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. on top of the world?</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>b. very lonely or remote from other people?</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>c. particularly excited or interested in something?</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>d. depressed or very unhappy?</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>e. pleased about having accomplished something?</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>f. bored?</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>g. proud because someone complimented you on something?</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>h. so restless you couldn't sit long in a chair?</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>i. that things were going your way?</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>j. upset because someone criticised you?</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>
Appendices

Item 3
Taking things all together, how would you say things are for you these days?

0  Not too happy
1  Reasonably happy
2  Very happy

Item 4
And how would you say things are for your spouse/partner?

0  Not too happy
1  Reasonably happy
2  Very happy
3  No spouse/partner

Q85. The numbers on the following lines represent different degrees of happiness in your relationship. The middle point, "happy", represents the degree of happiness of most relationships. Please circle the number which best describes the degree of happiness, all things considered, of your relationship.

<table>
<thead>
<tr>
<th></th>
<th>Extremely Unhappy</th>
<th>Fairly Unhappy</th>
<th>A Little Unhappy</th>
<th>Happy</th>
<th>Very Happy</th>
<th>Extremely Happy</th>
<th>Perfect</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>3</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>4</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>5</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendices

Q54. Have you felt uncomfortable about other people seeing your body, for example, in the change rooms, when wearing bathers or tight clothes?

- Not at all
- Some of the time
- A lot of the time
- Most of the time

A13_W05

Q55. Have you ever been teased about your weight or shape?

- No
- Yes

A13_W06

Q56. Who teased you? (Please mark more than one if necessary)

- Children at my school
- Children not from my school
- Brothers and/or sisters
- Parents
- Teachers
- Other adults
- NA

A13_W27
A13_W28
A13_W29
A13_W30
A13_W31
A13_W32

Q57. Have you been teased about your weight or shape in the last three months?

- No
- Yes
- NA

A13_W93

Q58. How often are you teased about your weight or shape?

- Once in a while/once or twice a month
- Often/once or twice a week
- Nearly every day
- NA

A13_W94
Appendix D
Ethics Approvals

KING EDWARD MEMORIAL HOSPITAL
FOR WOMEN

II/38/459
10th May 1980

Dr J Keenham
Crandon House
King Edward Memorial Hospital
For Women
Hoggs Road
Subiaco WA 6008

Dear Dr Keenham,

The above project has now been approved by the Board of Management.

The Ethics Committee expressed concern that the patient has to sign
the consent form to participate in the study before knowing the full
content of the questionnaire. It was noted that after signing the
consent form the patient may feel obliged to answer all questions,
none of which are particularly innocuous about. To avoid patients
feeling any pressure about participating in the study, the Committee
felt a letter should be given to each patient reassuring them that
their care at King Edward Memorial Hospital is not dependent on their
taking part in the study.

Would you please advise the date of commencement of the project and
provide a copy of the findings at its conclusion or in 12 months,
whichever comes first? Should there be a delay in commencement of
more than 6 months the project would need to be reviewed by the
Committee.

Best wishes with your project.

Yours sincerely,

[Name]
Director of Medical Services
Appendices

Pharmaceutical Research Institute
Medical School

M. J. Fisher

18/2 2065

7th August 1990

Dr. V. Macdonald

Research Fellow
University Department of Paediatrics

PREMATURE BIRTH UNIT

Dear Dr. Macdonald

Registration Number: 586

Research Title: "The Origins of Disease in the Fetus, the Child and the Young Adult: A Western Australian Pregnancy cohort Study"

Approved: 1990-23-5 - 11st August, 1990

The Medical Advisory Committee of Research and Ethics Sub-Committee has recommended that approval be given for you to undertake the recommended research. This recommendation is subject to final confirmation by the Board of Management. You will be notified only if the Board does not accept the recommendation.

The laboratory and Ethics Sub-committee has been charged with the responsibility of keeping the progress of all approved research under surveillance. If the research is not completed within six months you are asked to submit a progress report. A copy of the final results must be forwarded to the Sub-committee upon completion of the research.

Please note: Approval for studies is for three years and the research should be commenced and completed within that period of time. Projects must be resubmitted if an extension of time is required.

Yours sincerely,

B J Kirby

MEDICAL DIRECTOR

Copy: Dr P. Landau
Dr. T. Stanley
Dr. N. Newham
Dear Professor Ely

REGISTRATION NUMBER: 846/EP

TITLE: The Raine study – physical activity levels, respiratory disease and hypoxia: primary-airway responsiveness in early adolescence

REFERENCE NUMBER: EC03-147

MEETING DATE: 20 March 2003

The Ethics Committee has recommended approval be given to you to undertake the abovementioned research study. This recommendation has been ratified by the Women's and Children's Health Service.

The Ethics Committee does however wish to be informed immediately of:

I. any unauthorised effects experienced by any participant in the trial where these effects in degree or nature were not anticipated by the researchers, and steps taken to deal with these,

II. substantial changes in the research protocol together with an indication of ethical implications, and

III. other unforeseen events.

The Ethics Committee has been charged with the responsibility of keeping the progress of all approved research under surveillance. A copy of the final report must be forwarded to the Committee upon completion of the research or if the research is not completed within twelve months you are asked to submit a progress report and annually thereafter. This information should include:

a) The status of the project (completed/in progress/abandoned/not commenced), in the event that a project does not commence within 12 months of being approved by the Ethics Committee the study must be resubmitted to the Committee for approval.

b) Compliance with conditions of ethical approval, including security of records and procedures for consent.

c) Compliance with any special conditions stated by the Ethics Committee as a condition of approval.

d) Results from the study to date, including outcome.

Please note that approval for studies is for three years and the research should be commenced and completed within that period of time. Projects must be resubmitted if an extension of time is required. In the event that a project does not commence within 12 months of being approved by the Ethics Committee the study must be resubmitted to the Committee for approval.

Please quote the above registration number on all correspondence.

Yours sincerely

[Signature]

Dr Graff Master
Executive Director
Medical Services

27 March 2003

a) Raine Study Co-ordinator

* The Ethics Committee is constituted, and operates in accordance with the National Health and Medical Research Council's National Statement on Ethical Conduct in Research Involving Humans.
Appendix E
Communication of the findings of this thesis

Conference presentations


Media coverage and other presentations
2013 - 3 Minute Thesis Competition UWA finalist.


2015 - SBS Radio - Spanish section with Frank Madrid.