AN INVESTIGATION OF OBESITY AND BINGE EATING BEHAVIOUR IN PRE-ADOLESCENT AUSTRALIAN SCHOOL CHILDREN

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ABSTRACT

Childhood overweight and obesity is a significant and increasing health problem both nationally and globally. Yet few interventions for preventing obesity have been successful, particularly in the long-term, suggesting that important factors are being overlooked. The aims of this thesis were to investigate (a) the prevalence of childhood overweight, obesity, and binge eating; and (b) the relationships between body weight, binge eating behaviour, and a set of physical, psychological, and psychosocial variables including parent body size, body dissatisfaction, size-related teasing experiences, internalisation of sociocultural messages, depression, dieting attitudes and behaviour, and emotional eating.

Participants were 569 grade five and six primary school children (272 boys and 297 girls) from Catholic and Government schools across metropolitan Melbourne, Australia. Almost 25% of participants were classified as overweight or obese. Thirteen percent of participants reported engaging in overeating (with or without loss of control), 14% reported loss of control (with or without overeating), and 6% reported engaging in binge eating (overeating and loss of control).

Structural equation modelling analyses found that body weight and binge eating were indirectly related. Body weight was directly and positively associated with parent body size, size-related teasing experiences, body dissatisfaction, and internalisation of sociocultural messages, negatively associated with emotional eating, and indirectly associated with depression, and dieting attitudes and behaviour. Binge eating was directly and positively related to parent body size, emotional eating, depression, and body dissatisfaction, while indirect associations were found with size-related teasing experiences, internalisation of sociocultural messages, and dieting attitudes and behaviour. A direct relationship between body dissatisfaction and loss of control was also found. Some gender differences were detected.

Multivariate analysis of variance also revealed that binge eaters scored significantly higher on measures of depression, size-related teasing experiences, internalisation of sociocultural messages, and angry and worried related emotional eating than non-binge eaters. Differences were also found for participants reporting the presence or absence of overeating (regardless of loss of control) and loss of control (regardless of overeating).
Overall, the study demonstrated that psychological and psychosocial factors have a significant association with both weight and binge eating behaviour in a non-clinical sample of preadolescent Australian school children. As such, future intervention programs may benefit by addressing these factors. In addition, these results support the idea of working toward the prevention of obesity and eating disorders simultaneously in children, and of extending research in this area to examine causality.
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DECLARATION

“I declare that this thesis contains no material which has been accepted for the award of any other degree or diploma, except where due reference is made in the text of the thesis. To the best of my knowledge, this thesis contains no material previously published or written by another person except where due reference is made in the text of the thesis.”

Name: Kellie Karantzas

Signed:
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CHAPTER ONE:
INTRODUCTION

The prevalence of childhood overweight and obesity in the Western world has increased to such alarming rates that it is being heralded as a global epidemic, and major public health crisis (Wang & Lobstein, 2006; World Health Organization [WHO], 2000, 2002). With nearly one quarter of Australian children overweight or obese (Booth et al., 2001), an urgent need to address this health problem is required. Of major concern is that overweight and obese children are at increased risk of co-morbidities including type 2 diabetes, pulmonary conditions, and orthopaedic disorders (Lobstein & Baur, 2005; National Health & Medical Research Council [NHMRC], 2003b). Overweight children are also at increased risk of adult obesity, which is related to increased risk of cardiovascular and metabolic diseases, certain cancers, and a range of other medical and psychological problems (Lobstein & Baur, 2005; NHMRC, 2003a).

Obesity has proven to be a protracted condition that is difficult and costly to treat (Caballero, 2004; Lobstein & Baur, 2005; Wang & Lobstein, 2006). As such, the need for effective prevention efforts during childhood, a critical period for the development of health behaviours, is seen as crucial in addressing the obesity epidemic. Unfortunately, the majority of prevention efforts have been far from successful (Lobstein & Baur, 2005; Summerbell et al., 2005). These efforts have predominantly focused on healthy eating and exercise behaviours, with limited attention being given to psychological or psychosocial variables. A major aim of this thesis is to extend the research knowledge regarding the psychological and psychosocial factors related to overweight and obesity in childhood, in the hope to provide a greater understanding of the multifaceted nature of the problem, with the potential to enhance current and future prevention and treatment programs.

1.1 Interventions for Preventing and Treating Obesity in Children

A recent Cochrane review of interventions for preventing obesity in children (Summerbell et al., 2005) found that of the twenty-two reviewed studies (randomised controlled trials and controlled clinical trials published between 1990 and 2005) all focused on either (a) combined dietary education and physical activity, (b) dietary education alone, or (c) physical activity alone. While nearly all of the interventions
resulted in some improvement in diet or physical activity, few studies impacted significantly on weight. For example, only one of ten long-term studies (≥12 months) resulted in significant improvements, although only for girls, not boys. Of the twelve short-term studies (between 12 weeks and 12 months), two studies found minor reductions in overweight status as a result of the interventions.

These results suggest a number of issues in relation to current interventions: (a) the duration and intensity of the interventions needs to be reconsidered, and/or (b) the content and design of the interventions requires reconsideration. Although it is acknowledged that community-wide interventions focusing on diet and exercise are important, it is the hypothesis of this thesis that one of the major problems with current interventions is that they do not reflect the complex and multifaceted nature of the obesity problem in children, focusing too narrowly on diet and exercise, while excluding potentially important psychological and psychosocial factors.

1.2 Integrating Obesity and Binge Eating Research

While the importance of diet and exercise is not disputed, the focus of this thesis is on factors that have received little attention in the child obesity literature to date. In particular the role of binge eating behaviour in childhood obesity is investigated. The Diagnostic and Statistical Manual of Mental Disorders - Fourth Edition - Text Revision (DSM-IV-TR, American Psychiatric Association [APA], 2000) defines binge eating as eating behaviour characterised by eating a large amount of food in a short period of time associated with a sense of loss of control over eating during the episode. Research with adult populations has clearly shown that binge eating behaviour has a significant role in the development and maintenance of obesity for a subset of the population (Dingemans, Bruna, & van Furth, 2002; Yanovski, 1993). Research has also shown that adolescent and preadolescent children engage in binge eating behaviour, and that this behaviour may be related to increased psychopathology, body dissatisfaction, dieting behaviours, and increased weight (Stice, Presnell, & Spangler, 2002; Tanofsky-Kraff et al., 2004).

While the study of binge eating in preadolescent children is in its relative infancy, the existing literature would suggest that the development and maintenance of binge eating behaviour in childhood might provide markers for future risk of obesity and eating disorders, particularly binge eating disorder (BED) and bulimia nervosa (BN), in adolescence and adulthood.
It is important to note that while binge eating is a core feature of both BED and 
BN (refer Appendix A), binge eating in this thesis is discussed in terms of the obesity 
and BED literature, with comparisons made to the BN literature only when appropriate.
The overarching theme of this thesis is the better understanding of childhood obesity.
While BN has been related to overweight and obesity (and child obesity may be an 
important risk factor for the development of BN), BED has clearly been implicated in 
adult obesity for a subset of the population (Spitzer et al., 1992; Spitzer, Yanovski, et 
al., 1993).

Striegel-Moore (2000) commented, “During the 1980s, obesity and eating 
disorders became separate research areas, and with a few noteworthy exceptions have 
remained separate to this day” (p. 344). She proposed the re-integration of these two 
research fields for a number of important reasons, including, among others, evidence 
that obesity is a risk factor for developing an eating disorder, and that some eating 
disorders may be a risk factor for obesity (Striegel-Moore, 2000). She also noted that 
studies of risk factors for obesity and for eating disorders have common implications, 
especially in relation to prevention efforts. Irving and Neumark-Sztainer (2002; 
Neumark-Sztainer, 2003, 2005a), have also posed the question “Can we simultaneously 
work toward the prevention of obesity and eating disorders in children and 
adolescents?” Such propositions are worthy of serious consideration, particularly in 
light of the lack of success of obesity prevention efforts to date. By viewing obesity, 
together with eating disorders, as being on a continuum of weight and eating problems 
(Neumark-Sztainer, 2003, 2005a), new possibilities for addressing childhood obesity 
arise.

This thesis attempts to take important first steps in bridging the gap between 
obesity and eating disorder research by investigating the prevalence of, and possible 
relationship between, obesity and binge eating in a non-clinical sample of preadolescent 
Australian school children. An additional aim was to better understand the role of 
psychological and psychosocial factors in childhood obesity and binge eating, including 
body dissatisfaction, size-related teasing experiences, the internalisation of sociocultural 
messages regarding appearance standards (e.g., the promotion of a thin ideal for 
females), depression, dieting attitudes and behaviour, and emotional eating. These 
factors have each been implicated in the development and maintenance of eating 
disordered behaviours, most prominently in adolescent and adult populations (Stice, 
2002). A number of these same factors have been identified as consequences of obesity.
However, less is known about the presence or influence of a number of these factors prior to adolescence. This study therefore employed a self-report, cross-sectional design to examine the associations between weight, binge eating, and these psychological and psychosocial factors in preadolescent children. Investigating the relationships between these variables in children was seen as a crucial first step in determining if future prevention efforts could indeed benefit from addressing obesity and eating disorders simultaneously.

1.3 Map of the Thesis

The thesis begins with a review of the current obesity crisis in preadolescent children, highlighting its increasing prevalence and its significant health problems. Chapter two continues the discussion of the complex nature of childhood obesity, addressing the physical, psychological, and psychosocial variables associated with preadolescent overweight and obesity. The chapter places emphasis on the relative neglect of these variables in the obesity literature compared to factors such as healthy eating and exercise, and presents a discussion of the psychological and psychosocial variables that have been neglected in the research to date that may have promise in increasing our understanding of the obesity problem, thus impacting on future prevention and treatment programs.

Chapter three focuses on binge eating behaviour, a variable that this thesis argues has an important role to play in better understanding the complexity of obesity, and its resistance to intervention, at least for a subset of the population. A link is drawn between the psychological and psychosocial factors that act as both consequences of obesity and risk factors for binge eating behaviour. As the study of binge eating behaviour in preadolescent children is still in its infancy, chapter three also draws on the adult, and adolescent, literature to show how, and why, binge eating is such an important variable to investigate in a study of childhood overweight and obesity. The chapter concludes with a detailed description of the study aims, research questions, and hypotheses.

Chapter four presents the methodology of this thesis, including a detailed description of the measures and procedures utilised in the study, as well as a description of the study participants. The chapter concludes with a discussion of the data analyses conducted to address the research aims of the thesis, with an explanation of structural equation modelling (SEM) techniques.
Chapter five presents the results of the thesis, reporting the prevalence of overweight, obesity, and binge eating in the current non-clinical sample of preadolescent Australian school children, and presenting the relationships found between weight, binge eating and the set of physical, psychological, and psychosocial variables of interest in this study.

Chapter six presents a review and discussion of the results in relation to the study aims, and to previous research findings as outlined in the literature review. A discussion of the study implications, as well as its strengths and limitations, is presented, and final conclusions are drawn.
CHAPTER TWO:

CHILDHOOD OBESITY – A PUBLIC HEALTH CRISIS

This chapter focuses on the multiple factors involved in childhood overweight and obesity. It begins with the prevalence of overweight and obesity and its health consequences, and then focuses attention on risk factors and psychological and psychosocial correlates and consequences. While the physical and social problems associated with childhood overweight and obesity are well documented, with many researchers focusing almost solely on interventions related to healthy eating and exercise, psychological and psychosocial factors have been given less prominence by researchers. In the following sections, the case is made for the necessary inclusion of psychological and psychosocial variables in childhood overweight and obesity research if a more complete understanding of this problem is to be obtained. Increased knowledge of the complex interplay between physical, psychological, and psychosocial factors is crucial for the development of successful prevention and treatment efforts.

2.1 Childhood Overweight and Obesity

Childhood overweight and obesity is currently being hailed as a serious health concern in many western countries, including Australia (NHMRC, 1997, 2003b; U.S. Department of Health and Human Services, 2001; Wang & Lobstein, 2006; WHO, 2000, 2002). The increasing prevalence of overweight and obesity is so widespread that the WHO (2000, 2002) has suggested that it is now a global epidemic. This section defines overweight and obesity in children and then presents a discussion of the increasing prevalence of childhood overweight and obesity, with a focus on Australian, and particularly Victorian school children.

2.1.1 Definitions of Overweight and Obesity

The terms overweight and obesity are commonly used almost interchangeably in the scientific and lay literature (Field, Barnoya, & Colditz, 2002). However, the two concepts are not identical. Overweight generally refers to weighing more than a standard level for height and age, while obesity is defined as weighing substantially more than a standard level for height and age (Field et al., 2002). While obesity is also defined as excessive body fat (Field et al., 2002; Wells, Coward, Cole, & Davies, 2002),
obesity is most commonly measured and classified according to excess weight relative to height, rather than excess fat (Wells et al., 2002).

The most widely defined medical measure of obesity is the Body Mass Index (BMI; Flodmark, Lissau, Moreno, Pietrobelli, & Widhalm, 2004): a measure of weight (in kilograms) normalised by height (in metres) squared. Adult obesity, defined as a BMI ≥ 30.0 kg/m², is associated with increased morbidity or mortality (Pi-Sunyer, 1991). Adult overweight is defined as a BMI between 25.0 - 29.9 kg/m², which is defined as being “at risk” for obesity.

While these definitions may be suitable to define adult overweight and obesity, much less is known about the associated consequences of weight on morbidity and mortality in children, and at what weight cut-offs these consequences may occur (Berkowitz & Stunkard, 2002; Cole, Bellizzi, Flegal, & Dietz, 2000). A further difficulty is that BMI in childhood changes substantially with age (Cole et al., 2000). Thus, for children and adolescents, overweight and obesity have been estimated by various statistical approaches, and these approaches have led to differences in estimates of its prevalence. One of the most common approaches consists of using some type of relative index of overweight such as 120% or greater than a “standard” weight-for-height or age- and sex-specific 85th (overweight) or 95th (obesity) percentiles (Booth et al., 2001; Cole et al., 2000). Use of these relative indices, predominantly based on American datasets, has significant shortcomings however, as it presents the “average” as a healthy standard, and precludes comparisons across international populations (Booth et al., 2001; Cole et al., 2000).

In an attempt to create a standard international definition of childhood overweight and obesity, the International Obesity Task Force proposed that the adult BMI cut-off points described above (i.e., a BMI of 25.0 kg/m² for overweight and 30.0 kg/m² for obesity) be linked to BMI centiles for children to provide child cut-off points (Bellizzi & Dietz, 1999). As a result, Cole et al. (2000) established a standard definition for child overweight and obesity based on international survey data. This definition provides cut-off points for overweight and obesity by gender for children aged two to eighteen years, as determined to be equivalent to the adult cut-off points for overweight and obesity at age eighteen. This definition of child and adolescent overweight and obesity is now included in the Australian National Health Data Dictionary (Denney-Wilson, Booth, & Baur, 2003), and has therefore been adopted in this thesis (refer to
chapter four), and in other recent Australian childhood obesity research (Booth et al., 2001; NHMRC, 2003b; Salmon, Timperio, Cleland, & Venn, 2005).

While it is acknowledged that there are other measures of adiposity (i.e., level of fat) in children than the BMI, BMI is seen as the most practical and convenient method for assessing overweight among young people in a research context (Denney-Wilson et al., 2003; NHMRC, 2003b). For a more detailed discussion regarding the suitability of BMI as a measure of obesity in children, please refer to chapter four.

### 2.1.2 Prevalence of Childhood Overweight and Obesity

Nearly one quarter of Australian children are overweight or obese, with evidence to suggest that prevalence rates are increasing over time (Salmon et al., 2005). A recent Australian paper analysed prevalence data of child and adolescent overweight and obesity from three independent Australian studies conducted between 1995 and 1997 (Booth et al., 2001). Using Cole et al.’s (2000) international BMI cut-off values, Booth et al. (2001) found that the population prevalence and distribution of overweight, obesity, and overweight/obesity combined were generally consistent across datasets. Prevalence of overweight ranged from 14-16% for boys and 16-18% for girls, while obesity prevalence was 5% for boys and ranged from 5-6% for girls (overweight/obesity combined was 19-21% for boys and 21-24% for girls). Similar results have been found with Victorian school children. For example, Wake, Salmon, Waters, Wright, and Hesketh (2002) found that 17% of children aged 5-13 years were overweight in 1997 while an additional 6% were obese. Salmon et al. (2005), in a more recent study, and also using Cole et al.’s (2000) BMI cut-off values, found increased rates of overweight and obesity in their sample of Victorian school children (grades 5 and 6), with data collected during 2001. They found that 22% of study participants were overweight, and 7% were classified as obese. Combined, these studies suggest that 19-29% of Australian children and adolescents are overweight or obese (Booth et al., 2001; Salmon et al., 2005; Wake et al., 2002).

There is widespread evidence that the prevalence of overweight and obesity in children and adolescents has increased globally since the 1980s (NHMRC, 2003b; WHO, 2002). As an example, Lynch, Wang, and Wilcken (2000) compared their large-scale study data, collected from 1994 to 1997, for Sydney school children aged 5-12 years with 1985 data. Lynch et al. (2000) found that there had been significant BMI changes over the 10-12 year period. Specifically, they found an average increase of
3.9% for all ethnic groups in boys and a 1.2% increase in girls, a significant increase even after controlling for age. Similarly, Lazarus, Wake, Hesketh, and Waters (2000) compared large-scale survey data for Victorian primary school children collected in 1985 and 1997. Results suggested a mean increase of slightly more than 1 unit of BMI over the 12-year interval after adjusting for age in both boys and girls. When BMI was plotted by percentile for the 1985 and 1997 data, plots clearly showed that the most substantial change in BMI occurred at the heavier end of the distribution, with relatively little change among children at the lighter end of the distribution (Lazarus et al., 2000).

These results reflect similar findings in the United States (Troiano & Flegal, 1998), the United Kingdom (Rudolf et al., 2004), and parts of North America, Eastern Europe, the Middle East, the Pacific Islands, and China (WHO, 2002). For example, Troiano and Flegal (1998) found that 11% of young Americans aged 6-17 years were obese between 1988 and 1994, compared to about 4% between 1963 and 1965. An additional 14% of young people were at risk for obesity (i.e., overweight), meaning that 25% of the study population were either overweight or obese (Troiano & Flegal, 1998). Between 1999 and 2002, the percentage of obese children increased further to 16%, with a total of 31% being either overweight or obese (Hedley et al., 2004).

Overall, these results suggest that despite recent, and often costly efforts to prevent and treat childhood overweight and obesity, prevalence is actually continuing to increase over time. Further, it appears that obese children are becoming even more obese.

2.2 Physical Consequences of Childhood Overweight and Obesity

The increasing prevalence of overweight and obese children both nationally and globally is significant in terms of its personal, social, and psychological consequences, risk factors, and correlates. This section outlines the known physical consequences of being an overweight or obese child, highlighting the significant immediate and future health problems, with the former often impacting on the latter, that are facing up to a quarter of our nation’s children. The remainder of the chapter will examine the demographic risk factors associated with childhood overweight and obesity, and end with a discussion of the psychological and psychosocial consequences and correlates of childhood overweight and obesity.

Childhood overweight and obesity promote chronic complications during childhood and adolescence, having both short- and long-term consequences. For
example, the Bogalusa Heart Study, a longitudinal study of cardiovascular disease risk factors in American school children aged 5-17 years, found that compared to normal weight children, overweight children were 2.4 times as likely to have high blood cholesterol, 4.5 times as likely to have high systolic blood pressure, 7 times as likely to have high blood triglyceride levels, and 12.6 times as likely to have high blood levels of insulin while fasting (Freedman, Dietz, Srinivasan, & Berenson, 1999). Nearly 60% of the overweight children had at least one cardiovascular disease risk factor (Freedman et al., 1999). Further, autopsy studies of children who died of traumatic causes show that early atherosclerotic lesions are already developing in the aortas and coronary arteries of overweight children (Berenson et al., 1998). As the number of cardiovascular risk factors increases, so does the severity of asymptomatic coronary and aortic atherosclerosis in young people (Berenson et al., 1998). Sorof, Lai, Turner, Poffenbarger, and Portman (2004) have suggested that their own results with an American sample of over 5000 10-19 year-old school children “confirm an evolving epidemic of cardiovascular risk in youth, as evidenced by an increase in the prevalence of overweight and hypertension” (p.475).

In addition, increased childhood obesity has resulted in an apparent epidemic of type 2 diabetes mellitus in children and adolescents (Pinhas-Hamiel et al., 1996). Type 2 diabetes was traditionally considered a rare disease among children and adolescents (Pinhas-Hamiel & Zeitler, 2000), however research at a large clinical centre in the United States found a 10-fold increase in the incidence of type 2 diabetes among children and adolescents over a ten-year period (Pinhas-Hamiel et al., 1996), and this excludes the likely countless cases that go undiagnosed. The implications of early-onset disease have not been studied, although type 2 diabetes in adults can reduce life expectancy. Extrapolation from adult data makes it clear that this trend has important implications for health risk (Pinhas-Hamiel & Zeitler, 2000).

Further physical complications associated with childhood obesity include pulmonary conditions such as obstructive sleep apnoea (Redline et al., 1999) and asthma (Rodriguez, Winkleby, Ahn, Sundquist, & Kraemer, 2002), orthopaedic disorders such as slipped capitap femoral epiphysis (Loder, Aronson, & Greenfield, 1993) and tibia vara (Thompson & Carter, 1990), and gastrointestinal/hepatic complications such as non-alcoholic steatohepatitis (Rashid & Roberts, 2000). Recent research also suggests an association between iron deficiency and overweight (Nead, Halterman, Kaczorowski, Auinger, & Weitzman, 2004). General physical functioning,
increased bodily pain, and general physical and mental health have also been associated with obesity in Australian children (Wake et al., 2002). A more detailed description of these and further physical complications of childhood overweight and obesity are reviewed in the NHMRC’s (2003b) published clinical practice guidelines for the management of overweight and obesity in children and adolescents.

In addition to the short-term consequences of childhood overweight and obesity, the long-term consequences pose a significant threat to the health and longevity of overweight and obese children. For example, childhood obesity, regardless of adult weight, has been found to be associated with increased adult cardiovascular morbidity and mortality (NHMRC, 2003b), as well as a significant increase, and an earlier appearance of, chronic disease in adulthood (Ford, Mokdad, & Ajani, 2004; Mossberg, 1989; Must, 1996). Of greatest concern and potential public health effect is the risk that childhood overweight and obesity will persist into adulthood (Berkowitz & Stunkard, 2002; Must, 1996). While it was once believed that infants would grow out of their “baby fat” and not become obese adults, significant associations between measures of adiposity in childhood and adulthood have been found (Freedman et al., 2005; Serdula et al., 1993; Whitaker, Wright, Pepe, Seidel, & Dietz, 1997). Serdula et al. (1993), in a review of studies published from 1970 to 1992, found that about half (42 to 63%) of obese school-age children were obese as adults. For all studies and across all ages, the risk of adult obesity was at least twice as high for obese children as for non-obese children. The risk of adult obesity was greater for children who were at higher levels of obesity and for children who were obese at older ages. Similarly, Whitaker et al. (1997) found that for obese children over the age of six, the probability of adult obesity exceeded 50% compared to about 10% for non-obese children. The risk was significantly greater if either one or both parents were also obese. Some of the most recent results from the Bogalusa Heart Study (Freedman et al., 2005) also support these findings, and have even found moderate associations between the BMI of 2-5 year-old children and adult adiposity.

The increased risk of adult obesity for overweight and obese children is clearly a concern. The literature has presented well-documented links between adult obesity and increased mortality and morbidity due to numerous conditions including, but not limited to, hypertension, diabetes mellitus, dyslipidemia, coronary heart disease, congestive heart failure, stroke, osteoarthritis, gallstones, sleep apnoea, certain types of cancers (colon, breast, endometrial, gall bladder), musculoskeletal problems, menstrual
abnormalities, impaired fertility, and increased pregnancy risks (National Institutes of Health, 1998; NHMRC, 2003a). Overall mortality is modestly increased for overweight individuals (BMI of 25-29.9 kg/m²) and markedly increased for those with a BMI over 30 kg/m², particularly those with severe obesity (NHMRC, 2003a; Troiano, Frongillo, Sobal, & Levitsky, 1996).

2.3 Demographic Risk Factors for Childhood Overweight and Obesity

Given the clear physical consequences of childhood overweight and obesity, it is important to understand the risk factors that may contribute to this significant health problem if successful intervention is to occur. The current knowledge regarding demographic risk factors for childhood overweight and obesity is briefly presented in this section. While the role of some risk factors, such as parental obesity are well known and clearly linked to childhood overweight and obesity, other factors such as gender and socioeconomic status (SES) are less clear.

2.3.1 Parental Weight

Scientific research has clearly demonstrated that heredity plays a significant role in the development of body size and obesity (NHMRC, 2003b; Price, 2002). Research shows that having at least one obese parent increases the risk of an obese child becoming an obese adult (Mossberg, 1989; Whitaker et al., 1997). For example, in a 40-year follow-up study of overweight children, Mossberg (1989) found that the degree of obesity in the family (parents and grandparents) was one of the most important factors for weight level in adulthood. Mossberg (1989) concluded that the correlation between the degree of obesity in the parents and the weight of the child both in childhood and in adult life indicates that genetic factors influence the weight level throughout life. Similarly, Whitaker et al. (1997) found that having an obese parent significantly increased the chance that an obese child would become an obese adult. They found that 79% of obese 10-14 year-old children with at least one obese parent were at risk to become an obese adult. As the child aged however, the child’s own obesity status became the most important predictor.

In contrast, Bouchard and Perusse (1993), in reviewing knowledge of the genetic basis of human body fat content and human obesity, concluded that the heritability of body mass for height or body fat content is not particularly high. Referring to adoption studies, they commented that the heritability level is unlikely to exceed 40% of the age-
and gender-adjusted phenotype and that the value is likely to be significantly less than that. Bouchard and Perusse (1993) noted the importance of the shared environmental conditions within the family, as well as the genetic influences. In support, research shows that children’s health attitudes and behaviours appear to be more similar than dissimilar to those of their parents, and that one of the most common ways in which children learn about health is through their familial relationships (Tinsley, 2003). It is also parents, often mothers, who have control over children’s diets and the foods that are purchased for the home (Tinsley, 2003). In addition to food choices, shared environmental factors within the family include, but are not limited to eating out practices and physical activity levels.

Social and community factors also need to be considered as part of the shared family environment. For example, access to parks and walking and bike paths, media influences, and food availability within the community are just a small number of the external influences that might contribute to both parent and child weight (Neumark-Sztainer, 2005b). As such it is difficult to separate the environmental and genetic influences on the association between parent and child weight. However, whether the influence is genetic or environmental (and most likely it is a combination of both) it is clear that there is a strong positive relationship between parental obesity and child obesity.

2.3.2 Gender

While the association between parent and child weight is clear, the role of gender in obesity development is less well established, and appears to vary with age. For instance, research shows that adult women have a higher percentage of body fat than men, a finding consistent across countries, cultures, and dietary habits (Price, 2002). One explanation put forward is that “autosomal obesity genes interact with the sex hormones to favour the accumulation of body fat in women” (Price, 2002, p.75). However, gender differences in childhood overweight and obesity are less clear. In their review of three large-scale Australian surveys, Booth et al. (2001) found no consistent relationships between the prevalence of overweight/obesity and gender, suggesting that gender differences may not present until adulthood. Further research is required to clarify the role of gender in childhood overweight and obesity development.
2.3.3 SES

Similar to gender, the relationship between SES and obesity in children is also unclear. An early review of the literature found inconsistent results (Sobal & Stunkard, 1989). For example, among girls 35% of studies found no relationship between SES and obesity, 40% reported an inverse relationship, while 25% showed a direct relationship. Results were similar for boys, with 41% of studies finding no relationship, 26% finding a direct relationship, and 32% reporting an inverse relationship (Sobal & Stunkard, 1989). More recent studies (e.g., Goodman, Slap, & Huang, 2003; Haas et al., 2003) however have found that both lower household income and lower parental education are associated with overweight and obesity in American boys and girls.

Similar inconsistencies have been found with Australian data. For example, summarised in Booth et al.’s (2001) review paper, one study (New South Wales Schools Fitness and Physical Activity Survey) reportedly found a significant relationship between lower SES and obesity in primary school-age girls, but not boys, while two other studies (National Nutrition Survey & Health of Young Victorians Survey) found no significant relationship for either girls or boys. To date, the data is far from in agreement on whether SES is a risk factor for childhood overweight and obesity, and further research is required to determine its potential influence as a risk factor. Better understanding of risk factors such as parent weight, gender, and SES will assist in tailoring future prevention programs where they are most required.

2.4 Psychological and Psychosocial Factors Associated With Childhood Overweight and Obesity

Research has contributed to an understanding of the physical, and some of the demographic, risks associated with childhood overweight and obesity, however far less is known about the psychological and psychosocial factors associated with excess weight (e.g., Friedman & Brownell, 1995; Zametkin, Zoon, Klein, & Munson, 2004). Yet it is these psychological and psychosocial factors that often present the most immediate consequences for children, beginning from an early age (Boutelle, Neumark-Sztainer, Story, & Resnick, 2002; Must, 1996) and continuing to have long-term implications (Boutelle et al., 2002). Further, it is an incomplete understanding of these psychological and psychosocial factors that may contribute to the difficulties with current prevention and treatment programs, and to long-term weight loss success.
This section begins with a discussion of the psychological variables that have received the greatest attention in the child overweight and obesity literature to date, starting with body dissatisfaction, depression, and dieting attitudes and behaviour, and reviews some of the current limitations. The section then examines those variables that have received less attention in the preadolescent research, including size-related teasing experiences, internalisation of sociocultural messages regarding appearance standards, emotional eating, and binge eating behaviour. A case is put forward for why these psychological and psychosocial variables are so important in better understanding the consequences of childhood overweight and obesity, and how they may contribute to the maintenance and further exacerbation of the problem (e.g., consequently acting as risk factors for weight problems). Binge eating behaviour is considered so important, yet understudied in regards to the obesity problem, that chapter three is devoted to a more thorough discussion of this factor.

2.4.1 Body Dissatisfaction

One of the most well researched psychological consequences of childhood overweight and obesity is its role in the development of body image problems (Thompson, 1996; Wertheim, Paxton, & Blaney, 2004). Increased BMI leads to greater body dissatisfaction and a desire to be thin in preadolescent boys and girls (Ricciardelli & McCabe, 2001; Schur, Sanders, & Steiner, 2000). As an example, Rolland, Farnill, and Griffiths (1996), in an Australian sample of preadolescent children, found that 76% of girls who were overweight wanted to be thinner compared to 30% of the normal-weight girls. Similarly, 56% of boys who were overweight wanted to be thinner compared to 13% of the normal-weight boys. Similar results have been found with American children (Cattarin & Thompson, 1994; Schur, Sanders, & Steiner, 2000; Striegel-Moore, Schreiber, et al., 2000). For example, Shur et al. (2000) found that a high BMI was consistently associated with higher levels of body dissatisfaction in children in grades 3-6, while Cattarin and Thompson (1994), in their longitudinal study, found that an initial overweight status predicted size and weight dissatisfaction three years later for female adolescents. Thus the literature generally agrees that overweight children, particularly girls, will have more body image concerns than average-weight children.

However, less is known about body image concerns in boys, and literature suggests that the source of body dissatisfaction is different between the genders.
(Cohane & Pope, 2001; McCabe & Ricciardelli, 2004a). For example, Cohane and Pope’s (2001) review paper showed that whereas girls typically wanted to be thinner, boys frequently wanted to be bigger. Thus, for boys, body dissatisfaction can represent either a desire for a thinner or a larger body. In support, McCabe and Ricciardelli (2004a) found that existing data show that a significant minority of boys desire a thinner body while a small proportion desire a larger body. A limitation with many studies in this area however, is that the majority fail to distinguish between ‘bigness’ due to increased muscle and that due to fat, making conclusions difficult. It is generally agreed however that body dissatisfaction in boys is associated with body weight, and is often associated with distress (Cohane & Pope, 2001).

In contrast, Thompson, Coovert, Richards, Johnson, and Cattarin (1995) suggest that there may be no direct causal relationship between weight and body dissatisfaction at all. Rather, they suggest that body dissatisfaction may be mediated by factors such as teasing experience (as suggested by the negative verbal commentary hypothesis, which proposes that a history of teasing about physical appearance is a risk factor for the development of body dissatisfaction). In their study of preadolescent and adolescent females, using covariance modelling, Thompson et al. (1995) found that teasing experience acted as a mediator between weight status and the development of body dissatisfaction. In a replication study with an Australian adolescent female sample, van den Berg, Wertheim, Thompson, and Paxton (2002) also found that body dissatisfaction was predicted more strongly by teasing history than by actual body size. None of these studies included males in their studies however, limiting any conclusions that can be made to female populations only.

Stormer and Thompson (1996) tested four different factors that have been hypothesised to lead to body dissatisfaction, including the negative verbal commentary, in a group of college women. The other three factors included (a) social comparison, which emphasises that individuals who frequently compare themselves to others, particularly people who are more attractive, are at increased risk for body dissatisfaction; (b) sociocultural influences, which hypothesises that societal factors, particularly the role of the media, offer powerful messages in relation to what is physically desirable and undesirable. Awareness and internalisation of these factors is hypothesised to be a risk factor for body dissatisfaction; and (c) maturational status, that is, early physical maturation, defined as the experience of puberty prior to one’s age group or prior to age eleven may be a risk factor for the development of body
dissatisfaction (Stormer & Thompson, 1996). Stormer and Thompson (1996) found that social comparison and sociocultural influences were the major significant predictors of body dissatisfaction, while teasing explained only a small part of the variance. They suggested that “because teasing and maturational status are developmental variables, it is likely that their influences may lead to the onset of excessive social comparison and/or internalization of societal standards of acceptable appearance” (Stormer & Thompson, 1996, p.200), adding to the complex nature of the relationship. Section 2.4.5 provides a more detailed account of the impact of sociocultural influences on body dissatisfaction, however maturational status and social comparison were not investigated in the current study.

While these hypotheses exist, they have often been generated in relation to female populations and it is not known whether they may also play an important role in the development or maintenance of body dissatisfaction in preadolescent boys. Further, while research shows that body dissatisfaction is directly or indirectly related to overweight and obesity, the consequences of body dissatisfaction also need to be considered, particularly how they might relate back to body weight itself, perpetuating and even possibly worsening weight problems and contributing to increased psychological difficulties. The following sections will examine additional psychological and psychosocial factors associated with overweight and obesity, but also associated with body dissatisfaction, and a discussion will follow of how these variables may all be related in an interconnected and complex interplay that maintains and increases our nation’s weight problem.

### 2.4.2 Dieting Attitudes and Behaviour

Similar to body dissatisfaction, the relationship between weight and dieting attitudes and behaviour appears straightforward, with dieting attitudes and behaviour being closely related to BMI. Research has consistently shown that both boys and girls who have a larger BMI report higher levels of dieting and exhibit more diet-related attitudes (e.g., McCabe & Ricciardelli, 2003; Rolland, Farnill, & Griffiths, 1997, 1998; Vander Wal & Thelen, 2000). For example, Vander Wal and Thelen (2000) found that obese children were significantly more likely to express concern about their weight, and to report engaging in dieting behaviours than normal-weight children, with girls more likely to report these attitudes and behaviours than boys. Rolland et al. (1997) similarly found that children’s dieting attitudes and behaviours (as measured by the Children’s
Eating Attitudes Test [ChEAT], refer to chapter four for more details) were related to their BMI status. They found that the majority of overweight children wanted to be thinner and had engaged in weight-reducing behaviours. While a minority of normal to underweight children were also engaging in dieting behaviours, the percentage of overweight children was significantly higher (Rolland et al., 1997). More recently, Saling, Ricciardelli, and McCabe (2005) found that BMI was the main predictor of dieting for their non-clinical sample of boys and girls, both cross-sectionally and longitudinally.

There is a considerable body of literature that clearly shows the high prevalence of dieting attitudes and behaviours in both boys and girls in the general population (Ricciardelli & McCabe, 2001). For example, specific estimates for dieting to lose weight vary from 20% to 56% for girls and 31% to 39% for boys (Ricciardelli & McCabe, 2001). The high prevalence of dieting is a concern. Early dieting and related behaviours have been found by many researchers to be risk factors, which may be associated, in the long-term, with weight cycling, chronic body image problems, obesity and eating disorders (Ricciardelli & McCabe, 2001). As an example, Field et al. (2003), in a recent three-year longitudinal study of 9-14 year-old children, found that dieters gained more weight than non-dieters. Similarly, Stice Cameron, Killen, Hayward, and Taylor (1999), in their longitudinal study of adolescent females, found that increased dieting and radical weight-loss efforts predicted both an increase in weight and an increased risk for onset of obesity. Analyses controlled for initial body weight.

While dieting is a concern in itself, the correlation between dieting attitudes and behaviours and the development of future eating disorders, as well as increased weight gain, makes these attitudes and behaviours of even greater concern. It should be noted however, that a recent review of relevant research found that professionally administered weight loss programs for overweight children and adolescents generally did not increase symptoms for eating disorders (Butryn & Wadden, 2005). Unfortunately the concern is that much reported dieting behaviour is not undertaken under appropriate professional supervision.

While it is well understood that a relationship exists between body weight and dieting attitudes and behaviour, this relationship is correlational in nature, and research suggests that the relationship may not be a direct relationship at all, but may be mediated by numerous other factors. For instance, dieting attitudes and behaviour, similarly to body dissatisfaction (refer section 2.4.1 above) may be influenced by a
variety of factors such as social comparison, internalisation of sociocultural messages of attractiveness, or weight-related teasing history. In support, van den Berg et al. (2002) found that dieting behaviour was not directly related to BMI. Rather, dieting behaviour was directly associated with body dissatisfaction, and body dissatisfaction was directly related to BMI. Similarly, Thompson et al. (1995) found that dieting behaviour was indirectly associated with BMI, through both body dissatisfaction and weight-related teasing history. However, both studies were conducted with adolescent females, and it is unclear whether these relationships will exist for preadolescent children, and particularly whether they will apply for boys. Research suggests that dieting attitudes and behaviour are a consequence of, but also a risk factor for, overweight and obesity, so it is important to better understand these relationships in younger populations.

2.4.3 Depression

Together with body dissatisfaction and dieting attitudes and behaviour, depression is one of the psychological variables commonly linked to childhood overweight and obesity. However, unlike body dissatisfaction and dieting attitudes and behaviour, the literature on the relationship between depression and body weight in children is somewhat contradictory. For example, there appears to be a common belief that overweight children are unhappy with their weight and experience more depressive symptoms. Much of this research has been conducted with clinical populations (Erickson, Robinson, Haydel, & Killen, 2000). Research with clinical populations has often compared clinical samples of obese children with non-clinical samples of non-obese children (Erickson et al., 2000). These studies generally show that obese children seeking treatment demonstrate increased psychopathology and social problems compared with their non-obese peers (Erickson et al., 2000). However, such comparisons do not take into account the possible confounder of treatment-seeking behaviour.

To address these difficulties, Braet, Mervielde, and Vandereycken (1997) conducted a controlled comparison between clinical and non-clinical samples of obese children, and found that the clinical group of obese children scored higher on parent-based reports of psychopathology compared with the non-clinical group. This is consistent with findings in the adult literature on obesity and depression, which show that obese persons seeking treatment demonstrate higher levels of psychopathology than obese persons not seeking treatment (e.g., Fitzgibbon, Stolley, & Kirschenbaum, 1993;
Friedman & Brownell, 1995), and that in fact obese persons not seeking treatment demonstrate no greater psychopathology than the general population (e.g., Friedman & Brownell, 1995; Stunkard & Wadden, 1992). In support, Wadden, Foster, Stunkard, and Linowitz (1989) found that obese adolescent girls did not report greater depressive or anxious symptoms compared with non-obese adolescent girls.

However, the literature on obesity and psychological disturbance in non-clinical samples of children does provide some conflicting evidence. For example, Mustillo et al. (2003), in a longitudinal study of children aged 9-16 years, found that chronic obesity was associated with depressive disorders for boys, but not for girls. Yet, in a study of third-grade children, Erickson et al. (2000) found a modest association between depressive symptoms and BMI for girls, but not boys. For girls, depressive symptoms were strongly associated with overweight concerns. After controlling for level of overweight concerns, BMI was no longer significantly associated with depressive symptoms. In contrast, after controlling for BMI, overweight concerns remained significantly associated with depressive symptoms (Erickson et al., 2000). Therefore, this relationship seems to be explained by an excess of overweight concerns, rather than level of overweight.

Other research also supports this finding. For example, in studies with young females, aged 10-17 years old, van den Berg et al. (2002) and Thompson et al. (1995) each found that depression was only indirectly related to body weight. Thompson et al. (1995) found that depression was related to both body dissatisfaction and teasing history, and these variables were related to BMI, while van den Berg et al. (2002) found that depression was related to body dissatisfaction (which was directly related to BMI), but not teasing history. More recently, Steinberg, Phares, and Thompson (2004), in their study with preadolescent boys and girls aged 8-11 years, found a direct relationship between depression and body dissatisfaction. This relationship was stronger in girls, but also evident in boys. Further, boys’ perceptions of parental teasing were also related to higher levels of depression. They did not however directly investigate the relationship between BMI and depression.

Clearly, both clinical and non-clinical studies reveal inconsistent findings, and the role of depression in childhood overweight and obesity is far from certain. Yet, as with body dissatisfaction and dieting attitudes and behaviour, both direct and indirect relationships may exist. A further concern is that depression related to increased BMI may have its own set of consequences that also perpetuate the obesity crisis. Thus it is
important to explore the nature of these relationships in preadolescent boys and girls to fully understand childhood overweight and obesity, and how best to most effectively address the problem.

2.4.4 Weight-Related Teasing Experiences

Research also shows that there is a relationship between weight-related teasing experiences and increased body weight, as well as between teasing and levels of body dissatisfaction, depression, and dieting attitudes and behaviour (as discussed in the previous sections), although much of this research has been conducted with adult or adolescent populations. However, the negative verbal feedback that overweight and obese youth receive in the form of teasing is well-documented (Heinberg, 1996). For example, in a study with adolescents, Neuman-Sztainer et al. (2002) found that 63% of very overweight girls and 58% of very overweight boys reported weight-related teasing by their peers, while 47% of girls and 34% of boys reported weight-related teasing by family members. Hayden-Wade et al. (2005) found slightly higher rates in their sample of 10-14 year-old children. They found that 78% of overweight children, compared to 37% of non-overweight children reported being teased or criticised about their appearance. Of those children who reported appearance-related teasing, the overweight children were teased significantly more for weight-related aspects of their appearance than the non-overweight children.

More often that not, these experiences have negative consequences. For example, Hayden-Wade et al. (2005) found that the degree of weight-related teasing was positively associated with weight concerns, loneliness, and liking of sedentary/isolative activities, and negatively associated with self-perception of physical appearance and liking of active/social activities. In addition, Shapiro, Baumeister, and Kessler (1991) found that 97% of grade 3 and grade 6 children reporting teasing experiences had negative responses to the teasing, including anger, embarrassment, hurt, or sadness.

Sadly, stigmatisation and non-acceptance of overweight is seen in all age groups across the life-span (Rand & Wright, 2000). Investigating opinions from a variety of age groups, Rand and Wright (2000) found the greatest level of intolerance of overweight to be held by preadolescent children. In an Australian sample of grade 4 to 6 primary school children, Tiggemann and Anesbury (2000) found that the silhouette drawing of an obese child was rated significantly more negatively than the silhouette drawing of a
normal-weight child. The obese child was perceived as being lazier, less happy, less healthy, less attractive, less hard working, and less confident. In addition, the obese child was not liked the best nor chosen as the preferred friend or playmate (Tiggemann & Anesbury, 2000). This was regardless of the child’s gender, age, and weight, suggesting that even overweight children hold this negative view toward child obesity (Tiggemann & Anesbury, 2000). In addition, obesity, unlike height, was perceived as controllable, and a positive relationship was found between controllability beliefs and negative stereotyping. A second study by Anesbury and Tiggemann (2000) attempted to reduce negative stereotyping of obesity in children by changing controllability beliefs. They found that while a short intervention was able to change children’s controllability beliefs, the intervention was not successful in reducing negative stereotyping among the experimental group compared to a control group.

Cramer and Steinwert (1998) found that the idea that ‘fat is bad’ is now present in the thinking of children as young as three years old. Based on this, they suggested that their research supported the position that the origin of this stigmatisation arises from a child’s social and cultural environment, rather than being a part of normal cognitive development (Cramer & Steinwert, 1998). All the same, this position should be viewed with a margin of caution, because although this hypothesis may likely be true, it is also a difficult one to prove.

Of great concern is the role that teasing plays in producing body image problems and eating disturbances in children (Hayden-Wade et al., 2005) as well as adolescent females (Lunner et al., 2000; Thompson et al., 1995; van den Berg et al., 2002). As discussed above, Hayden-Wade et al. (2005) found that weight-related teasing was positively associated with weight concerns. Among the overweight children, they also found significant positive correlations between degree of teasing and bulimic behaviours, but not body dissatisfaction. In addition, Thompson et al. (1995), as mentioned in section 2.4.1, found a directional relationship between weight status and teasing, but no causal relation between level of obesity and body image in adolescent females. Rather, teasing significantly predicted body image disturbance. Similar results were found by van den Berg et al. (2002) and Lunner et al. (2000), who replicated Thompson et al.’s (1995) study in different cultural samples, including Australian adolescents. In each of these studies, teasing either fully or partially explained the effect of BMI on body dissatisfaction.
Of concern, being teased as a child or adolescent appears to have serious repercussions in adulthood. For example, Thompson, Fabian, Moulton, Dunn, and Altabe (1991), in their study of adult women, found that teasing about weight/size while growing up was related to adult levels of eating disturbance, body dissatisfaction, a tendency to compare oneself to others in terms of appearance, self-esteem, and depression. Similarly, Grilo, Wilfley, Brownell, and Rodin (1994) found that appearance-related teasing while growing up was associated with body dissatisfaction in adulthood for a sample of adult female patients. Two limitations of such studies however, are (a) that they are retrospective in nature and rely on recall, often of distant times and experiences; and (b) that they are often conducted with obese populations seeking treatment. All the same, in their review, based on evidence predominantly from adult populations, Friedman and Brownell (1995) concluded that teasing history was a potential risk factor for the development of body dissatisfaction and general psychological distress in obese individuals. The research presented above would suggest that the same is also true for children and adolescents.

To date, studies investigating the impact of weight on teasing in preadolescent children, particularly males, have been limited. However it is imperative to understand the role of teasing in childhood overweight and obesity, its consequences and role as a possible risk factor so that interventions do not overlook potentially important factors. Such psychological variables may have serious immediate and future repercussions for children that, unaddressed, may hinder solutions to the obesity problem.

2.4.5 Internalisation of Sociocultural Messages

Another possibly important, yet neglected psychosocial factor is that of the relationship between childhood weight and the internalisation of sociocultural messages regarding appearance standards. Internalisation of these messages, defined as “a progressive process whereby interactions between the person and outer world are replaced by inner representations of the self and body” (Kearney-Cooke, 2002, p.100), is clearly implicated in the development of body image disturbance, regardless of weight (Field et al., 2001; Sands & Wardle, 2003; Stormer & Thompson, 1996, as discussed in section 2.4.1). However, less is known about whether the influence of sociocultural messages might also inadvertently place children, particularly overweight children, at increased risk for weight gain through the promotion of disturbed eating behaviours such as binge eating (e.g., sociocultural pressures to conform to ideal body
shapes may result in body dissatisfaction or dieting behaviour, which consequently might promote further eating disturbances such as binge eating).

The sociocultural approach has received widespread support (Heinberg, 1996), and is based on the belief that common or culture-wide societal factors, particularly those involving the print and video media, offer powerful messages regarding the (un)acceptability of certain physical attributes (Heinberg, Thompson, & Stormer, 1995). Stormer and Thompson (1996) concluded that internalisation of sociocultural attitudes appears to contribute more significantly to body dissatisfaction than simple awareness of social pressures to conform to particular appearance standards (e.g., being thin). For example, Griffiths et al. (1999) investigated the sociocultural attitudes towards appearance in Australian participants with and without a dieting disorder, using the Sociocultural Attitudes Towards Appearance Questionnaire (SATAQ, refer to chapter four for more details regarding this measure). This questionnaire has two subscales: (a) awareness, which measures the level of awareness of sociocultural messages regarding appearance; and (b) internalisation, which measures the level of acceptance of these sociocultural messages (Heinberg et al., 1995). Griffiths et al. (1999) found that dieting disordered participants were more aware of, and internalised, social attitudes to appearance significantly more than the non-dieting disordered population. Awareness of sociocultural attitudes was associated with eating pathology for those with eating concerns, but not for those without eating concerns, while the internalisation of sociocultural attitudes toward appearance was associated with eating pathology for both those with and without eating concerns. Similarly, in a preadolescent sample, Sands and Wardle (2003) found that both awareness and internalisation of ideal body shapes were central components in the development of body dissatisfaction. However, internalisation mediated the relationship between awareness and body dissatisfaction. Thus internalisation does appear to play an important role in body disturbance development, above and beyond that of general awareness.

It is clear that young boys and girls are no longer immune from sociocultural pressures to meet certain appearance standards once demanded only of adults. Investigating the relationship between childhood weight and the influence of sociocultural messages, recent research with Australian children has shown that overweight children perceive more sociocultural pressure to lose weight compared to normal weight children (McCabe, Ricciardelli, & Holt, 2005; Ricciardelli, McCabe, Holt, & Finemore, 2003). The source of the pressure included parents, peers, and the
media. In addition, Ricciardelli et al. (2003) found that perceived pressure to lose weight was associated with weight loss cognitions and behaviours, and body dissatisfaction in boys and girls, and with weight importance and strategies to increase muscles in boys. Further, perceived pressure to increase muscles was found to be the best predictor of muscle importance and strategies to increase muscles in both boys and girls. Additionally, McCabe et al. (2005) demonstrated that boys were more likely to perceive that they receive messages to increase muscles, and were more focused than girls on increasing muscles. Both studies suggest that boys and girls are aware of the sociocultural ideals for their gender, and are attempting to achieve these ideals (McCabe et al., 2005; Ricciardelli et al., 2005).

Smolak, Levine, and Thompson (2001), in their study of grade 6 and 7 boys and girls, similarly found that both boys and girls were affected by sociocultural messages regarding appearance standards (as measured by the SATAQ), and that this was related to weight. Internalisation of sociocultural messages was associated with the use of weight control and muscle building techniques for boys, while for girls, both awareness and internalisation of these messages was positively related to their reported use of weight control but not muscle building techniques. BMI was found to be significantly and positively associated with awareness of sociocultural messages for girls, but not for boys, while internalisation of these messages was positively related to BMI for both boys and girls. All effects were stronger for girls than for boys.

It is clear that messages conveyed through the print and video media, as well as via parents and peers, are promoting body dissatisfaction and dieting attitudes and behaviour. Levine, Smolak, and Hayden (1994) studied the relationship between sociocultural factors and eating attitudes and behaviours among girls aged 10 through 14 years. They found that approximately 60% of girls reported reading at least one fashion magazine regularly, with the majority of these girls considering them an important source of information about ideal shape, diet, fitness, and beauty in general. Further, 22% of the girls who read the magazines regularly reported considerable interest in emulating the fashion models, as compared to 11% of those who did not read them on a regular basis and 3% of those who did not read them at all.

Schur et al. (2000) studied body dissatisfaction and dieting in young children (grades 3-6). Of great concern was their reported result that media was the second most frequent source of information about dieting mentioned by children (55%); the first most frequent source of information was from hearing a parent discussing dieting or requiring
to lose weight). Exactly half of the children said that they heard about dieting on
television, predominantly through advertising rather than programs (Schur et al., 2000).
Schur et al. (2000) commented in their discussion that it was clear from their
experiences talking with children that they were “immersed in a culture where messages
about dieting are prevalent and that they soak up the information that is so widespread
in their environment” (p.80). In fact a study was conducted to determine underlying
motives in female students (grades 4, 8, and 12) when they compared their physical
attractiveness to that of models in advertisements (Martin & Kennedy, 1994). The
results indicated that students did make comparisons with the fashion models, and that
both self-evaluation and self-improvement were motives for making such comparisons.
Further, students felt bad about themselves as a result of these comparisons. Martin and
Kennedy (1994) also presented vignettes to the students showing them a picture of a
young girl (Susie) reading a magazine, with a written statement outlining that Susie
notices the pretty model in the advert and starts comparing the way she looks to the way
the model in the ad looks. The student is asked to make up a story about the pictured
girl, telling what else is happening at the moment, why Susie is doing what she is doing,
what Susie is thinking, and what will happen next. Below is one young fourth-grader’s
story explaining the vignette:

“There once was a girl named Susie. She was looking at this
magazine that had a model she wanted to look like if she
looked like a model, but she didn’t so she was mad at herself.”
(Martin & Kennedy, 1994, p.368)

This student response is a clear example of the way many young girls and boys may
think when viewing the myriad images of the portrayed “thin ideal”.

Further, Field et al. (2001), in their prospective study with preadolescent and
adolescent boys and girls, found that for both boys and girls, making considerable effort
to look like same-sex figures in the media was predictive of developing weight concerns
and becoming a constant dieter.

Combined, these studies all provide evidence of the obvious negative impact of
sociocultural messages on children and adolescents, with links to body dissatisfaction,
dieting attitudes and behaviour, and BMI. Given these associations, it is plausible to
expect that BMI and internalisation of sociocultural messages may be reciprocally
related to one another. For example, while increased BMI may lead to the increased salience and internalisation of sociocultural messages, this internalised pressure may then promote eating disturbances such as binge eating that increase the longer-term risk for weight gain. Understanding the possible role of this psychosocial factor in childhood overweight and obesity may assist in creating interventions that address primary, rather than secondary risk factors for ongoing weight problems in the future, while also addressing risk factors for disordered eating.

2.4.6 Emotional Eating

A far less researched psychological factor related to childhood overweight and obesity is emotional eating, although a common theme in the adult literature is that obesity may develop, or continue to be maintained, when a person’s eating behaviour is influenced by emotional states such as anxiety or depression, or when eating serves the function of coping with stressful experiences (Striegel-Moore et al., 1999). Numerous review papers have outlined the accumulated knowledge regarding this relationship between emotional states, eating, and obesity (e.g., Allison & Heshka, 1993; Christensen, 1993; Ganley, 1989; Greeno & Wing, 1994). A number of theories are consistently mentioned, with one of the major hypotheses, as outlined in the psychosomatic theories, being that obese individuals are unable to differentiate between hunger and negative emotional states, and that they abnormally increase eating in response to emotional distress (e.g., Allison & Heshka, 1993; Ganley, 1989; Greeno & Wing, 1994). Support for this hypothesis has been mixed, with methodological flaws such as poor study design and serious inflations in family-wise Type 1 error rate, leading to difficulties in drawing conclusions (Allison & Heshka, 1993; Greeno & Wing, 1994). Other theories have suggested that normal weight individuals tend to eat less in response to stress, while stress has no impact on eating habits of obese individuals. Again, studies investigating this theory have produced mixed results, confounded by methodological problems (Greeno & Wing, 1994).

Alternative theories receiving greater attention are that obesity and emotional eating may be indirectly related, with some theorists suggesting that dieting behaviour mediates the relationship. These theorists suggest that restraint (i.e., conscious attempts to limit food intake) predisposes individuals to emotional eating, and overweight individuals are more likely to be dieting than normal-weight individuals (Allison & Heshka, 1993; Greeno & Wing, 1994). Other theorists however suggest that binge
eating mediates the relationship between emotional eating and obesity, postulating that emotional eating, or attempts to regulate or escape negative affect might be predisposing factors for binge eating (e.g., Ganley, 1989; Heatherton & Baumeister, 1991; Stice, 2002), and that sustained binge eating behaviour leads to weight gain. These theories, and a discussion of these relationships are outlined further in chapter three, which reviews binge eating and its various risk factors, correlates and consequences. Certainly these latter theories may assist in an increased understanding of what role, if any, emotional eating plays in the development or maintenance of overweight and obesity.

The abovementioned theories have been developed with adult populations, and little is known about emotional eating in children (Braet & Van Strien, 1997). The few known studies that have examined emotional eating in children have produced conflicting results, and do not consistently support one or other of the emotional eating theories described above. For example, Braet and Van Strien (1997) investigated emotional, external, and restrained eating behaviour in 9-12 year-old obese and non-obese children (external eating is defined as eating induced by food-related stimuli, such as the sight or smell of food, regardless of hunger and fullness signals, Braet & Van Strien, 1997). Using parental reports of eating behaviour, they found that the obese children scored significantly higher on the scales for emotional, external, and restrained eating behaviour. They also found that emotional and external eating were both related to increased caloric intake, as might be expected, suggesting that they may be potential predictors of greater weight gain in the longer term. Additionally, restrained eating was positively related to emotional eating and external eating, while emotional eating and external eating were positively associated with each other (Braet & Van Strien, 1997). These results provide some support for both the psychosomatic and restraint theories.

Of interest, Striegel-Moore et al. (1999), in their study of emotion-induced eating in 9-10 year-old girls, found an inverse association between BMI and emotional eating. Similarly, Hill, Draper, and Stack (1994), in their study of emotional eating in 9-year-old boys and girls, found that the underweight girls had the highest mean rating on emotional eating and the overweight girls the lowest rating, while the boys varied little on this measure. These results suggest a number of explanations that warrant further attention. For example, perhaps thinner girls feel more comfortable reporting that they engage in emotional eating than heavier girls (Striegel-Moore et al., 1999). Interestingly, Hill et al. (1994) used the same measure as Braet and Van Strien (1997),
although the children completed the measure themselves, while Striegel-Moore et al. (1999) designed a new measure to assess emotional eating in children, also through self-report. Alternatively, perhaps being thin is a risk factor for emotional eating (Striegel-Moore et al., 1999). Perhaps the thinner girls engage in increased dieting behaviour that leads to the development of emotional eating, supporting the restraint model (although Hill et al., 1994, found that the overweight children scored highest on restraint).

While the literature does not provide clear answers on the nature of the relationship between child weight and emotional eating, evidence suggests that emotional eating is present in young children and may have significant consequences, such as weight gain. Further, current research suggests that emotional eating may be related to dieting attitudes and behaviour and binge eating for girls, and possibly also for boys. Extending our knowledge of these relationships is an important next step in further understanding the risk factors associated with childhood overweight and obesity. It is possible that the lack of attention given to emotion-based eating in children may be a contributor to the lack of success of prevention programs to date, at least for a subset of the population.

2.4.7 Binge Eating Behaviour

Another significant step in extending our knowledge of childhood overweight and obesity is studying the role of binge eating behaviour in the development of childhood weight problems. In 1959, Stunkard first described a distinctive subgroup of obese patients who reported recurrent uncontrolled binge eating behaviour (Stunkard, 1959). Many of Stunkard’s patients met the criteria for BED, as outlined in the DSM-IV-TR (APA, 2000) and shown in Appendix A. In other words, these patients displayed regular binge eating in the absence of the extreme weight loss behaviours characteristic of BN.

Since that time, many studies have noted significant differences between subgroups of overweight and obese individuals, suggesting that a subgroup of obese individuals exist with significant binge eating behaviour. This behaviour appears to impact on the success of weight loss treatments and other variables. As an example, compared to non-binge eaters, obese binge eaters report an earlier onset of obesity and a greater period of their lifetime on a diet (Marcus, 1993; Yanovski, 1993). They have also been found to differ in dietary attitudes and eating behaviours, to eat significantly more food in laboratory studies when instructed to binge or eat normally, to overeat
more in response to negative emotional states (i.e., emotional eating behaviour), to report lower levels of self-esteem, and display significantly greater levels of psychopathology, especially depression and personality disorders (Marcus, 1993; Yanovski, 1993). Recent literature suggests that binge eating, and BED, have important roles in both the development and maintenance of obesity in adult populations (Yanovski, 2003). However, much less is known about the relationship between binge eating and obesity in childhood or adolescence (Marcus & Kalarchian, 2003).

As recently as 2001, Thompson and Smolak noted in their edited book on body image, eating disorders, and obesity in youth, that BED would not be covered in the book because at that time there was not enough information or studies conducted with children and adolescents to warrant inclusion (Thompson & Smolak, 2001). However, the limited research to date does suggest that binge eating behaviour is an important factor in better understanding childhood obesity, and a number of prospective studies have found that binge eating is a risk factor for obesity in adolescent females (e.g., Stice, Cameron, et al., 1999; Stice et al., 2002). Thus, while the relationship between binge eating and weight in preadolescent children has only just begun to be explored, adolescent research provides strong indicators that obesity may be subtyped according to the presence or absence of binge eating, having implications for current intervention programs. One of the aims of this research is to investigate that link between binge eating and weight in preadolescent children. Consequently, binge eating and BED are examined in the next chapter.

2.5 Chapter Summary

Research shows that the prevalence of childhood overweight and obesity is on the rise and has many physical, psychological, and psychosocial correlates and consequences. A thorough summary of the current knowledge of these precursors and correlates of childhood obesity has been presented in this chapter. This chapter has also shown that the current literature suggests that aspects of child obesity are still not well understood, and deserve greater attention. For example, while some variables such as emotional eating and binge eating behaviour have been shown to be of importance in understanding obesity in adulthood, much less is known about their impact in preadolescent children. These factors have shown to be of importance when understanding and treating adult obesity and may hold keys for better understanding and effectively intervening in child obesity. Particular emphasis has been placed on binge
eating behaviour as a variable that may play an important role in understanding and intervening in child obesity. The next chapter presents a discussion of binge eating and BED in greater detail, with a focus on the role that this may play in childhood overweight and obesity.
CHAPTER THREE: 
THE SIGNIFICANCE OF BINGE EATING FOR 
CHILDHOOD OVERWEIGHT AND OBESITY

This chapter begins by defining binge eating and BED, and summarising prevalence rates in adults, children, and adolescents. An exploration of the multiple factors related to binge eating follows, beginning with a discussion of the physical and demographic factors, and following with a detailed review of the psychological and psychosocial factors related to binge eating behaviour.

Much of the literature in these sections is drawn from adult, and adolescent populations, due to the scarcity of studies investigating these behaviours in preadolescent children. Thus, where child studies are rare, a brief discussion of adolescent and adult research will be presented. The chapter concludes with the research questions of this thesis.

3.1 Definitions of Binge Eating and BED

This section defines binge eating and BED, and clarifies the differences between BED and BN. As indicated in chapter 1, the BN literature will not be reviewed in this thesis, however it is important to understand the differences between these similar, yet distinctly different, eating disorders.

3.1.1 Binge Eating

Binge eating, as defined by the DSM-IV-TR (APA, 2000), is characterised by two features, namely the consumption of a large amount of food in a discrete period of time (larger than most people would eat in a similar period of time under similar circumstances), and a sense of lack of control over eating during the episode (e.g., a feeling that one cannot stop eating or control what or how much one is eating).

Although there have been variations in the literature regarding the definition of binge eating, and what constitutes a binge (Fairburn & Wilson, 1993), it is generally agreed that loss of control is the cardinal feature of binge eating (Fairburn & Wilson, 1993; Pratt, Niego, & Agras, 1998). In support, Telch, Pratt, and Niego (1998) found that loss of control over eating was the only criterion used to define binge eating by
82% of obese female participants with BED (Telch et al., 1998). Recurrent binge eating is a core feature of both BN and the more recently proposed disorder, BED.

3.1.2 BED

BED is included as a research diagnostic category in the DSM-IV-TR, for consideration as a new clinical diagnostic category after further study (APA, 2000). It is characterised by recurrent binge eating episodes associated with marked distress, but without inappropriate compensatory behaviours such as taking laxatives or induced vomiting seen in BN (APA, 2000). It first appeared in the DSM-IV (APA, 1994) as a specific example of Eating Disorder Not Otherwise Specified (EDNOS). As illustrated in Appendix A, binge eating in BED is defined exactly as it is in BN, except that symptoms for a duration of at least 6 months, as opposed to 3 months for BN, are required for the diagnosis.

Researchers have debated whether BED was deserving of its own diagnostic category in the DSM-IV (APA, 1994), where it was first mentioned. For example, Fairburn, Welch, and Hay (1993) argued that its inclusion in the DSM-IV would be a source of diagnostic confusion, as it would be difficult to differentiate between those who have BN-nonpurging type and BED (see Appendix A). In their rebuttal, Spitzer, Stunkard, et al. (1993) argued that although BED was initially defined to anticipate a DSM-IV proposal that would have limited BN to a purging type, BED is now defined so as to exclude all cases of both purging and nonpurging BN. They argued that although it is true that some degree of overlap may exist between BED and BN, such imprecise boundaries are inherent in the classification of eating disorders, such as the boundary between subthreshold cases of anorexia nervosa with purging, and cases of purging BN (Spitzer, Stunkard, et al., 1993). Further they affirmed that recognising this continuum does not preclude the utility of defining different categories of eating disorders for both research and clinical purposes (Spitzer, Stunkard, et al., 1993).

In fact, since that time, research evidence does suggest that there are distinct differences between BED and BN (de Zwaan, 1997; Wilfley, Wilson, & Agras, 2003). For example, while binge eating appears to develop in the context of dieting in the BN literature, in BED the onset of binge eating frequently begins in the absence of prior dietary restraint or weight loss (Abbott et al., 1998; de Zwaan, 1997; Dingemans et al., 2002; Mussell et al., 1995). Further, research shows that there are differences in age of onset of binge eating, with BED patients reporting an earlier onset than BN patients (de
Zwann, 1997). In addition, compared with participants with BN, those with BED appear to display less dietary restraint and lesser amounts of psychological distress and psychiatric comorbidity (de Zwann, 1997; Dingemans et al., 2002). BED is also generally more responsive to treatment than BN (Wilfley et al., 2003). The expanding body of research in this area clearly provides evidence that BED is clinically different to BN in numerous ways (Wilfley et al., 2003), and evidence is building that suggests BED is indeed deserving of its own diagnostic category. Thus, while BED is not yet a formal diagnosis within the DSM-IV, it is however generally accepted and utilised in clinical practice (Dingemans et al., 2002).

### 3.2 Prevalence of Binge Eating and BED in Adult Populations

Most research into binge eating behaviour and BED has focused on adult populations. More recently, researchers have begun to pay attention to both the presence of binge eating and BED in adolescents, and more rarely, children. However, as much of this work developed from the adult literature, this section will provide an overview of the prevalence of binge eating and BED in adult populations before discussing the prevalence of binge eating and BED in adolescent and preadolescent populations.

#### 3.2.1 Binge Eating in Adult Populations

Binge eating was first recognised by Stunkard (1959) as a distinctive clinical feature in observations of his obese patients and their eating patterns. Research shows that binge eating is a prevalent problem for both adult men and women and is found in all weight groups (McCabe & Ricciardelli, 2004b; Stunkard, 1993). However, determining true prevalence rates has been a difficulty in the literature for methodological reasons (e.g., problems with definitions and interpretations of binge eating, as well as self-report versus interview measures; McCabe & Ricciardelli, 2004b). For example, the way men and women often experience and interpret binge eating behaviour differs (Fairburn, Hay, & Welch, 1993; McCabe & Ricciardelli, 2004b). Research shows that women place greater emphasis on loss of control and associated feelings of distress while men place greater emphasis on the total amount eaten (Fairburn, Hay, et al., 1993; McCabe & Ricciardelli, 2004b).

Prevalence estimates of binge eating behaviour range from 14% to 49% for males, and from 17% to 79% for females (McCabe & Ricciardelli, 2004b). Binge eating correlates positively with body weight (e.g., Bruce & Agras, 1992; Hay, 1998; Telch,
Agras, & Rossiter, 1988) and is found among both community and clinical populations (e.g., Fairburn, Hay, et al., 1993; Hay, 1998; Spitzer et al., 1992), although to varying extents. For instance, research consistently shows that the prevalence rates of binge eating in persons enrolled in weight loss or treatment programs are significantly higher than in community populations (e.g., Fairburn, Hay, et al., 1993; Hay, 1998; Spitzer et al., 1992).

Prevalence rates of binge eating in treatment samples range from one quarter to one half of enrolled patients (Spitzer et al., 1992). One study noted that the rates of binge eating in a sample of Overeaters Anonymous attendees were as high as 83% (Spitzer et al., 1992). However, researchers have suggested that these figures are artificially inflated due to methodological flaws as discussed above (Castonguay, Eldredge, & Agras, 1995; Fairburn, Hay, et al., 1993).

In contrast, binge eating occurs much less frequently in community populations, and occurs in people of normal body weight as well as those who are overweight or obese (e.g., Hay, 1998; Spitzer et al., 1992). In Spitzer et al.’s (1992) multi-site study described below, they found that in their community-based sample, 6% of participants reported binge eating behaviour. Similarly, in an Australian representative community-based sample of both adolescents and adults, Hay (1998) found that 3% of participants had regular current episodes of binge eating. However, Robertson and Palmer (1997), in their community sample of British women with a history of obesity, found that 24% reported binge eating behaviour, similar to some treatment samples. The variability in these figures may be a further example of the measurement problems in binge eating research.

3.2.2 BED in Adult Populations

Spitzer and colleagues (1992) carried out the first formal study of BED over a decade ago. The study was a multi-site field trial of almost 2000 participants, which included eight weight control samples (six groups currently enrolled in programs and two groups previously enrolled) and three community samples. The study provided strong psychometric support for a binge eating syndrome, which represented the distinctive symptomatic features of BED. Spitzer and colleagues (1992) found that BED was common in the eight weight control samples, with an overall prevalence of 30%. Looking at a more specific population, Spitzer et al. (1992) also found that more than 70% of 230 individuals in Overeaters Anonymous met the same criteria for BED. The
prevalence of BED in the three community samples was 2%. In a second multi-site study designed to further address the validity of the diagnosis of BED, Spitzer, Yanovski, et al. (1993) found that approximately 29% of individuals in a wide variety of weight control programs satisfied the initial diagnostic criteria for BED. In the non-clinical community sample the prevalence of BED was 4.6%.

Using criteria for BED specified by the DSM-IV, Brody, Walsh, and Devlin (1994) found that 19% of participants in a treatment program met those criteria, substantially lower than found in previous research (e.g., Spitzer et al., 1992; Spitzer, Yanovski, et al., 1993). As Brody et al. (1994) noted, however, their sample was limited to mildly obese subjects, which may have prevented them from achieving an “accurate” (i.e., higher) estimate of the level of BED in overweight individuals.

In her Australian community-based study, Hay (1998) found that BED was prevalent in only 1% of all participants. Hoek and van Hoeken (2003) completed a review of the prevalence and incidence of eating disorders. Again noting methodological problems in this area of research, they reported prevalence rates of BED ranging from 0.2% to 4.5% (Hoek & van Hoeken, 2003). Based on available evidence, they concluded that the prevalence of BED was at least 1%.

Taken together, these results suggest that the prevalence of BED in adult populations appears to be greater than 20% in treatment populations, and under 5% in community-based populations, a substantial and important difference.

3.3 Prevalence of Binge Eating and BED in Children and Adolescents

Adult studies conducted with clinical populations have reported the mean age of individuals with BED to be in their early to mid 40’s, while in community samples the mean age tends to be younger, varying from the late 20’s to mid 30’s (Castonguay et al., 1995). These results suggest that individuals with BED are likely to suffer with the disorder for some time prior to seeking treatment, and the research shows that the onset of BED seems to take place between 19 and 25 years (Castonguay et al., 1995). However, the onset of binge eating has often been traced retrospectively by adults to late childhood or early adolescence (e.g., Abbott et al., 1998). More recent research with children and adolescents supports these retrospective claims with cases of binge eating and BED being reported in this younger population. Current knowledge of these prevalence rates is discussed in this section.
3.3.1 Binge Eating in Children and Adolescents

Research suggests that eating problems are often present by preadolescence (Lamerz et al., 2005; Stice, Agras, & Hammer, 1999; Tanofsky-Kraff et al., 2004), yet little is known about the age of emergence of these early eating disturbances or risk factors for these behaviours (Stice, Agras, et al., 1999). Stice, Agras, et al. (1999) investigated the timing of onset of disturbed eating during childhood and the predictors of these behaviours. They followed a sample of children and their parents for the first five years of the children’s lives. Over the five-year study period, mothers reported that 34% of children experienced the emergence of overeating. Of these children, 60% experienced these behaviours for two years or more, suggesting that while the authors were often predicting the first occurrence of this behaviour, in some cases they may have also been describing the onset of an enduring state. Stice, Agras, et al. (1999) also found that the risk for the emergence of these eating behaviours accelerated annually over the study period and was at the highest levels at age five. Furthermore, they found that heightened maternal restraint and drive for thinness, as well as infant BMI in the first month of life (suggesting a genetic component), predicted an increased risk for the emergence of overeating (Stice, Agras, et al., 1999). In further support, Lamerz et al. (2005), in a cross-sectional field survey of 5-6 year-old German children, found that episodes of binge eating were found in 2% of children surveyed. A significant relationship was again found between children’s binge eating and maternal eating disturbances. These findings suggest that there are eating disturbances that emerge during early childhood, and the possibility remains that the risk for the onset of these eating disturbances continues to increase during late childhood.

More commonly, researchers have investigated the prevalence of binge eating in late childhood to adolescence. In an Australian study of adolescent males and females, Maude, Wertheim, Paxton, Gibbons, and Szmukler (1993) found that approximately 20% of females and 25% of males reported bingeing behaviour at least weekly, while an additional 18% of females and 15% of males reported bingeing behaviour at least twice monthly. These results are higher than some others reported in younger samples, supporting the suggestion that eating pathology increases with increasing age. For instance, in another Australian sample of younger boys and girls aged 8-12 years, Rolland et al. (1997) found that 28% of children reported binge eating at least sometimes, with significantly more males reporting binge eating behaviour than females.
Lower prevalence rates have been reported by community-based American samples. For example, Maloney, McGuire, Daniels, and Specker (1989) found that 10% of 7-13 year-old children reported “going on eating binges where [they felt they] might not be able to stop” (Maloney et al., 1989). Childress, Brewerton, Hodges, and Jarrell (1993), in their sample of 9-16 year-old boys and girls, found that 16% of children reported binge eating behaviour. In each of these studies boys also reported binge eating significantly more than girls. Childress et al. (1993) suggested that these reports of binge eating in males might not be indicative of eating pathology, given the large caloric requirements of growing young males. However, the argument could also be made that growing young females also would have large caloric requirements.

Far fewer studies have investigated binge eating in obese adolescents or children (Decaluwe, Braet, & Fairburn, 2002; Tanofsky-Kraff et al., 2004). In the earliest studies, Severi, Verri, and Livieri (1993) reported that in a sample of 52 obese Italian adolescents aged 13-19 years, who each underwent a clinical interview, 27% of the girls and 18% of the boys were found to engage in binge eating behaviours. Similarly, Berkowitz, Stunkard, and Stallings (1993) used a diagnostic interview to evaluate binge eating among 51 obese American girls between the ages of 14 and 16. They found that 30% of these girls engaged in binge eating.

Later studies have found higher prevalence rates. For example, Britz et al. (2000), using a diagnostic interview, detected binge eating episodes among 60% of female and 35% of male obese adolescents and young adults in their German sample ($n = 47$; age range 15-21 years). Decaluwe et al. (2002) studied binge eating in 126 10-16 year-old obese children and adolescents seeking residential care due to their obesity. Binge eating episodes were reported by 35% of the boys and 37% of the girls, assessed by a self-report version of the Eating Disorder Examination. Six percent of the research sample reported two or more episodes of binge eating a week. In the most recently published study, Isnard et al. (2003) found in their French sample of severely obese adolescents (aged 12-17 years) that 26% of the boys and 15% of the girls reported moderate to severe binge eating behaviour. Taken together, these studies report prevalence rates between 16-30% using interview assessments of binge eating behaviour and 15-37% using self-report questionnaire assessments. The one exception was Britz et al. (2000) who found prevalence rates as high as 60%. As discussed earlier, understanding true prevalence rates of binge eating is difficult due to methodological problems. The range of prevalence rates described here is based on different criteria for
determining binge eating, and different methodologies. Even the interview methods vary across studies. All the same, the results do suggest that particularly for populations of treatment-seeking obese children and adolescents, binge eating is a prevalent occurrence for a significant minority.

Three of the published studies investigating binge eating in non-treatment-seeking overweight and obese children are of particular interest to the current study. Morgan et al. (2002) investigated loss of control over eating, adiposity, and psychopathology in 112 overweight American children aged between 6-10 years. Participants were initially categorised into four groups; those who reported at least one episode of overeating associated with loss of control, those who described loss of control alone, without overeating, a group who endorsed simply overeating episodes without loss of control, and a no-episode group. Thirty-seven children (33%) reported at least one episode of loss of control, with (18%) or without (15%) overeating. Of the remaining participants, 14% endorsed simple overeating episodes, while 53% reported no overeating episodes. Interestingly, they found that those children reporting at least one episode of loss of control over eating, regardless of the presence of self-defined overeating, were heavier and had higher scores on scales of anxiety, depression, body dissatisfaction, and disturbed eating attitudes than those not reporting loss of control (Morgan et al., 2002). As Morgan et al. (2002) noted, the behaviour of children endorsing loss of control but not overeating may be of special interest because it has been argued that loss of control is the most important component defining binge eating, regardless of the size of the binge (e.g., refer to Section 3.1.1). Supporting this, Morgan et al. (2002) found that those children who reported loss of control without overeating were statistically indistinguishable from those who reported loss of control associated with overeating, in terms of weight status and levels of general psychopathology.

The second, more recent study, also conducted by members of the same research team in the United States (Tanofsky-Kraff et al., 2004), found similar results with their non-treatment-seeking sample of overweight and normal weight children (aged 6-14 years). Nine percent of the children reported binge eating behaviour (loss of control with either objective [6%] or subjective overeating [3%]), 20% reported simple overeating episodes, and 70% reported no episodes. Compared to the normal weight children in the study, the overweight children reported significantly greater binge eating episodes (15% of overweight children compared to 4% of the normal weight children), explaining the overall lower figure of binge eating in this combined sample compared to
the previous study above which investigated binge eating only in overweight children. Further, eating with loss of control, compared with no overeating or overeating without loss of control, was significantly related to greater eating pathology, higher BMI, and greater body fat mass, although not related to degree of depressive symptoms or trait anxiety.

3.3.2 BED in Children and Adolescents

Despite the reported high prevalence of binge eating in children and adolescents, only a small percentage of those who report binge eating actually meet criteria for BED (Morgan et al., 2002). Berkowitz et al. (1993) were among the first researchers to study BED in adolescents. They found that 30% of the female adolescents in their sample, all in treatment for severe obesity, manifested “unequivocal binge eating” according to the Gormally Binge Eating Scale. They did not report however the percentage of adolescents who fulfilled the diagnostic criteria for BED. The reported prevalence of 30% adolescents engaging in binge eating is similar to the reported figures among obese adults seeking treatment (section 3.2.2; Spitzer et al., 1992; Spitzer, Yanovski, et al., 1993).

Later studies that have investigated prevalence of BED according to the diagnostic criteria as set out in the DSM-IV (APA, 1994) have found much lower percentages. For example, three different studies conducted with American and Norwegian children and adolescents have all found a prevalence rate of BED equal to 1%, with the majority of participants with BED being females (e.g., Decaluwe & Braet, 2003; Johnson, Rohan, & Kirk, 2002; Rosenvinge, Borgen, & Borresen, 1999).

Ackard, Neumark-Sztainer, Story, and Perry (2003), in their study of overeating among adolescent boys and girls, found a slightly higher prevalence of binge eating syndrome (defined as high frequency of objective overeating with loss of control and distress regarding the binge eating, measured using 4-items from the Questionnaire of Eating and Weight Patterns – Revised, QEW–R, as described in chapter four). Three percent of girls and 1% of boys fulfilled criteria for binge eating syndrome. Morgan et al. (2002), in their sample of overweight children, found that six children (5%) met questionnaire criteria for BED (using the QEW– Adolescent Version [QEW–A]). However, Morgan and colleagues noted that because at least some of the episodes elicited by the QEW–A might not meet strict criteria for objective binge episodes, a prevalence for BED of 5% in overweight children may prove to be an overestimate of
the actual number of children meeting criteria for BED (Morgan et al., 2002). This methodological issue is one worthy of consideration when interpreting all such results, particularly with younger children. Tanofsky-Kraff et al. (2004) found no cases of BED in their more recent study of binge eating behaviour in overweight and normal weight children.

At this stage, the investigation of BED in adolescence and preadolescence is still in its infancy. Although evidence suggests that children as young as six may suffer from BED, an alarming possibility, more work is necessary to better understand the prevalence of BED in young children, and how it might develop and be maintained.

3.4 Physical Consequences of Binge Eating and BED

This section briefly describes what is known about the physical consequences of binge eating and BED. Research investigating physiological differences between individuals who binge eat and those who do not is limited. The major physical consequence of binge eating, as would be expected, appears to be increasing BMI (Yanovski, 1993). This association is of grave concern given the physical and psychological consequences of overweight and obesity (as discussed in chapter two). Apart from increasing BMI however, research suggests that binge eating and BED are related to a number of other physical consequences. Current knowledge regarding these consequences is also outlined in this section.

3.4.1 Body Weight

The association of binge eating and adiposity is well established in the literature (Dingemans et al., 2002; Yanovski, 1993), and there is considerable evidence that increases in the prevalence of binge eating and BED are associated with increasing severity of obesity (Bruce & Agras, 1992; Dingemans et al., 2002; Spitzer et al., 1992). As an example, Bruce and Agras (1992) found that for a community-based sample of women, those with BED were more likely to be severely overweight compared to those who were classified as binge eaters (in this case defined as meeting criteria for BED with the exception of meeting the twice-weekly frequency criteria), suggesting that frequency of binge eating may mediate the relationship between binge eating status and overweight (Bruce & Agras, 1992). de Zwaan (1997), in her invited article on the status and utility of BED as a diagnostic category, noted that there may well be a positive correlation between binge eating severity and the degree of obesity, although some
studies have found no such correlation. Of significance however is that no studies had reported a significant negative correlation (de Zwaan, 1997).

Mussell et al. (1995), in their analysis of retrospective reports of obese women seeking treatment for BED found that most women reported being within the normal weight range (i.e., BMI between 20 to 24.9) during adolescence, and that obesity did not develop until an average of 10 years after the mean onset of BED. In fact, community studies generally show that the majority of individuals who meet criteria for BED are not obese, and almost half are not even overweight (Yanovski, 2003). However, Striegel-Moore, Dohm, et al. (2000), in their study of subthreshold BED, noted from their data that even at frequency levels that failed to satisfy diagnostic criteria for BED, recurrent binge eating was correlated with increased BMI. Obesity was significantly more common among women with subthreshold and diagnosed BED, compared to a sample of age-matched healthy controls. Striegel-Moore, Dohm, et al. (2000) did not however collect retrospective data about early weight history.

The literature with adolescents and children, however, is contradictory. For instance, Morgan et al. (2002), in their study with community-based overweight children aged 6-10 years, found that overweight children who reported episodes of loss of control not only had greater body weight and BMI, but also had greater adiposity than those with no loss of control, regardless of the presence of overeating. Similarly, Lamerz et al. (2005) found a relationship between binge eating and obesity in children as young as five years, while Field et al. (2003), in their community sample of preadolescent and adolescent boys and girls found that binge eating was an independent predictor of weight gain for boys, but not for girls. Most recently, Tanofsky-Kraff et al. (2006) found in their prospective study with children at high risk for adult obesity that binge eating (as assessed by the QEWPA) predicted increases in body fat (as measured by dual-energy x-ray absorptiometry, a highly accurate method for measuring body fat mass). On average, children who reported binge eating gained 15% more fat mass during the study period compared with children who did not report binge eating.

In contrast, Berkowitz et al. (1993), in their study with obese adolescent girls seeking treatment, found no relationship between the severity of binge eating and BMI. Similarly, Decaluwe et al. (2002), in their study of obese children and adolescents seeking inpatient treatment for their obesity, found that there were no differences in degree of overweight between binge eaters and non-binge eaters. However, Decaluwe and Braet (2003), in a later study with children seeking treatment, did find a significant
relationship between severity of binge eating and severity of overweight. Interestingly, they found that level of overweight preceded binge eating behaviour. Stice (2002), in his review paper, also noted that body mass had predicted onset of binge eating behaviour in a number of research studies. All the same, Stice (2002) concluded that BMI was not a direct risk factor for the development and/or maintenance of eating pathology. Given the limited study of binge eating in children and adolescents to date, and the often-delayed weight gain of individuals with BED, more work is required to better understand the relationship between body weight and binge eating at such a young age. It may be that the association between binge eating and body weight is not established until adulthood, although a body of research does suggest that this association is already evident in childhood, at least for a subset of the population.

3.4.2 Short-Term Consequences

Although there appear to be short-term consequences of binge eating behaviour, the information described in this section is derived from adult populations, and no studies to my knowledge have investigated the direct short-term consequences of binge eating in children and adolescents. However it would seem sensible to suggest that the short-term consequences discussed here might also be a concern for children and adolescents.

Cooper (1995) and Fairburn (1995), in their respective self-help texts, described the most immediate consequences of binge eating behaviour. They noted that binge eating has immediate physical consequences, such as producing a sense of fullness and bloatedness. Extreme fullness can lead to abdominal discomfort, and acute pain in the abdomen (Cooper, 1995; Fairburn, 1995). This fullness can also lead to breathlessness, caused by the distended stomach pressing up against the diaphragm and interfering with breathing. In rare cases, the stomach wall can be damaged and even tear. General digestive problems, including stomach cramps, flatulence, constipation, and diarrhoea are also common among people who binge (Cooper, 1995; Fairburn, 1995). Additional short-term consequences of binge eating may arise indirectly such as those related to overweight and obesity. These consequences were described in section 2.2.

In her reviews, de Zwaan (1997, 2001) discussed the metabolic characteristics of BED. She noted that few studies have investigated physiological differences between obese individuals with and without BED. de Zwaan (1997, 2001) found no evidence that obese subjects with BED were more prone to medical consequences of obesity than
obese subjects without BED if one controls for weight. Further, she found no significant
differences between obese binge eaters and non-binge eaters of comparable weight and
age in blood pressure, resting metabolic rate, resting energy expenditure, body fat
distribution (waist/hip ratio), percentage body fat, or blood levels of glucose, insulin,
lipids or thyroid hormones (de Zwaan, 1997, 2001). In addition no associations have
been found between binge eating severity and glycaemic control in obese patients with
type 2 diabetes (de Zwaan, 1997). However, a more recent review indicated that BED
has been associated with poorer physical health (Wilfley et al., 2003). One additional
difference noted in the literature is that obese women who binge eat have a greater
gastric capacity than obese women who do not binge eat (Yanovski, 1993). It is
proposed that binge eating enlarges gastric capacity, diminishing satiety signals and
leading to ever increasing binge sizes (Yanovski, 1993).

3.4.3 Long-Term Consequences

Since the prevalence of BED is increased with more severe obesity, generally
individuals with BED represent a population at risk for the medical complications of
obesity (Yanovski, 1993). For example, BED is prevalent in participants with type 2
diabetes, with rates ranging from 6-8% (Dingemans et al., 2002). It has been suggested
that BED precedes type 2 diabetes in most patients, and that BED is one of the causes of
obesity that often precedes type 2 diabetes (Dingemans et al., 2002).

Apart from the association between long-term BED and increasing obesity (the
long term physical consequences of obesity have been described in section 2.2), the
physical consequences of BED independent of obesity are not yet fully known. Wilfley
et al. (2003) noted in their review that in addition to poor physical health, BED was
associated with increased levels of disability and increased use of health care services. It
has also been suggested that a long-term consequence of binge eating, independent of
obesity, may be a failure or weakness of the biological mechanisms for the control of
appetite (Blundell & Hill, 1993). While this may be due to internal physiological
aberrations, it may also be due to significant changes in external behavioural patterns.
For example, if individuals are constantly overriding their biological satiety signals for
hunger and fullness, it could be expected that this externally applied shift in the
behaviour pattern may lead to a weakening of the biological mechanisms controlling
appetite (Blundell & Hill, 1993). Such a weakness in these natural biological
mechanisms may lead to later difficulties, as individuals try to reduce binge eating
behaviour or calorie intake. Faulty satiety messages will mean that the individual is unable to differentiate hunger and fullness, or potentially feel satisfied after eating reduced amounts of food. This may lead to the perpetuation of binge eating or at least overeating behaviours.

The general agreement in the binge eating literature is that the most serious long-term consequences of both binge eating and BED appear to be those associated with increased risk for weight gain and obesity, and an increased risk of greater psychopathology (de Zwaan, 1997; Yanovski, 1993). Given the possible relationship between binge eating and obesity in children, it is important to gain a comprehensive understanding of the demographic, psychological, and psychosocial correlates of binge eating, as an important step in addressing the current gaps in obesity prevention and treatment programs. Understanding these relationships more comprehensively may provide the key to success for such programs, which has generally eluded us to date. Extending the current knowledge of binge eating and its related factors for children is one of the major aims of this thesis, and the following sections provide a summary of key research leading to the research questions of this thesis.

3.5 Demographic Risk Factors for Binge Eating and BED

The current knowledge regarding the demographic risk factors for binge eating and BED are briefly presented in this section. Currently, little is known about the demographic risk factors for binge eating and BED, and more work is needed to better understand if demographic factors do in fact play a role in the development or maintenance of binge eating behaviours.

3.5.1 Parental Weight

There is some evidence to suggest that parental obesity may put an individual at risk for the development of both binge eating disorders, BED and BN. For example, Fairburn et al. (1998), in a risk factor analysis for BED, found that when compared to healthy weight controls, women with BED reported a higher prevalence of childhood and parental obesity, while women with BN reported even higher prevalence of childhood and parental obesity (Fairburn et al., 1998). However these variables were not found to be among the main risk factors associated with BED in the study.

In a discussion of the metabolic characteristics of binge eating, Drewnowski (1995) suggested that “The possibility remains that binge eating is a behavioral
mechanism involved in the expression of obesity in genetically vulnerable individuals” (p.743), and the antecedent as opposed to a consequence of dieting. These suggestions arose out of evidence that binge eating in obesity is associated with some of the same factors that are generally accepted to be the markers of a genetic predisposition to obesity (Drewnowski, 1995). He concluded that binge eating might be an important mechanism in the development of some forms of obesity (Drewnowski, 1995). This would certainly be consistent with the above associations between family history of obesity and binge eating behaviours.

If a relationship does exist between parental body weight and development of binge eating or BED in children, the nature of the relationship may be environmental rather than genetic (or possibly a combination of both, as discussed in section 2.3.1). As described earlier, Stice, Agras, et al. (1999) examined mothers’ eating attitudes and behaviours in relation to their children’s problem eating. Children’s eating behaviours were assessed by maternal reports, which were examined annually from the age of two years through five years. Results showed that heightened maternal emotion-based disinhibition around food, body dissatisfaction, and bulimic symptoms predicted the emergence of secretive eating in children (Stice, Agras, et al., 1999). Maternal dieting cognitions and behaviours further predicted the emergence of overeating in children. Stice, Agras, et al. (1999) proposed that maternal tendencies toward disinhibited eating and bulimic symptoms may (a) lead children to view eating as something which should be secretive, and (b) present powerful role models regarding eating behaviour. In addition, they proposed that mother’s dieting behaviour and pursuit of the thin-ideal may promote children’s own internalisation of these same goals, leading to restrained eating in the children and hence increased risk of overeating (Stice, Agras, et al., 1999). Similarly, Lamerz et al. (2005), in their cross-sectional study of binge eating in six year-old children, found that children of mothers who suffered from binge eating had six times the risk of binge eating themselves than children of mothers who did not binge eat, even after adjusting for both the child’s and maternal BMI, and gender. These results suggest that very young children may already be modelling maternal behaviours. As mothers are the primary socialising agents during early childhood, maternal eating attitudes and behaviours are likely to be very influential at such a young age. However, these studies relied solely on maternal reports for an assessment of children’s eating problems, therefore the importance of maternal influence at this young age may have been overestimated. It might also be possible that women with increased eating
pathology are more knowledgeable and/or more sensitive to their children’s eating behaviours, hence also inflating true prevalence of children’s emergence of eating pathology.

Additionally, mothers who are heavier (who are also more likely to experience weight concerns and be dieting) might also directly or inadvertently pass on their concerns to their children, encouraging restricted eating (either through verbal comment or via modelling), and hence place their children at heightened risk of binge eating. Using both maternal and adolescent reports of dieting attitudes and behaviours in a study with older boys and girls ($M = 14.6$ years) and their mothers, Fulkerson et al. (2002) found that mothers who encouraged their children to diet were significantly heavier than mothers who did not encourage their children to diet. They were also more likely to report that their children were currently overweight. Mothers’ encouragement to diet was associated with weight concerns and dieting behaviour for boys, and to a lesser degree for girls. Mothers’ self-reported dieting behaviours were associated with weight concerns and dieting practices in their daughters but not their sons, however this association was no longer significant after adjusting for children’s BMI. These results provide additional support for a relationship between parent weight and child’s binge eating behaviour in older age groups, however direct verbal comments from parents as opposed to modelling behaviour may be more important in older age groups, particularly for boys.

Overall, a relationship between parental weight and children’s binge eating behaviour does seem to exist, and may have both genetic and environmental constituents. Evidence regarding environmental factors emphasise the importance of involving families in childhood obesity prevention programs, as well as eating disorder prevention programs.

3.5.2 Gender

Research with adult populations shows significant gender differences in prevalence of binge eating behaviour, and in the eating disorders, anorexia nervosa, BN, and BED (Striegel-Moore, 1993), with greater prevalence among women. However, while women represent more than 90% of patients presenting for treatment for BN or anorexia nervosa (Tanofsky, Wilfley, Spurrell, Welch, & Brownell, 1997), gender differences are much less pronounced in BED prevalence rates (Striegel-Moore, 1993; Wilfley et al., 2003). For example, Spitzer and colleagues (1992; Spitzer, Yanovski, et
al., 1993) have found that in weight-reducing samples, BED was only somewhat more common in women than in men (3:2), while in community samples, small to non-significant gender differences were found.

While prevalence rates differ slightly between men and women, the characteristics of male and female sufferers of BED are generally common. For example, Tanofsky et al. (1997) found no significant gender differences for the demographic variables, or for eating disturbance, shape/weight concerns, interpersonal problems, or self-esteem. However, men with BED had more lifetime psychiatric problems, while women reported engaging in more emotional eating behaviour, particularly in response to anxiety, anger, frustration, and depression (Tanofsky et al., 1997).

Studies with children and adolescents have been more contradictory in nature. Decaluwe et al. (2002), in their study of obese children and adolescents seeking weight loss treatment, found that the prevalence of binge eating was similar between obese boys (35%) and obese girls (37%). Isnard et al. (2003) also found no gender differences in their sample of obese adolescents. An Australian sample of normal weight adolescent boys and girls also found no significant gender differences on measures of binge eating (McCabe & Vincent, 2003). However, Severi et al. (1993) found in their sample of obese children and adolescents that girls reported more binge eating than boys (27% compared to 18%), while Britz et al. (2000) also found binge eating to be more common among obese females than males (60% compared to 35%). However, Maloney et al. (1989), in their study of dieting behaviour and eating attitudes in children, found that boys reported binge eating more than girls (14% compared to 7%). The few studies investigating BED in children and adolescents show a trend toward higher prevalence in females (e.g., Decaluwe & Braet, 2003; Rosenvinge et al., 1999). Clearly, the current literature is contradictory, and further investigation is necessary to better understand gender differences (or similarities) in the prevalence, aetiology, and consequences of binge eating and BED.

3.5.3 SES

Few studies have investigated the possible role of SES in binge eating behaviour. Available evidence regarding the relationship between SES and binge eating is mixed with some studies finding no association and others reporting an inverse relationship. For example, Story, French, Resnick, and Blum (1995), in their sample of
over 36,000 adolescents, found that higher SES was associated with lower rates of binge eating for both boys and girls. Similarly, Striegel-Moore, Schreiber, et al. (2000) found an inverse relationship between SES and the bulimia subscale of the Eating Disorder Inventory in their sample of 11-16 year-old girls.

In contrast, Hay (1998), in her large-scale epidemiological study of eating disorder behaviours in Australian adolescents and adults, found that there were no significant differences in rates of reported binge eating between different household income groups. Similarly, Isnard et al. (2003) found no significant SES differences between adolescent binge eaters and non-binge eaters. To date, the few studies that have investigated the relationship between SES and binge eating have been contradictory, and it is not clear whether prevention programs would be more usefully targeted for certain demographics. As such, it is important to investigate the possible role of SES in binge eating further, to determine if attention and resources should be directed toward particular groups within the population.

3.6 Psychological and Psychosocial Factors Associated with Binge Eating and BED

One of the main aims of this thesis is to investigate the link between binge eating behaviour and obesity in Australian children, and to better understand the psychological and psychosocial factors that influence this relationship. While psychological factors are shown to be a major consequence of overweight and obesity, they are also risk factors for binge eating behaviour, suggesting a cyclical nature to the relationship. Understanding the complex interaction between these factors may lead to significant improvements in creating successful long-term obesity prevention and treatment programs.

This section presents a discussion of some of the psychological and psychosocial factors that have received attention in the literature to date, including body dissatisfaction, dieting behaviour, depression, and emotional eating, highlighting the areas that require further study in preadolescent populations. Note however that dieting attitudes are not reviewed in this section, as the binge eating literature has generally focused on dieting behaviour, as opposed to the role of dieting attitudes in binge eating. All the same, it is reasonable to expect that dieting attitudes would precede and be associated with these dieting behaviours. A case is then made for the need to better understand psychosocial factors such as weight-related teasing experiences and
internalisation of sociocultural messages, variables that have received limited attention to date. Findings from the adult literature will be drawn upon, particularly when establishing possible links that may be important for extending knowledge of preadolescent binge eating behaviour.

3.6.1 Body Dissatisfaction

The nature of the relationship between body dissatisfaction and body weight was outlined in chapter two. In this section, the relationship between body dissatisfaction and binge eating is discussed. Current theory suggests that body dissatisfaction promotes eating pathology such as binge eating because it leads to dieting behaviour and negative affect (Stice, 1999), although the role of restraint in the development of binge eating is still debatable (section 3.6.2 provides a further discussion of this point). Existing research supports this theory, at least for adult women. For example, in a recent study, Womble et al. (2001) tested a psychosocial model of binge eating symptoms in obese men and women. Body dissatisfaction was found to have a significant role in the severity of binge eating for both males and females, although there were some gender differences. For instance, for women, the relationship between body dissatisfaction and binge eating was mediated by negative affect and dietary restraint (supporting the abovementioned theory, i.e., body dissatisfaction may cause women to experience negative affect and engage in dietary restraint, and these two factors then promote binge eating behaviour). For men, a direct relationship was found between body dissatisfaction and binge eating. In his meta-analytic review of risk and maintenance factors for eating pathology, Stice (2002) found that body dissatisfaction was a risk factor for dieting, negative affect, and eating pathology, and a maintenance factor for bulimic pathology. In fact, body dissatisfaction emerged as one of the most robust and consistent risk and maintenance factors for eating pathology.

Research with children and adolescents also suggests a relationship between body dissatisfaction and binge eating behaviour. Decaluwe et al. (2002), in their study of binge eating in obese children and adolescents, found significant differences between binge eaters and non-binge eaters, with binge eaters reporting significantly more concerns about eating, weight and shape than non-binge eaters. In support, Stice et al. (2002) found that body dissatisfaction, along with appearance overvaluation, elevated dieting, pressure to be thin, modelling of eating disturbance, depressive symptoms, emotional eating, body mass, low self-esteem, and low social support predicted binge
eating onset with 92% accuracy in adolescent girls. Moyer, DiPietro, Berkowitz, and Stunkard (1997), in their examination of the precursors of binge eating in an adolescent female population found that body dissatisfaction was also significantly correlated with binge eating. Interestingly, they found that body dissatisfaction was more highly correlated with binge eating than was weight itself. These findings suggest that it is the perception of overweight that may be more important than actual weight in the development of perturbed eating behaviours. This hypothesis is supported by a retrospective study by Spurrell, Wilfley, Tanofksy, and Brownell (1997), who found that 62% of their sample of adult BED sufferers reported perceiving themselves as overweight as children (aged 6-12), yet the mean age of onset of overweight (determined by self-report) was 17 years ($SD = 11.26$). In addition, Morgan et al. (2002), in their sample of non-treatment-seeking overweight children aged 6-10 years, found that children who experienced loss of control, regardless of whether they reported overeating or not, had higher degrees of body dissatisfaction, even after adjustment for differences in BMI, than children who did not report loss of control during eating episodes.

The relationship between body dissatisfaction in BED is less clear, particularly in children and adolescents. It has received less attention in the literature, perhaps because overconcern with weight and shape is not among the research diagnostic criteria for BED (APA, 2000). Drawing on adult studies, the literature seems contradictory. For example, in their field study of the diagnostic criteria for BED, Spitzer, Yanovsk, et al. (1993), using a one-item measurement of weight and shape concern, found that individuals with BED reported higher body dissatisfaction than individuals without BED, but significantly lower body dissatisfaction than individuals with BN. However, Brody et al. (1994), also using a single-item question, found no differences in levels of reported overconcern with weight and shape between obese individuals who did not binge eat and those who met criteria for BED. In addition, utilising a more comprehensive assessment instrument, the Eating Disorders Examination, Marcus, Smith, Santelli, and Kaye (1992) found that obese individuals with BED were in fact comparable to normal weight individuals with BN in their level of overconcern for weight and shape.

Methodological differences in assessment and selected comparison groups likely confound the interpretation of the results of these studies as a whole. Further, none of these studies controlled for weight, suggesting that the relationships found (or not
found) may have been due to the weight of the participants rather than their binge eating. As an example, Eldredge and Agras (1996), controlling for weight, investigated weight and shape overconcern in women enrolled in a commercial weight loss program. Participants were categorised as BED, Eating Disorder Not Otherwise Specified, or controls, on two different weight levels (low versus high BMI). Eldredge and Agras (1996) found that weight did not influence self-reported weight and shape concerns. Individuals with BED expressed greater concern for weight and shape than those with Eating Disorder Not Otherwise Specified and non-eating disordered controls, suggesting that body dissatisfaction may indeed play a role in BED. In support, reviewing more recent research, Wilfley et al. (2003) concluded that individuals with BED are indistinguishable from those with BN or anorexia nervosa in regards to preoccupation with weight and shape concerns, and also the degree to which self-worth is influenced by weight and shape concerns.

While research with children and adolescents is limited, there is evidence to suggest that a relationship between body dissatisfaction and BED exists. For instance, in a recent study investigating overeating among adolescents, Ackard et al. (2003) found that severity of overeating was significantly associated with body dissatisfaction for both boys and girls, even after adjusting for BMI. Those children with binge eating syndrome reported the highest levels of weight and shape concern, followed by those with subclinical binge eating, then objective overeating, and finally children reporting no overeating had the lowest reported levels of body dissatisfaction.

Limited research does suggest that body dissatisfaction and BED may be associated in child and adolescent populations, although the role of restraint in this relationship is unclear. Further research is warranted to substantiate these findings in Australian populations, and to assist in understanding the complex relationship between binge eating, body dissatisfaction, dieting attitudes and behaviour, and negative affect. The following section will outline ways in which dieting behaviour may impact on this relationship, and then presents a discussion of the role of depression in further understanding binge eating development and maintenance.

### 3.6.2 Dieting Behaviour

One theory proposed to explain the relationship between body dissatisfaction and binge eating behaviour is that of restraint theory. In fact, the most widely accepted sociocultural model of binge eating is the restraint model (Striegel-Moore, 1995), which
proposes an indirect pathway to binge eating. For example, the internalisation of the
cultural beauty ideal of extreme thinness (predominantly for females) leads to body
dissatisfaction, which then motivates behavioural efforts to lose or maintain weight, or
in other words to engage in dieting (i.e., restrained eating) behaviour (Striegel-Moore,
1995). Dieting is thought to increase the risk that an individual will overeat to
counteract the effects of caloric deprivation (Stice et al., 2002). The model proposes that
prolonged dieting efforts may result in cognitive changes (e.g., all-or-nothing thinking
about food, such as viewing one minor deviation from “a diet” as a total failure) and
affective changes (e.g., irritability) that promote loss of control over eating, and shift
reliance from physiological cues to cognitive control over eating behaviours. When
these cognitive processes are disrupted, an individual is then more vulnerable to
disinhibited eating (Stice et al., 2002). The restraint model has received much support,
particularly in research relating to BN, where it is recognised that most BN sufferers
start dieting prior to the onset of binge eating (Dingemans et al., 2002). However, in the
BED literature, findings suggest that while dieting seems to play a role in the
development and maintenance of BED, it does not always appear to be such a major
factor (Dingemans et al., 2002). For example, Castonguay et al., in their 1995 review of
BED research, found that the onset of binge eating preceded the onset of dietary
restraint in the majority of BED cases, and concluded that the role of restraint in BED
was limited. Similarly, de Zwaan (1997) agreed that there is no evidence that binge
eating is a result of dietary restraint in obese individuals.

Alternative views to the restraint model focus on the role of emotions in binge
eating. The escape model is one such alternate theory, and suggests that binge eating is
used as an attempt to escape awareness of negative emotional states (Heatherton &
Baumeister, 1991). In support, de Zwaan (1997) believed, based on her review of the
literature, that disinhibition, rather than restraint, seemed to precipitate binge eating in
the obese. This theory is discussed further in section 3.6.6, where emotional eating is
discussed in greater detail.

The adult literature is far from in agreement on the role of dietary restraint in the
aetiology of binge eating, and whether it is a cause or consequence of binge eating
behaviour. For example, Womble et al. (2001), in their path analysis of binge eating in
adult men and women, found that dietary restraint was directly related to binge eating
for both men and women. Dietary restraint served as a mediator between weight cycling
and binge eating for both men and women. In addition, for women, dietary restraint also
acted as a mediator between body dissatisfaction and binge eating. This model suggests that dietary restraint does play a role in binge eating, and is part of a multifactorial explanation of binge eating behaviour.

Investigating gender differences in binge eating behaviour more specifically, Costanzo, Musante, Friedman, Kern, and Tomlinson (1999) found that while men and women share some common correlates of binge eating severity (such as failing on a diet and higher levels of depression), men were more likely to report binge eating due to negative emotions. Binge eating severity for women was most strongly related to diet failure and tests of dieting-associated moderate eating.

The literature with children and adolescents is similarly conflicting regarding the role of restraint in binge eating. For example, Ackard et al. (2003) found associations among dieting, overeating, and increased BMI in their study of overeating among adolescents, consistent with restraint theory. Similarly, in a recent longitudinal study, Field et al. (2003) found that binge eating was associated with frequency of dieting for both adolescent boys and girls. Stice and colleagues (Stice et al., 2002; Stice, Killen, Hayward, & Taylor, 1998) in their prospective studies with community samples of female adolescents also found that dieting level predicted greater risk for onset of binge eating, while French, Story, Downes, Resnick, and Blum (1995), in their cross-sectional study of community-based adolescents found that frequent dieting was most strongly related to poor body image, fears of being unable to control eating, and more prevalent history of binge eating. Further, Stice, Akutagawa, Gaggar, and Agras (2000) found that for a community sample of adolescent boys and girls, dieting and negative affect predicted binge eating in both their cross-sectional and prospective analyses. Interestingly, negative affect moderated the relationship between binge eating and dieting, although only in the cross-sectional analyses. The results were not as strong for males.

However other studies have found no such relationship. Berkowitz et al. (1993), in their cross-sectional study with obese adolescent girls seeking treatment, found no relationship between dieting and binge eating. They found that obese binge eaters were no more likely to have dieted (or to have dieted more often) than were obese non-binge eaters. Similarly, Decaluwe et al. (2002), in their study of obese treatment-seeking children and adolescents, found that there was no difference in restrained eating between binge eaters and non-binge eaters. In addition, Morgan et al. (2002) found few differences in the reported dieting behaviours of those who did, and did not, admit to
loss of control of their eating (LC) in their non-treatment sample of overweight children. They found that half of LC children had never dieted, and that there was no relationship between reporting attempted dieting and reporting episodes of loss of control. However, they did find that LC children had higher scores on scales of disturbed eating attitudes (as measured by the ChEAT) than non-LC children.

Tanofsky-Kraff, Faden, Yanovski, Wilfley, and Yanovski (2005), also in a sample of non-treatment-seeking overweight children, found that two thirds of the overweight children who reported both dieting and loss of control, reported experiencing episodes of loss of control prior to dieting. However, children who reported dieting prior to episodes of loss of control reported significantly greater disordered eating cognitions than children who experienced episodes of loss of control prior to dieting. This association lends support to the restraint theory of binge eating.

Taken together, these findings suggest that binge eating can occur both in the presence and absence of preceding dieting behaviours, and thus provide only limited support for the restraint model of binge eating. A number of researchers have begun to investigate the possibility that there are different pathways to binge eating, which may act as markers for different problematic eating behaviours in the future. For example, there is some evidence to suggest that for some individuals with BED, those who report binge eating prior to dieting have an earlier onset of binge eating, a younger age at which binge eating meets diagnostic criteria, history of more psychiatric problems, and are more likely to have a personality disorder (Spurrell et al., 1997). Stice et al. (2001) further suggest the possibility that BED sufferers could be categorised along dieting and negative affect dimensions. They found evidence that women with BED could be divided into a dietary subtype (63%) and a dietary-depressive subtype (37%), concluding that moderate dieting is a central feature of BED, however a subset of women with BED also display affective disturbance, signalling a more severe variant of BED (Stice et al., 2001). This does not necessarily recognise or explain the body of research that shows that a fairly large subgroup of individuals with BED start binge eating prior to the onset of dieting (Dingemans et al., 2002).

Clearly, there are still a number of unanswered questions regarding the role of restraint in binge eating. Many of the above studies were retrospective in nature, and conducted with adult women, and it is clear that both child and adolescent research, including longer term prospective investigations, are needed to better understand dieting
behaviour, both in terms of its importance as a clinical marker for different eating disorders, and its role in binge eating more generally.

3.6.3 Depression

Chapter two of this thesis presented a discussion of the relationship between obesity and depression, and showed that the research is far from in agreement regarding obesity and psychopathology, while chapter three has raised the issue that depression may be associated with binge eating and BED, even providing a marker for a subtype of BED sufferers. Chapter two further noted that while some researchers suggest that obese people show more psychopathology than the general population, others suggest that only clinical samples of obese people show psychopathology (refer to Section 2.4.3). However, the binge eating literature suggests that the presence of binge eating or BED may be acting as a mediator variable, accounting for the apparent relationship between psychopathology and overweight in clinical populations (Dingemans et al., 2002; Telch & Agras, 1994). In support, Telch and Agras (1994), investigating this hypothesis in a sample of obese female participants who engaged in binge eating behaviour, found that psychological distress increased as binge eating severity increased, while there was no significant relationship between degree of overweight and psychopathology. Therefore, Telch and Agras (1994) concluded that binge eating might account for the observed relationship between obesity and psychopathology reported in previous studies, although this study was only correlational in nature and thus the causal nature of the relationships could not be determined.

More specifically, many studies support the existence of a positive relationship between binge eating severity and depression, including the original multi-site trials conducted by Spitzer and colleagues (e.g., Spitzer, Yanovski, et al., 1993). For example, Wadden, Foster, Letizia, and Wilk (1993), in their sample of obese women, found that binge eaters reported significantly greater depression than non-binge eaters (almost 50% of severe binge eaters presented with clinically significant depression, compared with only 5% of the non-binge eaters). Further, Womble et al. (2001), in their path analysis of binge eating symptoms in obese men and women, found that negative affect (including a measure of depression), was significantly related to binge eating severity in both men and women. For men, negative affect also served as a mediator between weight cycling and binge eating, while for women, negative affect served as a mediator between body dissatisfaction and binge eating. Negative affect also served as a mediator
between teasing and binge eating for both men and women. In other words, each of these findings show that negative affect explains the relationship between binge eating and weight cycling, body dissatisfaction, and teasing. One hypothesis put forward to explain these relationships is that binge eating is a compensatory behaviour, serving as a form of self-medication to temporarily relieve depressive symptoms and modulate mood (Kruger, Shugar, & Cooke, 1996). These findings suggest that addressing the negative affect related to factors such as body dissatisfaction and teasing may serve to alleviate binge eating problems.

Studies with children and adolescents also support the existence of a relationship between depression and binge eating. Berkowitz et al. (1993), in their study of obese adolescent girls, found that binge eating was significantly correlated with depression ($r = .53$). They found that the more severe the depression, the more severe the bingeing behaviour. In their community sample of adolescent girls and boys, Ackard et al. (2003) also found that depressive mood scores increased with increasing binge eating severity. Further, Stice et al. (2002), in their prospective study with a community sample of adolescent girls, found that depressive symptoms were among numerous variables that predicted binge eating onset.

In contrast, Decaluwe et al. (2002), using a global measure of depression as determined by the Children’s Depression Inventory (CDI), found no differences in depression scores between a sample of binge eating and non-binge eating obese children and adolescents. However, the whole sample obtained reasonably high scores on the CDI, irrespective of their binge status. For example, looking at the percentage of obese children with a score of 13 or more on the CDI (an indication of depression), Decaluwe et al. (2002) found that 49% of the binge eaters and 46% of the non-binge eaters obtained a significant depression score. It is important to note that this sample was a highly selected pool of obese subjects who sought inpatient treatment. The authors therefore concluded that it was difficult to clarify whether the high degree of depression in this sample was related to binge eating, the status of obesity, or to their treatment-seeking behaviour.

In addition, Morgan et al. (2002), in their sample of community-based overweight children aged 6-10 years, found a significant association between depression and overweight for children who reported episodes of loss of control, but not for children who reported no episodes of loss of control, regardless of reported overeating.
This research suggests that it is the experience of loss of control rather than the binge eating itself that may be related to depression.

Thus, evidence suggests that depression and binge eating behaviour are associated, even in preadolescent populations, although the nature of this relationship is still unclear. Further, research shows that depression is related to severity of binge eating, providing some support for the theory that there are dieting and negative affect dimensions of BED, with negative affect related to a more severe variant of the disorder. It is clear that the relationships between binge eating, dieting behaviour, and depression require further attention, particularly in the preadolescent literature, with increased knowledge of the importance of these variables likely to be significant in terms of future prevention programs for obesity and eating disorders, and also for future treatment programs.

3.6.4 Weight-Related Teasing Experiences

Unlike body dissatisfaction, dieting behaviour, and depression, limited research has investigated the role of weight-related teasing experiences in binge eating, particularly for children. However, a few recent community-based adult studies have explored the role of teasing as a risk factor for binge eating and BED, and found that it may play an important role (Fairburn et al., 1998; Womble et al., 2001). For example, Fairburn et al. (1998) found that one of the major risk factors for BED was repeated exposure to negative comments from family members about shape, weight and eating. General teasing about non-appearance-related topics was not found to be a significant risk factor.

In support of this finding, Womble et al. (2001), in their psychosocial model of binge eating symptoms in obese men and women, found that teasing about weight and shape was directly related to binge eating for both men and women (although a non-significant relationship was found for the second half of the sample of women in the cross-validation model). It was also directly related to negative affect, which in turn, was related to binge eating (as discussed in section 3.6.3). They did not however assess the impact of general teasing.

Interestingly, Jackson, Grilo, and Masheb (2000), in their investigation of teasing history in BED found that general appearance teasing, but not weight-related teasing, was significantly associated with higher binge frequency in obese women. It is important to note however that each of these studies was retrospective in nature, and
teasing history was self-reported. Thus, while the results may be interpreted that teasing places greater risk for binge eating behaviours, it could also be an indication that those who develop binge eating behaviours have a greater sensitivity to negative comments. As Jackson et al. (2000) point out, the co-occurrence of depression with BED may actually influence reports of past teasing experiences.

Very few studies have investigated the relationship between teasing and binge eating in children and adolescents. Neumark-Sztainer et al. (2002) investigated weight-related teasing among a large community-based adolescent sample. Overall, girls reported more teasing than boys, and girls, particularly overweight girls, also reported being more bothered by the teasing than boys. Focusing on overweight youth, Neumark-Sztainer et al. (2002) found that 29% of overweight girls and 18% of overweight boys who experienced frequent weight-related teasing reported binge eating, compared to 16% of overweight girls and 7% of overweight boys who were not teased. Similar patterns were found for the overall sample. For example, regardless of weight status, adolescents who reported being teased about their weight were significantly more likely to report engaging in unhealthy weight control and binge eating behaviours than youth who did not report being teased (Neumark-Sztainer et al., 2002). In this study however, binge eating was assessed by participants’ response to a single question (“In the past year, have you ever eaten so much food in a short period of time that you would be embarrassed if others saw you [binge eating]?” [yes/no]). Similarly, Lieberman, Gauvin, Bukowski, and White (2001) found that peer nominations of overweight teasing were significant predictors of bulimic behaviour (using the bulimia/food preoccupation subscale of the ChEAT) in their sample of adolescent girls. Self-reported weight, shape, and appearance teasing was also found to significantly predict bulimic behaviour. Hayden-Wade et al. (2005) also found that degree of teasing was significantly and positively associated with bulimic behaviour for their sample of overweight children aged 10-14 years.

Based on these findings, and given the similarities found between the child and adult literature on other psychological variables associated with binge eating, such as depression and body dissatisfaction, it is plausible to hypothesise that teasing (or a greater sensitivity to teasing) may also play a role in the development or maintenance of binge eating for children. Given that teasing experiences often begin in early childhood, as described in section 2.4.4, further examination of the relationship between teasing and binge eating in preadolescent children is warranted.
3.6.5 Internalisation of Sociocultural Messages

Similar to the teasing literature, there is limited research on the impact of the internalisation of sociocultural messages (i.e., the level of acceptance of social messages regarding appearance standards) on the development and maintenance of binge eating or BED in either the adult or the child/adolescent literature. However, as mentioned in section 3.6.2, internalisation of sociocultural messages may have an indirect impact on binge eating behaviour through the processes hypothesised by the restraint model. For example, the central role of beauty in our society, particularly for females, raises risk for binge eating because it creates a powerful motivation for girls, and possibly also boys, to emulate the current beauty ideal, which often leads to body dissatisfaction, dieting behaviour, and other weight-altering behaviours (Stice et al., 2002; Striegel-Moore, 1995).

Stice and colleagues (2002) have been one of the few research teams to investigate the relationship between social messages and binge eating. Investigating the risk factors for binge eating onset in adolescent girls over a two-year period, they found that perceived pressure to be thin was a significant predictor of binge eating onset (together with a number of other variables, as discussed previously).

Further, in Stice’s (2002) review paper of risk and maintenance factors for eating pathology, he concluded that perceived pressure to be thin might play a more important role in fostering eating pathology than in maintaining it. In addition, he also concluded that internalisation of the thin ideal is both a causal risk factor and maintenance factor for eating pathology. Thin ideal internalisation was also found to be a causal risk factor for body dissatisfaction, dieting, and negative affect. These conclusions were based on both prospective and experimental findings.

No studies to the author’s knowledge have investigated the relationship between the internalisation of sociocultural messages and binge eating behaviour in preadolescent children, and studies are necessary to better understand if a relationship does exist, and what impact, if any, it may have, particularly on childhood development of binge eating and BED.

3.6.6 Emotional Eating

Like depression, the role of emotional eating in binge eating and BED is well established in the adult literature. As outlined in chapter two, emotional eating is considered to be eating that is influenced or induced by emotional states such as
depression, regardless of, and often in the absence of hunger, often as a way of coping with the emotion. One particular cognitive behavioural theory that has received attention in the literature is the escape model of binge eating (Heatherton & Baumeister, 1991; as briefly mentioned in section 3.6.2). The escape model proposes that binge eaters have high personal standards and expectations, and that falling short of these expectations and standards results in awareness of self as inadequate or deficient. Such awareness is associated with negative affect. Binge eaters attempt to escape this awareness and negative affect by narrowing their attentional focus sufficiently to avoid meaningful thought (i.e., self-reflection) regarding such perceived inadequacies. This cognitive narrowing, in turn, leads to disinhibited eating, resulting in binge eating, and an increased vulnerability to irrational beliefs and thoughts (Heatherton & Baumeister, 1991).

A similar theory that has received considerable support in the literature is the affect regulation theory, which proposes that people eat to provide comfort or distraction from negative emotions (e.g., Ganley, 1989; Stice, 2002). While variants of these two theories are evident in the literature, it is clear that most models propose that emotional eating plays an important role in precipitating and sustaining binge eating behaviour. It is also noteworthy to recall here the work by Stice and colleagues (2001) described in sections 3.6.2 and 3.6.3 whereby it was noted that negative affect-related binge eating has been found in a subset of BED cases, and may signal a more severe variant of the disorder.

Studies have also investigated possible gender differences in relation to emotional eating and binge eating. Tanofsky et al. (1997) investigated the gender differences in a clinical sample of individuals with BED. They found that women were more likely to report eating in response to negative emotions than men. However, they also proposed that this may be due to the possibility that men may either fail to make the connection between eating and emotions, or be less likely to admit to emotional eating due to prior socialisation to suppress verbalisation of their feelings (Tanofsky et al., 1997).

Constanzo et al. (1999) found a number of similarities between men and women in their sample of treatment-seeking participants. For example, failure on a diet and higher levels of depression were significant predictors of binge eating for both men and women. However, for men, depression was a stronger predictor of binge eating, while for women, failure on a diet was more strongly related to binge eating. The authors of
the study hypothesised that for men, food may have been used as a means of coping with negative affect, as opposed to direct emotional expression, which is seen as less socially acceptable for males (Constanzo et al., 1999).

Little research has yet addressed the role of emotional eating in children and adolescents as a risk factor for binge eating behaviours. As noted in chapter two, Striegel-Moore et al. (1999) investigated the role of emotion-induced eating in the development of obesity in children and found a modest inverse association between BMI and emotional eating, however they did not investigate eating behaviours such as binge eating. Berkowitz et al. (1993), in their study with obese adolescents, did however study the role of disinhibition, and happiness and satisfaction in binge eating. They found that just these two variables explained 63% of the variance in severity of binge eating as assessed by the Gormally Binge-Eating Scale.

Of importance, Binford, Mussell, Peterson, Crow, and Mitchell (2004), in a study of women receiving treatment for BED, found that an early onset of binge eating (≤13 years of age) as opposed to a later onset (>13 years of age) in BED may be associated with binge eating as an affective means of coping, particularly with anxiety. It is important to note that this study was retrospective in nature, however prospective studies also support a relationship between emotional eating and binge eating. For example, Stice et al. (2002), in their two-year prospective study with adolescent girls, found that emotional eating was a significant predictor of binge eating onset.

These results suggest that emotional eating may play an important role in the development and maintenance of binge eating behaviour for children and adolescents, as reflected in the adult literature. Further study is necessary to better understand the role, if any, of emotional eating in binge eating behaviour in preadolescent children.

3.7 Summary

Chapters two and three have highlighted the importance of considering psychological and psychosocial factors in both child obesity and binge eating. In fact, the psychological factors described in chapter two as consequences of obesity have, in chapter three, been implicated in the development and maintenance of binge eating behaviour, at least for a subset of the population. These relationships have predominantly been determined with adult populations, and less is known about how these factors may interact in preadolescent populations.
Binge eating behaviour has been associated with obesity development and maintenance. Thus, psychological and psychosocial consequences of one significant health problem (i.e., childhood obesity) can further impact on the development of eating disordered behaviour, and a spiralling situation can be foreseen, one that may help partially explain the current obesity crisis and the difficulties with intervention programs to date. The remainder of this chapter presents the specific research aims, questions, and hypotheses of this thesis. Chapter four outlines the methodology of the thesis, and chapters five and six present the results and a detailed discussion of their implications.

3.8 Research Aims

The aims of the current thesis were to investigate the prevalence of overweight, obesity, and binge eating behaviour in a non-clinical sample of preadolescent children, and to investigate the psychological and psychosocial factors related to weight and binge eating, including their relationship with each other. A further aim was to investigate the differences between participants reporting binge eating behaviour and those reporting no binge eating behaviour on these psychological and psychosocial factors.

3.8.1 Prevalence of Childhood Overweight and Obesity

The first aim of the study was to describe the prevalence of childhood overweight and obesity in a non-clinical sample of Australian school children. Two research hypotheses and one research question were investigated:

(1a) Based on recent Australian and worldwide data on the prevalence of overweight and obesity in children (section 2.1.2), it was expected that a significant number of children from a non-clinical sample would be overweight or obese.

(1b) Recent Australian studies have found no significant gender differences in the level of overweight and obesity (e.g., Booth et al., 2001; section 2.3.2). In the current study, it was therefore expected that there would be no significant gender differences in the level of overweight and obesity.

(1c) As the relationship between SES and weight is perhaps one of the most unclear in the literature (section 2.3.3), the research question “Is there a relationship between SES and weight, and does this differ between males and females?” was also investigated.
3.8.2 Prevalence of Childhood Binge Eating

The second aim of this thesis was to determine the prevalence of binge eating in a non-clinical sample of Australian school children. The following research questions were investigated to achieve this aim:

(2a) To what degree is binge eating behaviour prevalent in a non-clinical sample of preadolescent children?

(2b) Are there gender differences between children reporting binge eating behaviour and those reporting no binge eating behaviour?

(2c) Will significant weight differences be found between children reporting binge eating behaviour and those reporting no binge eating behaviour?

(2d) Is there a relationship between SES and binge eating behaviour?

(2e) Is binge eating syndrome prevalent in preadolescent children?

3.8.3 Relationships between Body Weight, Binge Eating Behaviour, and a Set of Physical, Psychological, and Psychosocial Factors

A third aim of this thesis was to develop and test a model that explained the relationships between body weight, binge eating behaviour, and a set of physical, psychological, and psychosocial factors. Figure 3.1 presents the hypothesised relationships between these variables, based on a synthesis of the literature reviewed in chapters two and three (as shown in brackets for each hypothesis). This section describes each of the hypothesised relationships.

(3a) Parents’ body size would be related to child’s BMI (section 2.3.1) and child’s binge eating behaviour (section 3.5.1).

(3b) Child’s BMI would be related either directly or indirectly to size-related teasing experiences, body dissatisfaction, internalisation of sociocultural messages, depression, dieting attitudes and behaviours, binge eating behaviour, and emotional eating (section 2.4).

(3c) Child’s binge eating behaviour would be either directly or indirectly related to BMI, size-related teasing experiences, body dissatisfaction, internalisation of sociocultural messages, depression, dieting attitudes and behaviours, and emotional eating (sections 3.4.1 and 3.6).
Figure 3.1. Hypothesised model of the relationships between BMI, binge eating behaviour, and a set of physical, psychological, and psychosocial factors.
(3d) The psychological and psychosocial variables, size-related teasing experiences, body dissatisfaction, internalisation of sociocultural messages, depression, and dieting attitudes and behaviour would be directly related to each other, perhaps mediating their relationships with, and/or between, BMI and/or binge eating (sections 2.4 and 3.6). In addition dieting attitudes and behaviour and depression would be directly related to emotional eating (sections 2.4 and 3.6).

(3e) As some of the hypothesised relationships above have not been previously tested with male populations, an additional research question was “Do the relationships between BMI, binge eating and related psychological and psychosocial variables differ between preadolescent males and females in a non-clinical sample?”

### 3.8.4 Differences Between Binge Eaters and Non-Binge Eaters

Differences between children who engage in binge eating behaviour and those who do not are not well known within the current literature, therefore the final aim of this study was to investigate potential differences. Based on the literature review, the following exploratory research question was investigated:

(4a) Do participants who engage in binge eating behaviour differ from participants who do not engage in binge eating behaviour on the following psychological and psychosocial variables: size-related teasing experiences, body dissatisfaction, internalisation of sociocultural messages, depression, dieting attitudes and behaviour, or emotional eating behaviour?
CHAPTER FOUR:  
METHOD

4.1 Participants

Participants were 569 grade five and six primary school children from Catholic and Government schools across metropolitan Melbourne, Australia. Two hundred and seventy-two boys and 297 girls, aged between 9 and 13 years of age ($M = 11.33$ years, $SD = .68$ years) obtained parental consent to participate in the current study and subsequently completed questionnaire materials during the period June 2000 to September 2001. Of these participants, 62% attended Government schools across Melbourne, while 38% attended Catholic schools. These figures are discrepant with national averages available at the time of data collection (73% of children attended Government schools and 18% of children attended Catholic Schools, as reported by the Australian Bureau of Statistics [ABS], Census Data, 1996).

Schools were selected to represent districts with either below average, average, or above average income (as determined by electoral information available for all Victorian districts, ABS Census Data, 1996). Twenty-three percent of children attended schools in below average income districts ($\leq 33^{rd}$ percentile), 54% attended schools in average income districts ($34^{th}$-$65^{th}$ percentile), while 24% of children attended schools in above average income districts ($\geq 66^{th}$ percentile).

The majority of participants were born in Australia (86.5%). An additional 3% were born in Europe, 6% were born in Asia and the remaining 4% of children were born in other countries (0.5% of children, $n = 3$, did not respond to this question). Similarly, the majority of participants’ mothers and fathers were born in Australia (58.5% and 53% respectively), Europe (11% and 14% respectively), or Asia (15.5% and 14% respectively).

Approval for this study was obtained from the Department of Education, Employment and Training, and the Catholic Education Office. Once approval was obtained, schools were chosen for selection based on obtaining a representative sample of school children from metropolitan Melbourne, Australia. Twenty-two schools were invited to be involved in the study, of which 59% ($n=13$) agreed to participate. Reasons for not participating included being involved in a number of other or similar research
studies, being a difficult time of year, no time available within the curriculum, or no reasons provided.

4.2 Materials

All participants had their height and weight measured, and completed a questionnaire package, which included a number of demographic questions as well as various measures to evaluate the psychological and psychosocial factors of interest in this study. These included body dissatisfaction, dieting attitudes and behaviour, depression, size-related teasing experiences, internalisation of sociocultural messages, emotional eating, and binge eating behaviour (refer to Appendix B). Questionnaire measures were randomly presented to participants in three different orders, to reduce possible priming effects of the various measures. Each of the measures is explained in detail in the following sections.

4.2.1 Demographic Information

Information was collected regarding children’s gender, their age, their mothers’ and fathers’ occupations, and country of birth for themselves, their mother, and their father. In addition, information was recorded regarding the school each participant attended, and whether the school was a Catholic or Government school.

Median weekly household income for the district of the attending school was used as a proxy for SES, as described in section 4.1. This measure of SES was chosen for a number of reasons. Firstly, many of the children were not reliably able to recall their parents’ occupations, and secondly, data was not collected directly from the parents of participating children due to methodological limitations of the study.

4.2.2 Body Weight

Each participant was weighed and measured by one of two researchers (including the author) during their data collection session. A set of metric scales to measure weight, and a tape measure fixed to the wall to record height, were set up in a private area outside of the testing classroom, where participants could be weighed and measured privately, without concern that other participants would know their results. Participants were weighed fully clothed, but without their shoes. Some participants preferred to weigh themselves, while 1.2% of participants declined to be weighed and measured. No participant was required to be weighed if they did not wish to partake in
the activity. Weight measurements collected by participants themselves were included in the final data set, as research shows that there is a high correlation between self-report and actual weight measures for children and adolescents (Field et al., 2001).

Participants’ BMI was then calculated (BMI = weight [kg] / height [m]²). BMI was used to measure overweight and obesity in this study for several reasons: (a) it is the most widely defined medical measure of overweight and obesity; (b) it is recommended by the International Obesity Task Force and is the Australian reference standard for categorising overweight and obesity among children and adolescents (Denney-Wilson et al., 2003; NHMRC, 2003b); (c) it is a simple and inexpensive measure to use with large sample sizes; (d) it is highly reproducible; and (e) it is a non-invasive measure of body weight. While BMI has been criticised as a measure of adiposity in children (Mulligan & Voss, 1999), other authors agree that BMI offers a reasonable measure (Dietz & Bellizzi, 1999), and has been validated with more accurate and direct measures of body fatness (American Academy of Pediatrics, 2003; Denney-Wilson et al., 2003). In addition, there are several advantages to using this index. For example, height and weight are measured with good accuracy, the methodology has remained unchanged for several decades and has been used prominently in the research literature, and the measurements are available in most data sets (Harlan, 1993).

BMI in childhood changes substantially with age, and a wide variety of definitions of child obesity have been in use, making weight trends difficult to quantify or to compare internationally (Cole et al., 2000). As such, Cole et al. (2000) established a standard definition for child overweight and obesity based on international survey data, and on the recommendation of the International Obesity Task Force that adult cut-off points (a BMI of 25 kg/m² for overweight and 30 kg/m² for obesity) be linked to BMI centiles for children to provide child cut-off points (Cole et al., 2000). These international cut-off points are currently recognised as the Australian reference standard for use in research settings (Denney-Wilson et al., 2003; NHMRC, 2003b), and have been used in the current study to categorise participants as normal weight, overweight, or obese (Refer to Appendix C for the international cut-off points as determined by Cole et al., 2000, and accepted as the Australian standard).

4.2.3 Parental Body Size

Weight and shape of parents was assessed using the Contour Drawing Rating Scale (Thompson & Gray, 1995), which consists of 9 adult male and 9 adult female
schematic figures ranging in size from very thin to very large. Participants were asked to select the female figure that most closely represented their mother’s body currently, and to select the male figure that most closely represented their father’s body currently. This measure of parental body size was chosen because no data was directly available regarding the parents of participants, and would have been impractical to collect, and a similar method has been used in previous research (Wade & Lowes, 2002).

4.2.4 Body Dissatisfaction

Body dissatisfaction was assessed using Collins’ (1991) set of gender-specific figural rating scales consisting of seven preadolescent body figures ranging from very thin (1) to very large (7). Participants were presented with two sets of the gender-appropriate figure rating scale and asked to select the body figure that they thought looked most like their own body currently (i.e., their current body), and the figure that they would most like to have currently (i.e., their ideal body). The discrepancy between a participant’s current and ideal body size is a measure of his/her body dissatisfaction, where the greater the discrepancy between a person’s current and ideal perceived size, the greater the body dissatisfaction.

Such an assessment tool is a widely used measure of body dissatisfaction, is simple and quick to administer, and requires minimal verbal fluency (Truby & Paxton, 2002), all making it ideal for use with children. Collins’ (1991) figure rating scales have been tested with preadolescent children and have been found to have good test-retest reliability (.71 for current size and .59 for ideal size). Internal consistency is not applicable for this measure.

4.2.5 Dieting Attitudes and Behaviour

The Children’s Eating Attitudes Test (ChEAT; Maloney, McGuire, & Daniels, 1988) was used to assess children’s attitudes and behaviours associated with eating and weight control. The ChEAT is designed for use with children under the age of 15 years, and is essentially a simplified version of the 26-item Eating Attitudes Test (EAT; Garner, Olmstead, Bohr, & Garfinkel, 1982), a common measure of eating attitudes and behaviours used with adolescent and adult populations. The ChEAT is a 26-item, self report questionnaire, which measures dieting behaviours, food preoccupation, bulimia, and concerns about being overweight. Responses to items are presented on a 6-point Likert scale, ranging from always to never, with the most extreme anorexic responses
always, very often, and often scored 3, 2, and 1 respectively. All other item responses are scored zero. Therefore the possible range of scores is 0 to 78, with a score of 20 or above being suggestive, although not diagnostic, of an eating disorder (Maloney et al., 1988). Total ChEAT scores were used in the current study to assess a global measure of dieting behaviours as well as associated attitudes and eating disturbance.

To aid participants’ understanding of some of the questionnaire terms, definitions of the terms binges and dieting were written on the classroom blackboard and verbally explained to children before they answered these items. Binges was defined as “eating lots and lots of food all at once and feeling like you just can’t stop eating”, while dieting was defined as “trying to eat less food than you normally would because you are worried about your weight or want to lose weight”. After repeated questions from participants regarding the item “I vomit after I have eaten”, a verbal explanation of this item was also provided. Participants were told that this item related to voluntary attempts at vomiting, rather than involuntary vomiting induced by illness.

The ChEAT has shown acceptable test-retest reliability ($r = .81$) and internal reliability ($\alpha = .76$; Maloney et al., 1988). For this study, Cronbach’s alpha coefficient was equal to .81.

4.2.6 Depression

The Children’s Depression Inventory (CDI; Kovacs, 1980, 1992) was used to measure depression. The CDI is a downward extension of the Beck Depression Inventory (Beck & Beamesderfer, 1974), with adaptations reflecting more age-appropriate language for younger populations. It is one of the most widely used screening tools for paediatric depression (Timbremont, Braet, & Dreessen, 2004; Zametkin et al., 2004), and is designed for children and adolescents, aged 7-17 years. The CDI is a 27-item, self-report measure that assesses the presence and severity of cognitive, affective, and behavioural symptoms of depression (Kovacs, 1992). Each item consists of three sentences, scored 0, 1, or 2, with higher scores indicating increased severity (e.g., “I am sad once in a while.” “I am sad many times.” “I am sad all the time.”). Items can be summed to provide five subscale scores (negative mood, interpersonal problems, ineffectiveness, anhedonia, and negative self-esteem) or total depression scores. For the purposes of this study, the total depression score was used as an overall assessment of depression severity. The current study excluded one item regarding suicidal ideation, as it was deemed inappropriate by the researcher, school
principals, and the various ethics committees to ask young children about suicide. Therefore, possible scores ranged from 0 to 52. A score greater than 20 is regarded as clinically significant in non-clinical populations (Kovacs, 1992).

The CDI has been shown to be both a valid and highly reliable measure of depression in populations of non-clinical and clinical samples of normal weight and obese children (Kovacs, 1992; Timbremont et al., 2004; Zanetkin et al., 2004), and exhibits good internal consistency (ranging from alpha coefficients of .71 to .89; Kovacs, 1992). Test-retest reliability has shown greater variability ranging from .38 to .87 (Kovacs, 1992). Cronbach’s alpha for the total CDI score in this study was .85.

4.2.7 Size-Related Teasing Experiences

At the time of data collection, no published psychometrically valid instrument was available that directly measured teasing experiences of children. As such, the Physical Appearance Related Teasing Scale (PARTS; Thompson et al., 1991), validated with adult women, was modified for use with children. The PARTS is an 18-item inventory, with two subscales, designed to retrospectively assess people’s experience of (a) weight teasing (W/ST), and (b) general appearance teasing (GAT). The W/ST subscale measures a person’s experience of teasing specifically related to their size or weight, and displays good psychometric properties: Thompson et al. (1991) reported an internal consistency of .91 and a test-retest reliability of .86. This factor converges well with measures of eating disturbance, body dissatisfaction, social comparison, depression, and self-esteem (Thompson et al., 1991). The GAT subscale measures a person’s experience of more general appearance related teasing, and shows little relationship to these variables (Thompson et al., 1991), therefore it was decided that only a modified version of the W/ST subscale would be used in the final analyses of the current study.

A 16-item modified version of the PARTS was included in the current study questionnaire package, although only the W/ST subscale items were included in the final analyses, as mentioned above. All items were rewritten in the present tense to address current teasing experiences. Further, the W/ST items were reworded such that the word overweight or weight was replaced with the word size. For example, the item “When you were a child, did you feel that your peers were staring at you because you were overweight?” was changed to “Kids at school stare at me because of my size.” The consequence of this rewording is that the W/ST items assess general size teasing.
interpreted by participants to include teasing related to weight (overweight or underweight) or to height (tall or short). However, it was decided that continual focus on weight-related teasing could potentially trigger negative emotions or distress for some of the young participants, particularly given the pervasive problem of weight-related teasing in schools.

For ease of presentation, the items were combined with the modified SATAQ items (see below) and presented as one questionnaire. The items were presented on a 5-point Likert-type scale with responses ranging from strongly disagree to strongly agree. Item scores were summed to produce a total Size-Related Teasing score, with possible scores ranging from 9 to 45. The modified Size-Related Teasing scale exhibited good reliability with the current study population, with a Cronbach’s alpha of .89.

4.2.8 Internalisation of Sociocultural Messages

At the time of data collection, no published psychometrically valid instrument was available that assessed children’s awareness or internalisation of sociocultural messages. For this reason, a modified version of the Sociocultural Attitudes Towards Appearance Questionnaire (SATAQ; Heinberg et al., 1995) was developed for use with children. The SATAQ is a 14-item inventory consisting of two factors: a six-item Awareness factor that assesses the level of awareness or acknowledgement of a societal emphasis on appearance, and an eight-item Internalisation factor that measures the level of internalisation or acceptance of these standards (Heinberg et al., 1995). The original measure was developed and tested with university aged female students, and has exhibited good internal consistency (Awareness factor: \( \alpha = .71 \); Internalisation factor: \( \alpha = .88 \)).

All 14 items were modified for use with both male and female children, by simplifying the wording and creating two separate versions with gender-specific language. Given that the body dissatisfaction literature also suggests that some boys may prefer a muscular image as opposed to a thinner ideal (e.g., McCabe & Ricciardelli, 2004a, refer to chapter two), and the increasing trend of muscular male images being presented in the print and video media (McCabe & Ricciardelli, 2004b), some items were re-written to reflect this ideal for boys. For example, the original item “Photographs of thin women make me wish that I were thin” was re-written as “Photographs of men with muscles make me wish that I had muscles” for use with boys. Items in the modified SATAQ were presented on a 5-point Likert type scale, in
combination with the modified PARTS (as described above) with responses ranging from strongly disagree to strongly agree. After appropriate item reversals were conducted, item scores were summed to produce two subscale scores, with possible scores ranging from 6-30 for the Awareness subscale and 8-40 for the Internalisation subscale. Reliability analyses with the current study population found that the Internalisation subscale exhibited good reliability for both boys and girls (α = .81 for total sample; α = .86 for girls; α = .72 for boys), however the Awareness subscale exhibited poor reliability (α = .44 for total sample; α = .50 for girls; α = .35 for boys). According to Nunnally (1978), Chronbach’s coefficient alpha should be .70 or greater for an instrument to be considered reliable, therefore a decision was made to exclude the Awareness subscale from the final analyses.

4.2.9 Emotional Eating

At the time the current study’s measurement package was developed, the researcher was not aware of any published psychometrically valid instruments to assess emotional eating in children. Existing adult measures of emotional eating such as the Emotional Eating Scale (EES; Arnow, Kenardy, & Agras, 1995), and the Dutch Eating Behaviour Questionnaire – Emotional Eating Subscale (DEBQ; Van Strien, Frijters, Bergers, & Defares, 1986) were considered inappropriate for use with children in the current study, both because the inventories were considered to be too lengthy to include, and secondly because it was believed that some of the emotions listed in the EES and the DEBQ would be difficult for younger populations to understand. In support, Braet and Van Strien (1997), using the DEBQ with children aged 9-12 years, found that the meaning of emotions such as irritated, depressed or discouraged needed to be explained.

As such, the researcher developed five items to measure emotional eating in the current study, assessing children’s eating in response to five different emotions: boredom, happiness, sadness, anger, and worry. These emotions were chosen as they were considered to be basic emotions that young children would likely understand, have some experience with, and know how to interpret reasonably accurately. Items were presented on a 3-point Likert-type scale ranging from I don’t feel like eating to I really feel like eating. Items were analysed individually, as reliability analyses did not suggest the items formed a reliable scale (α = .51), even after removing the single positive emotion from the scale. Individual analyses of each item were considered appropriate as the researcher was interested in understanding whether children (a) displayed emotional
eating behaviour, and (b) responded differently depending on the type of emotion experienced. In support, Arnow et al. (1995) noted that the meaning of a total score on their adult measure, the EES, was unclear as the measure was “intended to permit more differentiated study of the phenomenon of emotional eating” (p.87), and that results should be reported by specific subscales.

4.2.10 Binge Eating

To assess binge eating behaviours, items from the Questionnaire of Eating and Weight Patterns – Revised (QEWP-R; Spitzer, Yanovski, & Marcus, 1993, reproduced in Pike, Loeb, & Walsh, 1995) were modified for use with children, in an attempt to reflect the DSM-IV-TR diagnostic criterion for BED. The QEWP-R is a 28-item, criterion-based instrument that assesses the essential DSM-IV-TR diagnostic criteria for purging and nonpurging BN, as well as BED, in adult populations. The items representing binge eating syndrome have been shown to have reasonable internal consistency with both weight-control ($\alpha = .75$) and community samples ($\alpha = .79$; Pike, Loeb, & Walsh, 1995), and to identify both high and low probability binge eaters (Nangle, Johnson, Carr-Nangle, & Engler, 1994). Further, the BED diagnosis based on the QEWP-R appears to be moderately stable over a 3-week period (kappa = .58; Nangle et al., 1994) and correlates well with the diagnosis based on structured interview (kappa = .57; de Zwaan et al., 1993). These figures are based on studies with adult populations however, and less is known about how well the measure assesses binge eating in children. At the time the current study was conducted no other measures were available for use with children, and this questionnaire appeared to be the most suitable measure for use with children, with appropriate modifications. However, it is important to note that one recent study compared an adolescent version of the QEWP with the Children’s Eating Disorder Examination and found that they did not concur on either the presence or type of eating episodes among the children in their study (Tanofsky-Kraff et al., 2003).

The current study included modified versions of the 6 items of the binge eating sub-section of the QEWP-R, as it was considered inappropriate to present items that were suggestive of negative eating strategies, such as using laxatives to avoid gaining weight after binge eating, to preadolescent children. Modifications were made to the wording of the items, to make them more simplistic and easier to comprehend. Further, given the young age of participants, they were asked to recall behaviours over the past
two months, rather than the DSM-IV-TR diagnostic criteria time frame of six months. The other noteworthy difference is that participants were asked about loss of control regardless of whether they reported eating a large amount of food or not. In the original QEWP-R, if respondents answered NO to having eaten a large amount of food during the past six months, they then skipped the item related to loss of control. In the present study, both items were presented separately, as research has shown the importance of loss of control in binge eating, regardless of amount of food eaten (e.g., Morgan et al., 2002; refer chapter three). Examples of each item were presented literally and verbally to participants during the assessment period. Given the various modifications made to the questionnaire, the items in the current study have been used to assess the presence of binge eating behaviours, and binge eating syndrome, but cannot provide a diagnosis for BED, based on the DSM-IV-TR criteria.

4.3 Procedure

After ethics approval was obtained, the questionnaire package was initially trialled with boys and girls aged 9-11 years, and with parents and school teachers, to ensure that all items were suitable for administration with children, were well understood, and that the assessment materials were not too lengthy.

School principals from Government and Catholic schools across Metropolitan Melbourne, Australia, were contacted by telephone to discuss the study, and request their school’s involvement. If principals expressed an interest in the study, an information package was sent to them including an information letter and a copy of the questionnaire package (see Appendix D). Once principal approval was obtained for school participation, letters were sent home to parents requesting parental consent for their child’s participation (see Appendix D). The study was described as a project about primary school students’ behaviours and attitudes about eating, exercise and life. The numbers of parents providing informed consent for their children ranged considerably across schools, from less than 40% to over 90%. Exact numbers are unavailable, as grade teachers were responsible for the distribution and collection of consent forms, and researchers were not privy to exact numbers of declines or acceptances. In discussion with various grade teachers, reasons for non-consent included parents not receiving the letters from their children, parents forgetting to return the forms, children not wishing to participate in the study, parents feeling uncomfortable with their children participating in research about body weight, health and eating behaviours, and parents disagreeing
with research in schools in general. Although statistics are unavailable regarding reasons for refusing participation, anecdotally, the majority of grade teachers commented that their observations indicated that those parents or children who were more conscious of dieting behaviours and weight related issues were less inclined to participate in the current study. While there is no evidence to support this claim, these anecdotal comments suggest that the results of this study may be a conservative estimate of weight and eating problems in primary school aged children.

Participants completed the questionnaire package during normal classroom hours in group sizes of 15–30 children. The study was introduced with the aid of the information sheet included in the assessment package (refer Appendix B), and participants were told that the questionnaire was not a test, and that their information was private and anonymous. Participants were then asked to provide their own informed consent if they were willing to participate, with less than 1% of children declining participation. Explanations of definitions such as bingeing (“eating lots and lots of food all at once and feeling like you just can’t stop eating”) and dieting (“trying to eat less food than you normally would because you are worried about your weight or want to lose weight”) were then provided verbally and also written on the class blackboard for reference as participants encountered questions they might not understand. Participants were encouraged to ask for help if they had any difficulties understanding the questions. The researcher then guided the participants through the first few questions of the package, that is, the demographic questions, and then participants were instructed to work through the package at their own pace. All participants were requested to stop when they got to the final questionnaire, assessing binge eating. This questionnaire was explained and administered to the participants as a group, with definitions of “eating a large amount of food” and “loss of control” provided. For example, care was taken to describe what might constitute a large amount of food (providing examples), and emphasising that special occasions like birthday parties or special events were different and shouldn’t be counted when answering the questions. Loss of control was described as “just eating and eating, and feeling like you can’t stop”.

In addition, while one researcher supervised participants completing the questionnaires, a second researcher took weight and height measurements of participants individually in a private area. In total, the assessment period took one hour.

After completing the questionnaire package, a 30-minute debriefing session was led by one of the researchers (the author of the study), where participants were
encouraged to ask any questions they might have, or to discuss any issues that had arisen during participation. Further, the researcher explained the study in more detail, discussing how information would be collated and used. The researcher then led an education session, discussing a variety of topics including healthy eating and exercise behaviours, the dangers of dieting, learning to understand and accurately evaluate sociocultural messages, and the importance of accepting one another regardless of size and shape.

After testing sessions were completed with each participating school, follow-up letters were sent to the school principal thanking them for their involvement in the study. The letter also provided them with additional information, including referral sources for students, parents, or teachers who wished to find out more information or follow-up on any issues raised through their involvement in the current study (refer to Appendix D).

4.4 Data Analysis

After screening procedures were conducted with the dataset, the aims, hypotheses, and research questions of the thesis were addressed by utilising descriptive statistics, structural equation modelling (SEM), and multivariate analysis of variance (MANOVA) techniques. This section provides an overview of the SEM analyses employed in this study.

4.4.1 SEM

SEM was employed to assess the hypothesised relationships between body weight, binge eating, and the set of physical, psychological, and psychosocial variables assessed in this study. SEM encompasses a set of statistical techniques (Kline, 1998) and has a number of benefits that make it a useful analysis when trying to test models that represent complex relationships between variables. For example, SEM has the advantage of being able to investigate relationships amongst both measured and latent variables, the ability to account for measurement error that cannot be explained by traditional multiple regression analyses, and the ability to analyse covariances as well as means (Byrne, 2001; Kline, 1998). Importantly, it also allows for the evaluation of the overall model fit by simultaneously analysing all of the relationships expressed in the model (Kline, 1998), and can accommodate the fitting of complex models to multiple data sets simultaneously, allowing for comparisons between groups. It can also be
utilised as either an exploratory or confirmatory technique (Byrne, 2001; Kline, 1998). As such, it has become a standard tool in many scientific disciplines (Hu & Bentler, 1999).

4.4.2 Assessing a Model’s Goodness-Of-Fit

SEM techniques assess the goodness of fit between a hypothesised model and a set of data. If a model is found to adequately fit the data, then it is supported. If not, the model is rejected. A good fitting model will have parameter estimates (e.g., factor loadings, measurement errors, variances and correlations amongst latent factors) with minimal discrepancies between the sample covariance matrix and the population covariance matrix implied by the model (Byrne, 2001; Kline, 1998).

The overall fit of a model is evaluated by absolute and incremental fit indices. While many different types of fit indices have been developed to assess model fit, this section will only describe those fit indices employed in the present study, based on recommendations provided by current SEM literature (Byrne, 2001; Hu & Bentler, 1999; Kline, 1998).

Absolute fit indices evaluate how well the hypothesised model reproduces the sample data (Byrne, 2001; Hu & Bentler, 1999). The most basic absolute fit index is the chi-square ($\chi^2$) statistic, which assesses the overall fit of the data to the model by testing whether there is a significant difference between the sample covariance matrix and the population covariance matrix implied by the model (Byrne, 2001; Kline, 1998). A non-significant $\chi^2$ statistic indicates minimal discrepancy, establishing goodness of fit. However, when sample sizes are large, which is generally a requirement of SEM (Byrne, 2001; Kline, 1998), non-significant chi-square values are rarely obtained, therefore examination of alternative fit indices is required to adequately assess the fit of the model to the data (Byrne, 2001; Hu & Bentler, 1999; Kline, 1998). For the current study, the root mean square error of approximation (RMSEA) and the standardised root mean square residual (SRMR) were employed as the absolute fit indices for assessing model fit. The RMSEA attempts to correct for the tendency of the likelihood $\chi^2$ statistic to reject implied models with large sample sizes. It measures the amount of error or “poorness of fit” in the implied model, assessing how well it would fit the population covariance matrix if it were available, and correcting for model complexity by taking into account the degrees of freedom (Byrne, 2001). Values less than .05 are indicative of a good fitting model (e.g., 5% or less error in the approximation) with values larger
than .10 indicative of a poor fitting model (Byrne, 2001; Hu & Bentler, 1999). The SRMR also assesses the average error in the implied model. However, the SRMR compares the implied model to the observed variable matrix rather than an assumed population matrix. Values less than or equal to .06 indicate good fitting models (Hu & Bentler, 1999).

Incremental fit indices compare the hypothesised model to a null model, also called the independence model or baseline model, where the observed variables are assumed to be completely uncorrelated (Kline, 1998). Incremental fit indices assess the proportional improvement of the overall fit of the hypothesised model relative to the null model (Hu & Bentler, 1999). In the current study, the incremental fit indices utilised were the Tucker-Lewis index (TLI), also known as the Bentler-Bonnett non-normed fit index (NNFI), and Bentler’s comparative fit index (CFI). The TLI and the CFI take into account the complexity of the model and assess the hypothesised model fit relative to the null model. Values for both indices range from zero to one, where zero indicates that the proposed model is equivalent to the null model and one indicates that the proposed model is a perfect fit. Values greater than or equal to .95 represent a good fitting model (e.g., the hypothesised model is ≥ 95% better than the null model), while values greater than .90 represent an adequate fitting model (Hu & Bentler, 1999; Kline, 1998).

4.4.3 Bootstrapping

In analysing the hypothesised model, bootstrapping of the data was employed for two reasons: (a) as a remedy for the presence of univariate and multivariate violations of normality; and (b) as a cross-validation measure, to ensure that the model solution was robust. Bootstrapping is a re-sampling procedure where repeated samples of the same size are taken from the original data set. Cases from the original data set are randomly selected with replacement to generate samples with the same N as the original data set (Kline, 1998; Tabachnick & Fidell, 1996; West, Finch, & Curran, 1995). There are no limitations as to the number of times a particular case in the original data set may be utilised in a given empirical sample. Each case may be drawn more than once or not at all (Tabachnick & Fidell, 1996).

The bootstrapping procedure empirically simulates a sampling distribution drawn from the population, where the population is the researcher’s original data set (Kline, 1998). In order to produce adequate and robust sampling distributions, it is
common practice to generate a minimum of 500 empirical samples when undertaking
bootstrapping procedures (Kline, 1998). Averaged parameter estimates with confidence
intervals usually set between 90-95% are calculated across the empirical samples. These
estimates may then be compared to the estimates of the original sample. If the parameter
estimates of the original sample fall within the confidence interval range of the averaged
sampling distribution, then it can be assumed that the model fitted to the original data
set is a robust and stable model solution (Byrne, 2001).

4.4.4 Multigroup Invariance

Measurement invariance is concerned with assessing whether or not the
relationship amongst observed variables (paths) are the same for different groups (e.g.,
males and females). Measurement invariance was employed in the current study to
determine whether the final model was an adequate fit for both males and females, and
whether there were any significant differences between males and females for the
hypothesised relationships in the model. To determine measurement invariance, each
path in the model is constrained equally to one, and a difference test is conducted,
comparing the freely estimated to the fully constrained model. If a difference is found
then the source of discrepancy needs to be determined by freeing each pathway one at a
time, conducting a chi-square test each time a pathway is unconstrained. A significant
chi-square difference indicates that the pathway coefficient is significantly different
between the two groups.

A special note should be made that the invariance test examines the size of the
difference between the unstandardised path coefficients for boys and girls (accounting
for standard errors). This is different to testing whether the magnitude of a given
coefficient in a path model is significant.
CHAPTER FIVE: RESULTS

This chapter presents a detailed account of the analyses conducted to address the research aims, hypotheses, and questions of this study, as presented in chapter three. The chapter begins by explaining the screening procedures used with the data, and follows with a description of the prevalence of overweight, obesity, and binge eating behaviour in the current non-clinical sample of preadolescent Australian school children. The chapter then presents the results of the SEM techniques utilised to test the hypothesised relationships between body weight, binge eating, and the set of physical, psychological, and psychosocial variables of interest in this study. The chapter concludes by describing the results of the MANOVAs conducted to test for differences between participants reporting binge eating behaviour and those reporting no binge eating behaviour.

All analyses were conducted with the statistical packages, SPSS 12.0.1 for Windows and AMOS 4.0 (Arbuckle, 1999).

5.1 Screening the data

The dataset was thoroughly screened before analyses were commenced, and the accuracy of the data file was ensured by double-checking all data entries and reviewing all individual scores for out-of-range values. Three hundred and five cases had missing data on one or more item, resulting in a total of 1.5% missing data points. A visual check of missing data suggested that items were likely incomplete because the participants had accidentally missed the item as they completed the series of questions on each page. As noted by Tabachnick and Fidell (1996), if less than 5% data points are missing in a random pattern from a large data set, almost any procedure for handling missing values yields similar results. Expectation maximisation (EM) method was chosen to deal with missing data, as it is a conservative approach, avoids over-fitting, and produces realistic estimates of variance (Tabachnick & Fidell, 1996). There were less than 10% missing data on all scales, including the Children’s Depression Inventory (CDI), the Children’s Eating Attitudes Test (ChEAT), the modified version of the Internalisation subscale of the Sociocultural Attitudes Towards Appearance Questionnaire (SATATQ-M), the modified version of the Size-Related Teasing subscale
of the Physical Appearance Related Teasing Scale (PARTS-M), and also the emotional eating items, therefore all scales were treated using the Missing Value Analysis (MVA) function in the SPSS 12.0.1 statistical package. The MVA function also describes the pattern of missing data, and whether values are missing randomly. It estimates means, standard deviations, covariances and correlations using EM methods, and then imputes missing values with estimated values using EM methods. Results showed that replacing the missing values changed the means and standard deviations of all items where missing values were imputed only slightly, verifying that the variance of the variables was minimally impacted by the replacement of missing values. Finally, all imputed values were rounded to the nearest whole number to be consistent with the rest of the scores within that item. Checks were redone to ensure that all values were within the appropriate range. Missing data were not replaced for the following variables: mother’s and father’s perceived body size, body dissatisfaction scores, the modified items from the Questionnaire of Eating and Weight Patterns – Revised (QEWP-R), or for height and weight. For these items, participants with missing data could not be included in the analyses for which the item was used. Therefore, participants were included in as many analyses as level of completion of their data allowed.

Data were screened for univariate (zresid = ± 2.58, α ≤ .01) and multivariate outliers. A total of 95 univariate outliers were found across the following variables: mother’s perceived body size, father’s perceived body size, BMI, CDI scores, body dissatisfaction scores, ChEAT scores, Internalisation of Sociocultural Messages subscale scores, and Size-Related Teasing subscale scores. As it is quite often the outliers who are of particular interest in studies of this kind, concern was raised regarding the implications of deleting or modifying them in any way. Examination of the 5% trimmed mean statistic showed only negligible differences in the mean with and without the top and bottom 5% cases deleted. Therefore the rationale for including the univariate outliers without modification was further strengthened, and no univariate outliers were subsequently removed.

However, given the sensitivity of SEM and MANOVA to multivariate outliers, a decision was made to delete all multivariate outliers. A small number of multivariate outliers were detected, using Mahalanobis Distance, and were removed prior to analysis. These are reported in the presentation of each analysis below (sections 5.4 and 5.5).

A special note must be made in relation to a number of dichotomous variables. The dichotomous variable, binge eating, resulted in more than a 90-10 split between
categories. Such a split automatically creates outliers. While Tabachnick and Fidell (1996) recommend deleting dichotomous variables with such an extreme split, this variable was retained for analysis for two reasons: (a) we would not expect, nor would we hope for, more than 10% of the sample to engage in binge eating as it was defined in this study, as it is an extreme eating behaviour; and (b) this variable is of primary interest for a number of analyses investigating the differences between binge eaters and non-binge eaters. The two composite variables constituting binge eating (overeating and loss of control) also had highly uneven distributions, with splits of approximately 87% - 13%, however these variables were retained in the current sample for the same reasons outlined above.

To assess normality, skewness and kurtosis values were examined. Univariate normality is commonly assessed by inspecting the standardised skewness and kurtosis values. However, Tabachnick and Fidell (1996) note that with large sample sizes the standardised skewness is not as important as its absolute value and the visual appearance of the distribution. Furthermore, Monte Carlo simulations of multivariate data suggest that it is more appropriate to examine absolute skewness and kurtosis values as it is skewness values greater than ±3.0 and kurtosis values greater than ± 4.0 that result in inaccurate estimations of test statistics (Hu & Bentler, 1999; Curran, West & Finch, 1996; West et al., 1995). As shown in Table 5.1, only ChEAT scores showed deviations in kurtosis with a value greater than 4.0. However, a decision was made not to transform the data for a number of reasons: (a) Tabachnick and Fidell (1996) state that the larger the sample size the smaller the effect non-normality is likely to have. In particular, for grouped data with large samples, transformation of variables is less imperative. In addition, underestimation of variance associated with negative kurtosis disappears with samples of 100 or more cases, and for positive kurtosis disappears with samples of 200 or more cases. Given that the sample size in this study was greater than 500, underestimation of variance was not a concern; (b) As stated previously when considering outliers, a normal distribution of abnormal eating behaviours would not be expected in the current non-clinical sample. As these particular “abnormal” behaviours are of considerable interest in the current study, a concern was that by normalising the data, the impact of these behaviours would be substantially reduced; and (c) By leaving the data untransformed, there is no doubt that the sample described is as real as possible to the true population.
Table 5.1

Number of participant responses, means, standard deviations, range of possible scores, and absolute univariate skewness and kurtosis values for all study variables, excluding the binge eating variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
<th>M</th>
<th>SD</th>
<th>Range of Scores</th>
<th>Absolute Skewness</th>
<th>Absolute Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Mass Index</td>
<td>561</td>
<td>18.89</td>
<td>3.47</td>
<td>12.08 - 38.71</td>
<td>1.38</td>
<td>3.22</td>
</tr>
<tr>
<td>Weight Category</td>
<td>561</td>
<td>0.29</td>
<td>0.56</td>
<td>0 - 2</td>
<td>1.79</td>
<td>2.18</td>
</tr>
<tr>
<td>Mother’s Body Size</td>
<td>545</td>
<td>5.63</td>
<td>1.39</td>
<td>1 - 9</td>
<td>-.13</td>
<td>.00</td>
</tr>
<tr>
<td>Father’s Body Size</td>
<td>536</td>
<td>6.11</td>
<td>1.18</td>
<td>1 - 9</td>
<td>-.32</td>
<td>1.20</td>
</tr>
<tr>
<td>Body Dissatisfaction</td>
<td>560</td>
<td>0.32</td>
<td>0.79</td>
<td>-4 - 3</td>
<td>.11</td>
<td>2.20</td>
</tr>
<tr>
<td>EE - Bored</td>
<td>569</td>
<td>1.86</td>
<td>.63</td>
<td>1 - 3</td>
<td>.12</td>
<td>-.57</td>
</tr>
<tr>
<td>EE - Happy</td>
<td>569</td>
<td>1.73</td>
<td>.75</td>
<td>1 - 3</td>
<td>.50</td>
<td>-1.09</td>
</tr>
<tr>
<td>EE - Sad</td>
<td>569</td>
<td>1.44</td>
<td>.66</td>
<td>1 - 3</td>
<td>1.22</td>
<td>.24</td>
</tr>
<tr>
<td>EE - Angry</td>
<td>569</td>
<td>1.37</td>
<td>.63</td>
<td>1 - 3</td>
<td>1.48</td>
<td>.95</td>
</tr>
<tr>
<td>EE - Worried</td>
<td>569</td>
<td>1.54</td>
<td>.69</td>
<td>1 - 3</td>
<td>.90</td>
<td>-.41</td>
</tr>
<tr>
<td>Depression (CDI)</td>
<td>569</td>
<td>7.21</td>
<td>6.30</td>
<td>0 - 42</td>
<td>1.56</td>
<td>3.08</td>
</tr>
<tr>
<td>Dieting (ChEAT)</td>
<td>569</td>
<td>10.01</td>
<td>8.80</td>
<td>0 - 63</td>
<td>1.91</td>
<td>5.91</td>
</tr>
<tr>
<td>Internalisation</td>
<td>569</td>
<td>20.53</td>
<td>6.18</td>
<td>8 - 40</td>
<td>.55</td>
<td>.16</td>
</tr>
<tr>
<td>Size-Related Teasing</td>
<td>569</td>
<td>15.86</td>
<td>6.37</td>
<td>9 - 44</td>
<td>1.00</td>
<td>.92</td>
</tr>
</tbody>
</table>

Note. EE = Emotional eating; Dieting = Dieting attitudes and behaviour, as measured by the Children’s Eating Attitudes Test; Internalisation = Internalisation subscale of the Sociocultural Attitudes Towards Appearance Questionnaire - Modified; Size-Related Teasing = Size-Related Teasing subscale of the Physical Appearance Related Teasing Scale - Modified.

As analyses utilised in this study included both ungrouped and grouped data, tests of normality were also conducted for grouped data, according to gender and binge eating behaviours. As with ungrouped data, univariate outliers were detected as well as some evidence of kurtosis, predominantly for ChEAT scores. However, decisions were made not to remove univariate outliers or perform transformations for the reasons already provided.
Multivariate normality was also assessed using Mardia’s multivariate kurtosis statistic for SEM and the Box’s M statistic for MANOVA. Details relating to the assessment of multivariate normality are presented in the relevant sections below (section 5.4 for SEM and section 5.5 for MANOVA).

Data were also screened for violations in linearity, homoscedasticity and homogeneity of variance. Through an examination of the bivariate scatterplots and normal probability plots, no major violations were detected in linearity and homoscedasticity, although a number of bivariate pairs indicated some evidence of heteroscedasticity. While this is not fatal to an analysis it can weaken the analysis slightly. Violations of homogeneity of variance were only detected in analyses pertaining to MANOVA. These are discussed in detail in section 5.5. Finally, there was no evidence of multicollinearity (i.e., bivariate correlations were less than .80).

Table 5.1 summarises the number of participant responses, means, standard deviations, range of possible scores, and univariate skewness and kurtosis values for all variables, excluding the binge eating variables, after the screening and modification of the data was completed.

5.2 Prevalence of Childhood Overweight and Obesity

One of the first aims of the study was to describe the prevalence of childhood overweight and obesity in the current sample of Australian school children. BMI was calculated for all participants, based on their height and weight, as discussed in chapter four. Eight participants requested not to undertake the height and weight assessment, resulting in 1.4% missing data for the BMI calculation. Table 5.1 shows the mean, standard deviation, and range of scores for BMI.

An independent t-test revealed no significant differences between BMI for boys ($M = 18.81, SD = 3.61$) and girls ($M = 18.96, SD = 3.34$), $t(559) = .53, p > .05$. While BMI is expected to increase with age, analyses did not test for age differences, as the age ranges between participants were too narrow to expect any differences (e.g., the majority of participants were aged between 10 and 12.5 years).

As BMI is dependent on age, participants were categorised as normal weight or below, overweight, or obese based on Cole et al.’s (2000) international cut-off points as shown in Appendix C. Table 5.2 shows the number of participants categorised as normal weight or below, overweight, or obese, by gender.
Table 5.2
Participants categorised as normal weight or below, overweight, or obese, based on Cole et al.’s (2000) international cut-off points

<table>
<thead>
<tr>
<th></th>
<th>Normal weight or below</th>
<th>Overweight</th>
<th>Obese</th>
<th>Overweight &amp; Obese</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Males (n=269)</td>
<td>77.0</td>
<td>207</td>
<td>17.5</td>
<td>47</td>
</tr>
<tr>
<td>Females (n=292)</td>
<td>75.3</td>
<td>220</td>
<td>19.5</td>
<td>57</td>
</tr>
<tr>
<td>Total (N=561)</td>
<td>76.1</td>
<td>427</td>
<td>18.5</td>
<td>104</td>
</tr>
</tbody>
</table>

Chi-square tests for independence revealed no significant gender differences, $\chi^2(2, N = 561) = .42, p > .05$, or socioeconomic differences, $\chi^2(4, N = 561) = 5.29, p > .05$, for any of the weight categories. Socioeconomic differences across weight category for gender could not be adequately assessed due to insufficient cell sizes. Specifically, two cells in each analysis for boys and girls (78%) had an expected count less than five (e.g., obese by low SES and high SES categories for both males and females), violating the assumption for chi-square that at least 80% of cells should have expected frequencies of five or more (Pallant, 2001).

In summary, Table 5.2 shows that almost a quarter of participants were overweight or obese, with additional analyses revealing no significant gender or socioeconomic differences between normal weight, overweight, or obese participants.
5.3 Prevalence of Childhood Binge Eating Behaviour

A further aim of the study was to determine the prevalence of binge eating behaviour in the current study population. Binge eating consists of two defining factors: (a) eating a large amount of food in a brief period of time (overeating), associated with (b) loss of control. Table 5.3 presents the number of participants reporting whether or not they experienced either overeating and/or loss of control, according to gender. Four hundred and forty-six children (78.4%) reported engaging in neither of the binge eating behaviours. There were no missing data for these analyses.

Table 5.3

Participants’ reported responses regarding their experiences of binge eating behaviours

<table>
<thead>
<tr>
<th></th>
<th>(1) Overeating</th>
<th>(2) Loss of control</th>
<th>Binge eating (presence of 1 &amp; 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>YES% (n)</td>
<td>NO% (n)</td>
<td>YES% (n)</td>
</tr>
<tr>
<td>Males (n=272)</td>
<td>19.1 (52)</td>
<td>80.9 (220)</td>
<td>15.1 (41)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>84.9 (231)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>YES% (n)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>NO% (n)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>9.2 (25)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>90.8 (247)</td>
</tr>
<tr>
<td>Females (n=297)</td>
<td>8.1 (24)</td>
<td>91.9 (273)</td>
<td>12.8 (38)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>87.2 (259)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>YES% (n)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>NO% (n)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2.4 (7)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>97.6 (290)</td>
</tr>
<tr>
<td>Total (N=569)</td>
<td>13.4 (76)</td>
<td>86.6 (493)</td>
<td>13.9 (79)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>86.1 (490)</td>
</tr>
</tbody>
</table>

Chi-square tests for independence, employing Yates’ Correction for Continuity, revealed significant gender differences for overeating, $\chi^2(1, N = 569) = 14.01, p < .001$, and the presence of binge eating, $\chi^2(1, N = 569) = 11.24, p < .001$, with a higher percentage of boys reporting a greater frequency in each instance. No significant gender differences were found for reported loss of control, $\chi^2(1, N = 569) = .44, p > .05$.

Chi-square tests for independence were also performed to test for differences between weight category and binge eating behaviours, and SES and binge eating behaviours. Analyses revealed no significant differences between weight categories and presence of binge eating, $\chi^2(2, N = 561) = .34, p > .05$, overeating, $\chi^2(2, N = 561) = 2.72, p > .05$, or loss of control, $\chi^2(2, N = 561) = 3.17, p > .05$. Further, no significant
socioeconomic differences were found for binge eating, $\chi^2(2, N = 569) = 4.64$, $p > .05$, or for overeating, $\chi^2(2, N = 569) = 3.23$, $p > .05$. However, a significant difference was found between socioeconomic group and loss of control, $\chi^2(2, N = 569) = 8.31$, $p < .05$. Specifically, a higher percentage of participants from the low and average SES groups reported loss of control compared to participants from high SES.

In total, 123 participants (22%) reported often experiencing overeating and/or loss of control. These participants were then asked to answer a further set of questions, which represented the modified binge eating section of the QEWP-R and the diagnostic criteria of the DSM-IV-TR (APA, 2000). These items relate to a diagnosis of BED. However, as the items relating to compensatory behaviours, such as purging, were not included in the questionnaire package, a diagnosis of BN also cannot be ruled out. Thus the term binge eating syndrome is used throughout the remainder of this thesis to describe participants who fulfilled all research diagnostic criteria for BED excluding the items related to compensatory behaviours. The remainder of this section briefly describes participants’ responses to each of the included QEWP-R items.

One hundred and fourteen participants responded to the item “How often did you have times when you ate this way – that is, eating a large amount of food or feeling that your eating was out of control?” with 7.3% missing data. Of these participants, 48% said they ate this way less than one day a week, 17% responded one day a week, 21% responded two or three days a week, 8% responded four or five days a week, and 6% reported that they ate this way nearly every day.

An independent t-test revealed no significant differences between the reported frequency of either experience for boys ($M = 1.25$, $SD = 1.33$) and girls ($M = .84$, $SD = 1.12$; $t(112) = 1.76$, $p > .05$). In addition, a univariate between-groups analysis of variance (ANOVA) was conducted to test for differences between reported frequency of overeating and/or loss of control for weight category. No significant differences were found across weight category (normal weight or below: $M = 1.05$, $SD = 1.31$; overweight: $M = 1.32$, $SD = 1.06$; obese: $M = .75$, $SD = 1.04$), $F(2,111) = .64$, $p > .05$.

Table 5.4 provides a summary of participant responses to the items relating to whether they had any of five different experiences during times of overeating and/or loss of control as outlined by the QEWP-R and the DSM IV-TR diagnostic criteria. Table 5.4 also reports the responses according to gender and weight category.
Table 5.4
Participant responses to five items experienced during times of overeating and/or loss of control, shown as a total sample, for gender, and for weight category

<table>
<thead>
<tr>
<th>Item</th>
<th>Male</th>
<th>Female</th>
<th>Normal weight or below</th>
<th>Overweight</th>
<th>Obese</th>
<th>Total</th>
<th>Missing Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Eating much more quickly than usual (N = 121)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>n = 1.6%</td>
</tr>
<tr>
<td>YES % (n)</td>
<td>53 (35)</td>
<td>30.9 (17)</td>
<td>41.8 (38)</td>
<td>40.9 (9)</td>
<td>62.5 (5)</td>
<td>43 (52)</td>
<td></td>
</tr>
<tr>
<td>NO % (n)</td>
<td>47 (31)</td>
<td>69.1 (38)</td>
<td>58.2 (53)</td>
<td>59.1 (13)</td>
<td>37.5 (3)</td>
<td>57 (69)</td>
<td></td>
</tr>
<tr>
<td>(2) Eating until uncomfortably full (N = 121)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>n = 1.6%</td>
</tr>
<tr>
<td>YES % (n)</td>
<td>50 (33)</td>
<td>54.5 (30)</td>
<td>47.3 (43)</td>
<td>68.2 (15)</td>
<td>62.5 (5)</td>
<td>52.1 (63)</td>
<td></td>
</tr>
<tr>
<td>NO % (n)</td>
<td>50 (33)</td>
<td>45.5 (25)</td>
<td>52.7 (48)</td>
<td>31.8 (7)</td>
<td>37.5 (3)</td>
<td>47.9 (58)</td>
<td></td>
</tr>
<tr>
<td>(3) Eating large amounts of food when not hungry (N = 120)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>n = 2.4%</td>
</tr>
<tr>
<td>YES % (n)</td>
<td>45.5 (30)</td>
<td>38.9 (21)</td>
<td>46.7 (42)</td>
<td>31.8 (7)</td>
<td>25 (2)</td>
<td>42.5 (51)</td>
<td></td>
</tr>
<tr>
<td>NO % (n)</td>
<td>54.5 (36)</td>
<td>61.1 (33)</td>
<td>53.3 (48)</td>
<td>68.2 (15)</td>
<td>75 (6)</td>
<td>57.5 (69)</td>
<td></td>
</tr>
<tr>
<td>(4) Eating alone due to embarrassment of amount eaten (N = 120)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>n = 2.4%</td>
</tr>
<tr>
<td>YES % (n)</td>
<td>10.6 (7)</td>
<td>13 (7)</td>
<td>8.9 (8)</td>
<td>18.2 (4)</td>
<td>25 (2)</td>
<td>11.7 (14)</td>
<td></td>
</tr>
<tr>
<td>NO % (n)</td>
<td>89.4 (59)</td>
<td>87 (47)</td>
<td>91.1 (82)</td>
<td>81.8 (18)</td>
<td>75 (6)</td>
<td>88.3 (106)</td>
<td></td>
</tr>
<tr>
<td>(5) Feeling disgusted, sad or guilty with self after overeating (N = 119)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YES % (n)</td>
<td>27.3 (18)</td>
<td>47.2 (25)</td>
<td>28.1 (25)</td>
<td>68.2 (15)</td>
<td>37.5 (3)</td>
<td>36.1 (43)</td>
<td></td>
</tr>
<tr>
<td>NO % (n)</td>
<td>72.7 (48)</td>
<td>52.8 (28)</td>
<td>71.9 (64)</td>
<td>31.8 (7)</td>
<td>62.5 (5)</td>
<td>63.9 (76)</td>
<td></td>
</tr>
</tbody>
</table>
Chi-square tests for independence, employing the continuity correction for a
2X2 table, revealed significant gender differences for two items: “eating much more
quickly than usual”, $\chi^2(1, N = 121) = 5.12, p < .05$, with boys reporting a greater
frequency than girls, and also for “feeling disgusted with yourself, sad or feeling very
guilty after overeating”, $\chi^2(1, N = 119) = 4.22, p < .05$, with girls being significantly
more likely to report these negative feelings than boys. No significant gender
differences were found for the other three items: “eating until you felt uncomfortably
full”, $\chi^2(1, N = 121) = .10, p > .05$, “eating large amounts of food when you didn’t feel
hungry”, $\chi^2(1, N = 120) = .29, p > .05$, or “eating alone because you were embarrassed
by how much you were eating”, $\chi^2(1, N = 120) = .01, p > .05$.

In addition, chi-square tests for independence were also performed to test for
differences between weight category and each item shown in Table 5.4. Analyses
revealed significant differences only for the item “feeling disgusted with yourself, sad,
or feeling very guilty after overeating”, $\chi^2(2, N = 119) = 12.29, p < .05$. Those who
were overweight reported significantly more negative feelings than either obese or
normal weight participants. No significant differences were found for the other four
items “eating much more quickly than usual”, $\chi^2(2, N = 121) = 1.34, p > .05$, “eating
until you felt uncomfortably full”, $\chi^2(2, N = 121) = 3.48, p > .05$, “eating large amounts
of food when you didn’t feel hungry”, $\chi^2(2, N = 120) = 2.67, p > .05$, or “eating alone
because you were embarrassed by how much you were eating”, $\chi^2(2, N = 120) = 2.96,
p > .05$.

Of the 123 participants (22% of sample) who reported often experiencing either
overeating and/or a loss of control when eating, 114 participants (7.3% missing data)
responded to the items “How upset were you by overeating (eating more than you think
is best for you)?” and “How upset were you by the feeling that you couldn’t stop or
control what or how much you were eating?” In relation to overeating, 56% of these
participants reported being not at all upset, 29% reported feeling a little bit upset, 7%
reported feeling moderately upset, 2% reported feeling greatly upset, and 6% reported
feeling extremely upset. Similarly, in relation to reported loss of control, 54% of
participants reported being not at all upset, 31% reported feeling a little bit upset, 6% reported
feeling moderately upset, 5% reported feeling greatly upset, and 4% of
participants reported feeling extremely upset.
Two independent t-tests were conducted to examine gender differences for how upset participants reported feeling regarding their overeating and/or loss of control. The t-tests revealed significant differences, with girls reporting feeling more upset by overeating (girls: $M = .98, SD = 1.20$; boys: $M = .52, SD = .95$), $t(112) = 2.31, p < .05$, and loss of control (girls: $M = .96, SD = 1.14$; boys: $M = .53, SD = .90$), $t(112) = 2.25, p < .05$, than boys. In addition, two ANOVAs were conducted to test for differences between weight categories across reported overeating and loss of control. A significant difference was found between weight categories for overeating, $F(2, 111) = 6.27, p < .01$. Post-hoc analyses with Dunnett’s correction for unequal cell sizes, revealed a significant difference between normal weight ($M = .52, SD = .95$) and overweight participants ($M = 1.36, SD = 1.22$). While no significant difference was found between normal weight and obese participants ($M = 1.13, SD = 1.46$), a trend in the expected direction was found. A significant difference was also found between weight categories for loss of control, $F(2, 111) = 9.99, p < .001$. Post-hoc analyses with Dunnett’s correction for unequal cell sizes, revealed a significant difference between normal weight ($M = .49, SD = .87$) and overweight participants ($M = 1.41, SD = 1.05$), and between normal weight and obese participants ($M = 1.38, SD = 1.51$).

An additional aim of this study was to determine whether the current non-clinical sample of preadolescent Australian school children would fulfil the research criteria for a diagnosis of binge eating syndrome. Taking all responses to all items together, 491 participants (86%) fulfilled no criteria, eight participants fulfilled one criterion, twelve participants fulfilled two criteria, eight participants fulfilled three criteria, and two participants fulfilled all four criteria for binge eating syndrome (one additional criterion excluding compensatory behaviours is required for a full diagnosis of BED). Neither participant who fulfilled 4 criteria answered that they vomited after eating on the ChEAT scale, indicating that these participants may fulfil the full criteria for a diagnosis of BED, although other forms of compensatory behaviour were not assessed. Seventeen participants (3%) did not answer one or more of the questions, and were excluded from the analyses.

In summary, approximately 20% of participants reported binge eating behaviour, including overeating and/or loss of control, with less than 1% fulfilling the criteria for binge eating syndrome. Some significant differences were found across gender, weight category, and socioeconomic group.
5.4 Investigation of Relationships between BMI Binge Eating, and a Set of Physical, Psychological, and Psychosocial Factors

A major aim of this study was to develop and test a model of the possible relationships between BMI, binge eating, and a set of physical, psychological, and psychosocial risk factors and consequences, as shown in Figure 3.1 and discussed in section 3.8.3.

SEM was employed to test the proposed model, using AMOS 4.0 (Arbuckle, 1999). As the AMOS package has no function to deal with missing data, cases with missing data on variables such as BMI and parent’s perceived body size were deleted. Fifty-six cases had missing data on one or more variables and were thus deleted from the data file, resulting in a final N of 513.

Tests for violations of assumptions were conducted for the final sample. Univariate normality was tested as described in section 5.1. The distribution of ChEAT scores deviated significantly from normality with absolute kurtosis > 4.0, however once multivariate outliers were removed (as reported below), univariate normality was no longer violated. Most of the estimation techniques in SEM assume multivariate normality (Byrne, 2001; Tabachnick & Fidell, 1996). Therefore tests of multivariate normality were also conducted through AMOS, showing evidence of multivariate non-normality, Mardia’s coefficient of multivariate kurtosis = 56.07, p < .01. Eleven outliers were detected using Mahalanobis Distance at a criterion at the .001 level. Given the sensitivity of SEM to multivariate outliers, and the risk of inflated Type 1 error in estimation of parameters, the outliers were removed from the SEM analyses. Multicollinearity and singularity were also tested by examining the bivariate correlations between all variables included in the structural equation model, with no violations detected (r < .80). Table 5.5 shows the means, standard deviations, and correlations for all variables tested in the model.

In SEM, the use of coarsely categorised variables (e.g., dichotomous variables or discrete variables with less than five categories) are generally undesirable (Muthen & Kaplan, 1985; West et al., 1995), as they tend to bias parameter estimates and associated standard errors of structural models (West et al., 1995). As body dissatisfaction, the emotional eating items, and the binge eating items were all coarsely categorised, SEM analyses were conducted on the correlation matrix, as shown in Table 5.5, rather than the raw data, as proposed by Muthen (1984). For example, Muthen (1984) suggested
Table 5.5

Means, standard deviations, and correlation matrix for all study variables included in the hypothesised model

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
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<th>4</th>
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<td>.18**</td>
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<td>.13**</td>
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<td>.21**</td>
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<td>.34**</td>
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<td>11. EE – Bored</td>
<td>-.16**</td>
<td>.19**</td>
<td>.09</td>
<td>.03</td>
<td>-.04</td>
<td>-.11*</td>
<td>-.10*</td>
<td>-.02</td>
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<tr>
<td>12. EE – Happy</td>
<td>-.19**</td>
<td>.10*</td>
<td>.06</td>
<td>-.04</td>
<td>.03</td>
<td>-.19**</td>
<td>.04</td>
<td>.12**</td>
<td>.07</td>
<td>.07</td>
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</tr>
<tr>
<td>13. EE – Sad</td>
<td>.06</td>
<td>.13**</td>
<td>-.01</td>
<td>-.01</td>
<td>-.04</td>
<td>.04</td>
<td>-.01</td>
<td>-.02</td>
<td>.07</td>
<td>.02</td>
<td>.20**</td>
<td>-.11*</td>
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<td>14. EE – Angry</td>
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<td>.16**</td>
<td>.07</td>
<td>-.01</td>
<td>-.01</td>
<td>.03</td>
<td>.01</td>
<td>.04</td>
<td>.04</td>
<td>.09*</td>
<td>.01</td>
<td>.16**</td>
<td>.21**</td>
<td>.20**</td>
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<td>15. EE – Worried</td>
<td>-.07</td>
<td>.18**</td>
<td>.09*</td>
<td>-.04</td>
<td>.04</td>
<td>-.09*</td>
<td>.10*</td>
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<td>.10*</td>
<td>.10*</td>
<td>.22**</td>
<td>.22**</td>
<td>.20**</td>
<td>.26**</td>
<td></td>
</tr>
</tbody>
</table>

M 18.91 | .13 | .14 | 5.63 | 6.11 | .32 | 9.71 | 6.76 | 20.54 | 15.62 | 1.86 | 1.74 | 1.43 | 1.37 | 1.54 |
SD 3.34 | .34 | .34 | 1.35 | 1.13 | .76 | 7.92 | 5.80 | 6.13 | 6.08 | .63 | .76 | .65 | .63 | .69 |

Note. BMI = Body Mass Index; OVEREAT = Eating a large amount of food in a short time; LOSS CONT = Feeling of loss of control of what or how much food was eaten; MUMS SIZE = Mother’s perceived body size; DADS SIZE = Father’s perceived body size; BODYDIS = Body dissatisfaction score; DIETING = Dieting attitudes and behaviour, as measured by the Children’s Eating Attitudes Test; DEPRESSION = Children’s Depression Inventory scale score; INTERN = Internalisation subscale of the modified Sociocultural Attitudes Towards Appearance scale; TEASING = Size-Related Teasing subscale of the modified Physical Appearance Related Teasing Scale; EE = Emotional eating item for Bored, Happy, Sad, Angry, & Worried.

N = 502, *p<.05 two-tailed; **p<.01 two-tailed.
that given that coarsely categorised variables are assumed to consist of an underlying continuous distribution, by calculating the polychoric and point bi-serial correlations amongst the variables, and conducting analyses on the correlation matrix, that this is likely to yield unbiased parameter estimates and standard errors (Muthen, 1984; West et al., 1995).

Maximum likelihood estimation was employed to estimate all models. Firstly, the hypothesised model, as shown in Figure 3.1, was tested and it was found to have reasonable fit with the study sample, $\chi^2 (69, N = 502) = 176.67$, $p < .05$, with fit indices shown in Table 5.6. However, while absolute fit indices indicated adequate fit, the same could not be said for the incremental fit indices, with both the CFI and TLI falling below .90. Examination of the modification indices indicated that a covariance between the error variances for the emotional eating items happy and sad would improve model fit. It appears reasonable to assume that children would likely see the emotions happy and sad to be opposites of one another, as opposed to the other emotions in the scale. As such, it was determined that the addition of this covariance path made sense, and that when viewed as opposing emotions they may indeed be related in an interesting and important way. The model was then re-run with this post-hoc modification, and a chi-square difference test indicated a significantly improved fit between the initial and the modified model, as shown in Table 5.6.

On further inspection, modification indices also indicated that a covariance between the error variances for body dissatisfaction and the loss of control component of binge eating would improve model fit. Given that research suggests that it is the loss of control component of binge eating that is considered its most meaningful feature (Fairburn & Wilson, 1993; Pratt et al., 1998), it was deemed appropriate to also add this path. Again, as shown in Table 5.6, the model was re-run with this modification, and analyses indicated that this modified model was a significant improvement on the previous models.
Table 5.6

Fit indices and $\Delta^2$ for the initial and respecified structural equation models

<table>
<thead>
<tr>
<th>Model Description</th>
<th>$\chi^2$</th>
<th>df</th>
<th>CFI</th>
<th>TLI</th>
<th>RMSEA</th>
<th>SRMR</th>
<th>$\Delta^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Hypothesised Model</td>
<td>176.67</td>
<td>69</td>
<td>.88</td>
<td>.82</td>
<td>.06</td>
<td>.05</td>
<td></td>
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<tr>
<td><strong>Model Building (e.g., pathways added):</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Covariance added between e2 (happy) and e3 (sad); MI = 31.28</td>
<td>138.04</td>
<td>68</td>
<td>.93</td>
<td>.88</td>
<td>.05</td>
<td>.05</td>
<td>38.63***</td>
</tr>
<tr>
<td>Covariance added between ebd (body dissatisfaction) and bingee2 (loss of control); MI = 16.31</td>
<td>118.46</td>
<td>67</td>
<td>.94</td>
<td>.91</td>
<td>.04</td>
<td>.04</td>
<td>19.58***</td>
</tr>
<tr>
<td><strong>Model Trimming (e.g., pathways deleted):</strong></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Internalisation of Sociocultural Messages $\rightarrow$ Binge Eating</td>
<td>118.47</td>
<td>68</td>
<td>.95</td>
<td>.92</td>
<td>.04</td>
<td>.04</td>
<td>.01</td>
</tr>
<tr>
<td>Dieting Attitudes and Behaviour $\rightarrow$ Binge Eating</td>
<td>118.55</td>
<td>69</td>
<td>.95</td>
<td>.92</td>
<td>.04</td>
<td>.04</td>
<td>.08</td>
</tr>
<tr>
<td>Binge Eating $\rightarrow$ Body Mass Index</td>
<td>118.64</td>
<td>70</td>
<td>.95</td>
<td>.92</td>
<td>.04</td>
<td>.04</td>
<td>.09</td>
</tr>
<tr>
<td>Body Mass Index $\rightarrow$ Depression</td>
<td>118.84</td>
<td>71</td>
<td>.95</td>
<td>.92</td>
<td>.04</td>
<td>.04</td>
<td>.20</td>
</tr>
<tr>
<td>Dieting Attitudes and Behaviour $\rightarrow$ Emotional Eating</td>
<td>119.08</td>
<td>72</td>
<td>.95</td>
<td>.93</td>
<td>.04</td>
<td>.05</td>
<td>.24</td>
</tr>
<tr>
<td>Size-Related Teasing Experiences $\rightarrow$ Body Dissatisfaction</td>
<td>119.71</td>
<td>73</td>
<td>.95</td>
<td>.93</td>
<td>.04</td>
<td>.05</td>
<td>.63</td>
</tr>
<tr>
<td>Size-Related Teasing Experiences $\rightarrow$ Binge Eating</td>
<td>120.56</td>
<td>74</td>
<td>.95</td>
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<td>Body Dissatisfaction $\rightarrow$ Dieting Attitudes and Behaviour</td>
<td>122.11</td>
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<td>.95</td>
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<td>.04</td>
<td>.05</td>
<td>1.55</td>
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<tr>
<td>Body Mass Index $\rightarrow$ Dieting Attitudes and Behaviour</td>
<td>123.16</td>
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<td>.93</td>
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<tr>
<td>Depression $\rightarrow$ Emotional Eating (Final Model)</td>
<td>125.59</td>
<td>77</td>
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<td>.05</td>
<td>2.43</td>
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*Note: MI = modification index

***p<.001
On examination, 18 significant pathways and 11 non-significant pathways were detected in this model. As a means of testing the stability of the parameter estimates and validating the model, the sample was bootstrapped to 1000 replications. The parameter estimates of the original sample (i.e., factor loadings, error variances, factor variances, item variances and factor covariances) fell within the 90% confidence intervals of the averaged bootstrapped sampling distribution, as presented in Table 5.7, thus verifying a robust and stable model solution. It is important to note here that although the path coefficient for the pathway between body dissatisfaction and binge eating was initially non-significant, the 90% confidence intervals of the bootstrapped distribution did not include a value of zero (if examined to 3 decimal places), indicating that this pathway could possibly be significant.

The model was then re-run with each non-significant pathway removed from the model one by one, with the least significant pathway deleted each time. During this process, the pathway between binge eating and body dissatisfaction was found to be significant and thus remained in the final model. Table 5.6 summarises the fit indices and \( \Delta^2 \) for each step in the re-specification of the model. Figure 5.1 shows the final model after removal of all non-significant pathways. In summary, the model shows that BMI is significantly associated with parent size, size-related teasing experiences, body dissatisfaction, internalisation of sociocultural messages, and emotional eating, and indirectly related to depression and dieting attitudes and behaviour. BMI and binge eating are not directly related to one another, however they are indirectly related through their relationships with the other variables in the model, e.g., size-related teasing experiences and depression.

In addition, binge eating is seen to be directly related to parent size, depression, body dissatisfaction, and emotional eating, and indirectly related to size-related teasing experiences, internalisation of sociocultural messages, and dieting attitudes and behaviour. A relationship is also seen between the loss of control component of binge eating and body dissatisfaction. The model explains 29% of the variance in binge eating.
Table 5.7

*Standardised path coefficients and bootstrapped confidence intervals for the respecified model*

<table>
<thead>
<tr>
<th>Pathway</th>
<th>Standardised Path Coefficient (β)</th>
<th>Bootstrapped Standardised Lower Bound 90% CI</th>
<th>Bootstrapped Standardised Upper Bound 90% CI</th>
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<td>Parent Size → BE</td>
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<td>.41</td>
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<tr>
<td>Parent Size → BMI</td>
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<td>.18</td>
<td>.49</td>
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<tr>
<td>BMI → Teasing</td>
<td>.34***</td>
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<td>.41</td>
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<tr>
<td>BMI → Internalisation</td>
<td>.19***</td>
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<td>BMI → Dieting</td>
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<td>Depression → BE</td>
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<td>.35</td>
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<tr>
<td>Dieting → BE</td>
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<td>.21</td>
</tr>
<tr>
<td>Dieting → EE</td>
<td>.03</td>
<td>-.08</td>
<td>.15</td>
</tr>
<tr>
<td>Internalisation → Depression</td>
<td>.15***</td>
<td>.08</td>
<td>.23</td>
</tr>
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<td>Teasing → BD</td>
<td>-.03</td>
<td>-.10</td>
<td>.03</td>
</tr>
<tr>
<td>Internalisation → BD</td>
<td>.14***</td>
<td>.07</td>
<td>.20</td>
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<tr>
<td>BD → Depression</td>
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<td>BD → BE</td>
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<td>.18</td>
</tr>
<tr>
<td>BE → BMI</td>
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<td>-.24</td>
<td>.17</td>
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Table 5.7 (continued)

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<tr>
<th>Pathway</th>
<th>Standardised path coefficient (β)</th>
<th>Bootstrapped Standardised Lower Bound 90% CI</th>
<th>Bootstrapped Standardised Upper Bound 90% CI</th>
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<td>.24</td>
<td>.37</td>
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<td>-.33***</td>
<td>-.43</td>
<td>-.24</td>
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<td>Loss of Control ↔ BD</td>
<td>.23***</td>
<td>.14</td>
<td>.33</td>
</tr>
<tr>
<td>EE → Bored</td>
<td>.44a</td>
<td>.33</td>
<td>.53</td>
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<tr>
<td>EE → Happy</td>
<td>.43***</td>
<td>.32</td>
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<td>.48</td>
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<td>EE → Angry</td>
<td>.47***</td>
<td>.39</td>
<td>.55</td>
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<tr>
<td>EE → Worried</td>
<td>.52***</td>
<td>.43</td>
<td>.61</td>
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<tr>
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<td>Dad’s Size → Parent’s Size</td>
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<td>.67</td>
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<td>Loss of Control → BE</td>
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<tr>
<td>Overeating → BE</td>
<td>.71a</td>
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*Note. BE = Binge eating; BMI = Body Mass Index; Teasing = Size-related teasing experiences, as measured by the Size-Related Teasing subscale of the Physical Appearance Related Teasing Scale – Modified; Internalisation = Internalisation of sociocultural messages, as measured by the Internalisation subscale of the Sociocultural Attitudes Towards Appearance Questionnaire - Modified; Dieting = Dieting attitudes and behaviour, as measured by the Children’s Eating Attitudes Test; EE = Emotional eating; BD = Body dissatisfaction.

*aSignificance unable to be determined as parameter was constrained to one (although confidence intervals suggest that pathways are significant).

*p < .05, **p < .01, ***p ≤ .001
Figure 5.1. Final respecified model of the significant relationships between BMI, binge eating, and physical, psychological, and psychosocial factors, with standardised path coefficients.
5.4.1 Gender Differences

Although gender differences were not expected in relation to the hypothesised model, the literature suggests that some of these relationships would be stronger for girls than boys (e.g., evidence suggests that overweight girls may experience greater body dissatisfaction than overweight boys, section 2.4.1). In addition, some of the relationships have not been explored in boys at all. Therefore to investigate whether gender differences were evident in any of the hypothesised relationships, the final model was tested for invariance between boys and girls. As such, the original sample with all cases deleted with missing data (N = 513) was divided into two groups based on gender. Violations of assumptions were again tested for each group. Five multivariate outliers were found and deleted for each of these groups, resulting in a final sample of 240 cases for boys and 263 cases for girls. Correlation matrices were again analysed rather than the raw data, due to the presence of coarsely categorised variables in the model. Table 5.8 display the means, standard deviations, and correlations between all variables for boys and girls (correlations below the diagonal for boys and above the diagonal for girls).

When the multi-group analysis was initially run, it resulted in an unidentified model. The source of non-identification was a negative error variance located on the “overeating” component of binge eating for boys. The occurrence of negative error variance can be attributed to a number of possible causes, including (a) the model has been incorrectly specified, resulting in an illogical parameter estimate because variance has been forced to take unrealistic values; or (b) brought about by sampling fluctuations in parameter estimates (Chen, Bollen, Paxton, Curran, and Kirby, 2001). To test the hypothesis that sampling fluctuation was the cause, the residual error variance was constrained to .0001 in accordance with recommendations outlined by Chen et al. (2001). The respecified model resulted in identification, supporting the hypothesis of random sampling fluctuation. Had this not been the case, re-specification would have resulted in a non-identified model again.
Table 5.8

Means, standard deviations, and correlation matrix for all study variables included in the final structural equation model, for boys and girls

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<td>-</td>
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<td>-</td>
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Males (n = 240)

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<td>14.79</td>
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<td>1.78</td>
<td>1.50</td>
<td>1.46</td>
<td>1.58</td>
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<tr>
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<td>0.78</td>
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Females (n = 263)

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<td>1.51</td>
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<tr>
<td>SD</td>
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<td>6.83</td>
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<td>6.11</td>
<td>0.75</td>
<td>0.63</td>
<td>0.56</td>
<td>0.66</td>
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</table>

Note: Values above the diagonal are those for girls, and those below the diagonal are those for boys. BMI = Body Mass Index; OVEREAT = Eating a large amount of food in a short time; LOSS CONT = Feeling of loss of control of what or how much food was eaten; MUMS SIZE = Mother’s perceived body size; DADS SIZE = Father’s perceived body size; BODYDIS = Body dissatisfaction score; DIETING = Dieting attitudes and behaviour, as measured by the Children’s Eating Attitudes Test; DEPRESSION = Children’s Depression Inventory scale score; INTERN = Internalisation subscale of the modified Sociocultural Attitudes Towards Appearance scale; TEASING = Size-Related Teasing subscale of the modified Physical Appearance Related Teasing Scale; EE = Emotional eating item for Bored, Happy, Sad, Angry, & Worried.

*p < .05, two-tailed, **p < .01, two-tailed.
The multigroup test resulted in an adequate fitting model for boys and girls, $\chi^2(155, N = 503) = 228.35, p < .05$, RMSEA = .03, SRMR = .07, CFI = .92, TLI = .90. The model, including all standardised path coefficients for boys and girls are illustrated in Figures 5.2 and 5.3 respectively. Non-significant pathways are illustrated as dashed lines in the models. A number of similarities between boys and girls are apparent in the two models. For example, BMI is significantly and directly associated with size-related teasing, body dissatisfaction, and internalisation of media messages, and significantly and indirectly associated with depression and binge eating behaviour for both boys and girls. In addition, dieting attitudes and behaviour are related to depression, emotional eating is related to binge eating, and size-related teasing and internalisation of media messages are related to one another. A number of differences are also apparent. For example, parent size is significantly related to BMI and binge eating for girls only, while emotional eating is significantly and negatively related to BMI for boys only. Size-related teasing is significantly associated with dieting attitudes and behaviour for boys, but not for girls, while internalisation of media messages is significantly related to dieting attitudes and behaviour, body dissatisfaction, and depression for girls, but not for boys. Body dissatisfaction is significantly associated with depression for girls only, although the relationship is weak, while body dissatisfaction is significantly related to loss of control for boys only. The relationship between body dissatisfaction and binge eating is not significant for boys or girls. The model explains more of the variance in binge eating for girls than boys. For example, for boys, the model explains 22% of the variance in binge eating, while for girls, the model explains 69% of the variance in binge eating.

While it is noted that the size of some of the standardised path coefficients is quite small (e.g., the standardised path coefficient between body dissatisfaction and depression for girls is .13), all values are above .10. This suggests that while the contribution made by some pathways to the model is lower than others, all significant pathways (regardless of size) are still making a useful contribution to the overall model (Kline, 1998).

To determine whether any of the regression pathways were significantly different across gender, an invariance test was conducted, where all paths were constrained equally between groups. The constrained model also supported an adequate fitting model, $\chi^2(179, N = 503) = 270.12, p < .05$, RMSEA = .03, SRMR = .07, CFI = .91, TLI = .89. However, the chi-square difference test revealed significant differences,
\[ \chi^2_{\text{diff}}(24, N = 503) = 41.77, p < .05, \]
between the freely estimated and constrained models, suggesting that there were one or more significant differences in the path coefficients between boys and girls. To locate the sources of difference, each pathway of the constrained model was freely estimated in a consecutive manner as part of the invariance testing process (Byrne, 2001; Kline, 1998; Section 4.4.4). Table 5.9 summarises the results of this analysis.

As shown in Table 5.9, three significant differences between the two groups were found. These were for the pathways between internalisation of sociocultural messages and dieting attitudes and behaviour, emotional eating and binge eating, and binge eating and its subscale item, loss of control. Examination of the coefficients showed that the relationship between internalisation of sociocultural messages and dieting attitudes and behaviour was stronger for girls (\( \beta = .34 \)) than boys (\( \beta = .06 \)), while the relationships between binge eating and loss of control (\( \beta = .48 \) for boys and \( \beta = .39 \) for girls) and emotional eating and binge eating (\( \beta = .41 \) for boys and \( \beta = .40 \) for girls), were stronger for boys than girls. Recall from section 4.4.4 that these estimates take into account standard error, thus while the coefficients for the pathway between emotional eating and binge eating are almost identical for boys and girls, this is simply due to the effect of the standard error on the unstandardised coefficients. The actual size of the unstandardised coefficients is significantly different.
Figure 5.2. Final model of the relationships between BMI, binge eating, and related physical, psychological, and psychosocial variables, with standardised path coefficients, for boys.
Note: Dashed lines indicate non-significant paths.

Figure 5.3. Final model of the relationships between BMI, binge eating, and related physical, psychological, and psychosocial variables, with standardised path coefficients, for girls.
Table 5.9

*Summary of chi-square difference tests for invariance in the path regression weights between boys and girls*

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<th>df</th>
<th>$\Delta \chi^2$</th>
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<td>Parent Size $\rightarrow$ BMI</td>
<td>267.21</td>
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<td>Dad’s Perceived Size $\rightarrow$ Parent Size</td>
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<tr>
<td>BMI $\rightarrow$ Teasing</td>
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<tr>
<td>BMI $\rightarrow$ Internalisation</td>
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<td>BMI $\rightarrow$ Body Dissatisfaction</td>
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<td>.09</td>
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<tr>
<td>Covariance between Teasing &amp; Internalisation</td>
<td>264.53</td>
<td>173</td>
<td>.57</td>
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<tr>
<td>Teasing $\rightarrow$ Depression</td>
<td>260.99</td>
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<tr>
<td>Teasing $\rightarrow$ Dieting</td>
<td>260.98</td>
<td>171</td>
<td>.01</td>
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<td>Internalisation $\rightarrow$ Body Dissatisfaction</td>
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<td>Internalisation $\rightarrow$ Depression</td>
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<td>Internalisation $\rightarrow$ Dieting</td>
<td>251.09</td>
<td>168</td>
<td>5.72**</td>
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<td>Body Dissatisfaction $\rightarrow$ Depression</td>
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<td>Covariance between Body Dissatisfaction and Loss of Control</td>
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<td>1.81</td>
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Loss of Control

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<td>Depression $\rightarrow$ Binge Eating</td>
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<td>Emotional Eating $\rightarrow$ Binge Eating</td>
<td>241.24</td>
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<td>4.71**</td>
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<td>7.67**</td>
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<td>Emotional Eating $\rightarrow$ Worried</td>
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<td>155</td>
<td>.51</td>
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(Freely estimated model)

*Note. BMI = Body Mass Index; Teasing = Size-related teasing experiences, as measured by the Size-Related Teasing subscale of the Physical Appearance Related Teasing Scale - Modified; Internalisation = Internalisation of sociocultural messages, as measured by the Internalisation subscale of the Sociocultural Attitudes Towards Appearance Questionnaire – Modified; Dieting = Dieting attitudes and behaviour, as measured by the Children’s Eating Attitudes Test.

$^{**}p < .01$
5.5 Differences Between Participants Reporting Binge Eating Behaviour and Those Reporting No Binge Eating Behaviour

This final section presents the analyses conducted to investigate the differences between participants reporting binge eating behaviour and those reporting no binge eating behaviour. The aim of the analyses was to determine whether children who engage in binge eating behaviour differ from non-binge eaters on psychological or psychosocial variables such as depression or size-related teasing experiences. As such, two one-factorial between-groups MANOVAs were conducted, with binge eating as the between-groups factor. The first analysis comprised of the dependent variables depression, dieting attitudes and behaviour, body dissatisfaction, size-related teasing experiences, and internalisation of sociocultural messages. The second analysis included the five emotional eating items (happy, sad, angry, bored, and worried) as the dependent variables. Two separate MANOVAs were run due to the high number of dependent variables, and the low number of participants reporting binge eating behaviour, which, if included as one analysis, would have resulted in inadequate statistical power. In addition, given the potential importance of the separate components of binge eating (e.g., overeating and loss of control), two two-factorial between-group MANOVAs (overeating x loss of control) were conducted using the same dependent variables listed above. For all analyses, minimum cell sizes were greater than or equal to 31. Thus cell sizes were sufficient for conducting all analyses with adequate statistical power (Tabachnick & Fidell, 1996).

Although it would have been interesting to also include gender as a factor in the analyses, gender was not included. Adding gender as an additional factor would have led to further reductions in cell sizes, decreasing statistical power and likely resulting in spurious findings.

Preliminary assumption testing was conducted to check for normality, linearity, univariate and multivariate outliers, homogeneity of variance-covariance, and multicollinearity. No violations were detected for linearity or multicollinearity (section 5.1). Although some violations of normality were detected, MANOVA is fairly robust to modest violations of normality, particularly with a sample size of at least twenty in each cell (Tabachnick & Fidell, 1996). For the set of dependent variables including depression, dieting attitudes and behaviour, size-related teasing experiences, body dissatisfaction, and internalisation of sociocultural messages, twelve multivariate
outliers were detected using Mahalanobis Distance \((5) = 20.25, p < .05\). These outliers were excluded from the relevant analyses due to MANOVAs sensitivity to multivariate outliers. No multivariate outliers were found for the analyses including the emotional eating items.

A number of variables violated the assumption of equality of variance in the four analyses, and are outlined as each analysis is reported below. As MANOVA is a sensitive test, particularly with large sample sizes, for all variables that violated this assumption, a more conservative alpha level of .025 was set for determining significance of the univariate F-tests (Tabachnick & Fidell, 1996).

5.5.1 Binge Eating

In the first set of analyses, binge eating (overeating associated with loss of control, as defined by the DSM-IV-TR, APA, 2000) was the independent variable. Three variables in the analysis violated the assumption of equality of variance (i.e., depression, emotional eating – sad, emotional eating - angry). For these variables, an alpha level of .025 was set as described above.

For the first one-factorial between-groups MANOVA with dependent variables depression, dieting attitudes and behaviour, body dissatisfaction, size-related teasing experiences, and internalisation of sociocultural messages, a statistically significant difference was found between binge eaters and non-binge eaters, Pillai’s Trace = .04, \(F(5,542) = 4.53, p < .001\), partial \(\eta^2 = .04\) (observed power = .97). Univariate F tests with Bonferroni corrections (\(\alpha = .005\) for depression; \(\alpha = .01\) for all other dependent variables) revealed that binge eaters and non-binge eaters differed in their ratings of depression, \(F(1,546) = 17.41, p < .001\), size-related teasing experiences, \(F(1,546) = 8.43, p < .01\), and internalisation of sociocultural messages, \(F(1,546) = 7.01, p < .01\). As shown in Table 5.10, mean scores indicated that binge eaters reported higher levels of depression, size-related teasing experiences, and internalisation of sociocultural messages than non-binge eaters.

For the second one-factorial between groups MANOVA with the five emotional eating items (happy, sad, angry, bored, and worried) as the dependent variables, a statistically significant difference was again found between binge eaters and non-binge eaters, Pillai’s Trace = .04, \(F(5,563) = 4.96, p < .001\), partial \(\eta^2 = .04\) (observed power = .98). Univariate F tests with Bonferroni corrections (\(\alpha = .005\) for sad and angry; \(\alpha = .01\) for all other dependent variables), and analysis of means as shown in Table 5.10,
showed that binge eaters reported higher levels of angry-related emotional eating, 
$F(1,567) = 14.38, p < .001$, and worried-related emotional eating, $F(1,567) = 13.78, p < .001$, than non-binge eaters.

Table 5.10

Estimated marginal means and standard deviations for all dependent variables included in the one-factorial between-group MANOVAs (binge eating)

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Non-Binge Eaters</th>
<th>Binge Eaters</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
</tr>
<tr>
<td>Depression</td>
<td>6.57</td>
<td>5.62</td>
</tr>
<tr>
<td>Dieting Attitudes and Behaviour</td>
<td>9.44</td>
<td>7.71</td>
</tr>
<tr>
<td>Body Dissatisfaction</td>
<td>.32</td>
<td>.75</td>
</tr>
<tr>
<td>Size-Related Teasing Experiences</td>
<td>15.56</td>
<td>6.05</td>
</tr>
<tr>
<td>Internationalisation of Sociocultural Messages</td>
<td>20.27</td>
<td>5.96</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>$n^b$</th>
<th>517</th>
<th>31</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emotional Eating – Bored</td>
<td>1.85</td>
<td>.63</td>
<td>2.06</td>
</tr>
<tr>
<td>Emotional Eating – Happy</td>
<td>1.71</td>
<td>.76</td>
<td>1.94</td>
</tr>
<tr>
<td>Emotional Eating – Sad</td>
<td>1.42</td>
<td>.65</td>
<td>1.69</td>
</tr>
<tr>
<td>Emotional Eating – Angry</td>
<td>1.35</td>
<td>.63</td>
<td>1.78</td>
</tr>
<tr>
<td>Emotional Eating – Worried</td>
<td>1.51</td>
<td>.67</td>
<td>1.97</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>$n^b$</th>
<th>537</th>
<th>32</th>
</tr>
</thead>
</table>

$^a$Number of participants in each group, after the removal of missing data and 12 multivariate outliers. $^b$Number of participants in each group. No missing data or multivariate outliers.

5.5.2 Overeating and Loss of Control

In the second set of analyses, the two individual items that together constitute binge eating, that is, overeating and loss of control, were included as the independent variables in two two factorial between-groups MANOVAs. For these analyses, six variables violated the assumption of equality of variance (i.e., depression, internalisation of sociocultural messages, and the emotional eating items happy, sad, angry, and worried). For these variables, a more conservative alpha level of .025 was set to determine significance of the univariate F tests.
For the first two-factorial between-groups MANOVA (overeating x loss of control) with dependent variables depression, dieting attitudes and behaviour, body dissatisfaction, size-related teasing experiences, and internalisation of sociocultural messages, a statistically significant multivariate main effect was found for overeating. Pillai’s Trace = .03, $F(5,540) = 3.24, p < .01$, partial $\eta^2 = .03$ (observed power = .89). Univariate F tests with Bonferroni corrections ($\alpha = .005$ for depression and internalisation of sociocultural messages; $\alpha = .01$ for all other dependent variables), and analysis of mean scores as shown in Table 5.11, revealed that participants reporting overeating behaviour had lower body dissatisfaction scores than those not reporting overeating behaviour, $F(1, 544) = 7.31, p < .001$. Furthermore, a significant multivariate main effect for loss of control was also found, Pillai’s Trace = .07, $F(5,540) = 8.15, p < .001$, partial $\eta^2 = .07$ (observed power = 1.00). Participants reporting loss of control had higher scores on measures of depression, $F(1, 544) = 13.74, p < .001$, body dissatisfaction, $F(1, 544) = 23.34, p < .001$, size-related teasing experiences, $F(1, 544) = 9.53, p < .01$, and internalisation of sociocultural messages, $F(1, 544) = 14.87, p < .001$. No significant interaction effect was found between overeating and loss of control, Pillai’s Trace = .02, $F(5,540) = 2.20, p > .05$, partial $\eta^2 = .02$ (observed power = .72).

For the second two-factorial between-groups MANOVA (overeating x loss of control) with the five emotional eating items (happy, sad, angry, bored, and worried) as the dependent variables, a significant multivariate main effect was found for overeating, Pillai’s Trace = .05, $F(5,561) = 5.83, p < .001$, partial $\eta^2 = .05$ (observed power = .99). Univariate F tests with Bonferroni corrections ($\alpha = .005$ for happy, sad, angry and worried; $\alpha = .01$ for bored), and analysis of means as shown in Table 5.11, indicated that participants reporting overeating behaviour also reported higher scores on all negative forms of emotional eating compared to non-overeaters, e.g., bored, $F(1, 565) = 7.67, p < .01$, sad, $F(1, 565) = 9.70, p < .005$, angry, $F(1, 565) = 14.47, p < .001$, and worried, $F(1, 565) = 11.78, p \leq .001$. However, no significant multivariate main effect was found for loss of control, Pillai’s Trace = .01, $F(5,561) = .93, p > .05$, partial $\eta^2 = .01$ (observed power = .34), nor was an interaction effect found between overeating and loss of control, Pillai’s Trace = .01, $F(5,561) = 1.18, p > .05$, partial $\eta^2 = .01$ (observed power = .42).
Table 5.11

Estimated marginal means and standard deviations for all dependent variables included in the two-factorial between-group MANOVAs (overeating x loss of control)

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>No Overeating</th>
<th>Overeating</th>
<th>No Loss of Control</th>
<th>Loss of Control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Depression</td>
<td>7.65</td>
<td>9.50</td>
<td>9.44</td>
<td>5.59</td>
</tr>
<tr>
<td>Dieting Attitudes and Behaviour</td>
<td>10.09</td>
<td>13.08</td>
<td>11.46</td>
<td>7.71</td>
</tr>
<tr>
<td>Body Dissatisfaction</td>
<td>.48</td>
<td>1.27</td>
<td>.20</td>
<td>.74</td>
</tr>
<tr>
<td>Size-Related Teasing Experiences</td>
<td>16.52</td>
<td>10.29</td>
<td>17.37</td>
<td>6.07</td>
</tr>
<tr>
<td>Internationalisation of Sociocultural Message</td>
<td>21.31</td>
<td>10.16</td>
<td>21.06</td>
<td>5.98</td>
</tr>
</tbody>
</table>

\(n^a\) 477 71 472 76

| Emotional Eating – Bored                  | 1.86 | 1.07| 2.10 | .64 | 1.98 | 1.11| 1.98  | .64 |
| Emotional Eating – Happy                  | 1.71 | 1.29| 1.92 | .76 | 1.80 | 1.31| 1.83  | .76 |
| Emotional Eating – Sad                    | 1.37 | 1.11| 1.65 | .66 | 1.51 | 1.15| 1.50  | .67 |
| Emotional Eating – Angry                  | 1.31 | 1.07| 1.64 | .64 | 1.42 | 1.11| 1.53  | .64 |
| Emotional Eating – Worried                | 1.54 | 1.15| 1.86 | .68 | 1.61 | 1.17| 1.78  | .68 |

\(n^b\) 493 76 490 79

\(^a\)Number of participants in each group, after the removal of missing data and 12 multivariate outliers. 
\(^b\)Number of participants in each group. No missing data or multivariate outliers.
5.6 Chapter Summary

This chapter has presented the analyses conducted to address the study’s research aims, questions, and hypotheses. Overweight and obesity was found to be prevalent in approximately 25% of the current non-clinical group of Australian school children, while just over 20% reported often engaging in overeating and/or loss of control during eating episodes during the two months prior to participating in the study. DSM-IV-TR - defined binge eating (e.g., presence of both overeating and loss of control; APA, 2000) was reported by 6% of participants, with less than 1% reaching criteria for binge eating syndrome.

The hypothesised model, with some modifications, was found to be an adequate fit to the data. While no direct relationship was found between body weight and binge eating behaviour, they were indirectly related, where the relationship was partially explained by size-related teasing experiences, internalisation of sociocultural messages, dieting attitudes and behaviour, body dissatisfaction, and depression. BMI was also found to be directly related to parent size, size-related teasing experiences, body dissatisfaction, internalisation of sociocultural messages, and emotional eating, and indirectly related to depression and dieting attitudes and behaviour. Parent size and emotional eating explained 12% of the variance in BMI.

Binge eating was directly related to parent size, depression, body dissatisfaction, and emotional eating (which explained 29% of the variance in binge eating), with indirect relationships with size-related teasing experiences, internalisation of sociocultural messages, and dieting attitudes and behaviour. A relationship was also found between the loss of control component of binge eating and body dissatisfaction. Gender differences were evident in the final model, suggesting that the various factors impacted on one another in varied ways for boys and girls. For example, while internalisation of sociocultural messages, but not size-related teasing experiences was directly related to dieting attitudes and behaviour for girls, the opposite was true for boys.

Differences were also found between participants reporting binge eating behaviours and those reporting no such behaviours. Binge eaters (overeating and loss of control) were found to have significantly higher scores on measures of depression, size-related teasing experiences, internalisation of sociocultural messages, and two of the negative emotional eating items (angry and worried) compared to non-binge eaters. In
addition, differences were found for overeaters (regardless of loss of control) compared to non-overeaters and participants reporting loss of control (regardless of overeating) versus no loss of control. For example, overeaters reported lower body dissatisfaction than non-overeaters, but more emotional eating in regards to all negative emotions (i.e., bored, sad, angry, and worried) than non-overeaters. In contrast, participants reporting loss of control scored higher on measures of depression, body dissatisfaction, size-related teasing experiences, and internalisation of sociocultural messages than participants reporting no loss of control, although no differences were found for emotional eating. No interaction effect between overeating and loss of control was found.

The results of this study have shown that obesity and binge eating are evident in this sample of non-clinical Australian school children, and that while binge eating and BMI are not directly related, they do share common relationships with other physical, psychological, and psychosocial factors. These findings have implications for future obesity interventions. Chapter six presents a detailed discussion of the results of this study, the relevance of the findings to the existing obesity and binge eating literature, implications for prevention and intervention programs, as well as future directions of study. Limitations will also be reviewed.
CHAPTER SIX: DISCUSSION

Childhood overweight and obesity is a major public health concern, and with prevalence rates increasing globally since the 1980s, it has been described as a worldwide epidemic (WHO, 2000, 2002). Despite numerous attempts to develop and implement prevention and treatment programs, few of these programs have actually shown proven long-term success in reducing childhood overweight and obesity rates (Summerbell et al., 2005). The possible contribution of binge eating behaviour to childhood weight has only recently begun to receive attention in the literature. However, early evidence suggests that the relationship between weight and binge eating is an important one to explore further, and may contribute new insights for consideration in future research and intervention endeavours.

The aims of this thesis were fourfold: (a) to describe the current prevalence of overweight and obesity in a non-clinical sample of preadolescent Australian school children; (b) to determine the prevalence of binge eating behaviour, including binge eating (overeating associated with loss of control), overeating (regardless of loss of control), and loss of control (regardless of overeating) in a non-clinical sample of preadolescent Australian school children; (c) to investigate the relationships between body weight, binge eating behaviour, and a set of physical, psychological, and psychosocial variables, including parent body size, size-related teasing experiences, internalisation of sociocultural messages, body dissatisfaction, dieting attitudes and behaviour, depression, and emotional eating; and (d) to explore differences between participants reporting the presence or absence of binge eating, overeating and/or loss of control on the psychological and psychosocial variables size-related teasing experiences, internalisation of sociocultural messages, body dissatisfaction, dieting attitudes and behaviour, depression, and emotional eating.

This chapter begins with a discussion of the findings relevant to each of these four aims, followed by a detailed examination of how the various psychological and psychosocial factors contribute to a better understanding of overweight, obesity, and binge eating in a non-clinical sample of preadolescent Australian school children. The chapter then presents the limitations of the present study, before the implications and
future directions for research are considered. The chapter concludes with a final summary of the thesis.

6.1 The Prevalence of Childhood Overweight and Obesity

The first aim of the study was to describe the prevalence of overweight and obesity in a non-clinical sample of preadolescent Australian school children. Two research hypotheses, and one research question, were investigated in relation to this aim. The first hypothesis (1a) was that a significant number of children from a non-clinical sample would be overweight or obese. Support for this hypothesis was found, with 19% of participants being classified as overweight, and an additional 5% as obese. These results are remarkably consistent with other recent Australian data on childhood obesity (e.g., Booth et al., 2001; Wake et al., 2002), as well as research collected in the United States (Troiano & Flegal, 1998), although are slightly lower than those found by Salmon et al. (2005). Although the current study collected prevalence data during the same time frame and in the same area (e.g., metropolitan Melbourne, Australia) as Salmon et al. (2005), the latter found that almost 30% of children were overweight or obese using similar methodology (e.g., the use of Cole et al.’s, 2000, cut-off points for defining weight status, and measuring children with light clothing but no shoes). The current study however is consistent with earlier prevalence rates collected during the mid 1990s, suggesting that prevalence rates have not increased significantly during the past decade. While prevalence rates vary slightly between studies, and it is unclear whether prevalence rates have increased or remained stable during the past decade, it is clear that a substantial minority of Australian children are overweight or obese, and prevalence is certainly not decreasing with time.

The second hypothesis (1b), that no significant gender differences would be found, was also supported. Chi-square analyses found that there were no significant gender differences between the three weight categories (normal weight or below, overweight, obese), further supporting previous Australian studies (e.g., Booth et al., 2001). While prior research has shown that adult women have a higher percentage of body fat than men, and that female children are “fatter” than male children (Price, 2002), measurement of participants’ body fat levels was not undertaken in the current study, and this relationship could not be directly investigated. However, support for the BMI as a reasonably accurate and direct measure of body fatness has previously been found (American Academy of Pediatrics, 2003; Denney-Wilson et al., 2003). This
suggests that while firm conclusions cannot be drawn about gender differences in relation to body fatness, it does seem reasonable to assume that gender is not a risk factor for obesity development during childhood. This relationship may change however during adolescence or adulthood.

Thirdly, the research question (1c) “Is there a relationship between SES and weight?” was posed. Chi-square analyses revealed no socioeconomic differences between the three weight categories. Due to lack of statistical power, gender differences across SES for the weight categories could not be determined. Although research has revealed numerous inconsistencies in previous findings (section 2.3.3), this study supports the evidence-based conclusions of the NHMRC, that “[SES] is not a strong risk for obesity and overweight in children and adolescents in Australia” (NHMRCb, 2003, p.xvii).

These results indicate that overweight and obesity does not discriminate between gender or SES in this group of Australian children, and supports the importance of conducting interventions at the whole-school or community level, rather than focusing attention on specific populations (e.g., females or low SES areas). Some caution should be exercised however when interpreting the findings of SES in this study, given the measurement issues raised in chapter four (section 4.2.1) and in the limitations section of this chapter (section 6.6).

6.2 The Prevalence of Childhood Binge Eating Behaviour

The second aim of the thesis was to determine the prevalence of binge eating behaviour in a non-clinical sample of preadolescent Australian school children. Because the literature has indicated that loss of control is the cardinal feature of binge eating (Fairburn & Wilson, 1993; Pratt et al., 1998), binge eating behaviour was examined in two ways. Firstly, binge eating as defined by the DSM-IV-TR (APA, 2000) was investigated, that is, the presence of overeating associated with loss of control. Secondly, prevalence of overeating (regardless of loss of control), and loss of control (regardless of overeating) was also investigated.

In response to research question (2a), this study found that a significant number of participants reported often engaging in binge eating behaviour. Specifically, 13% of participants reported engaging in overeating behaviour (regardless of loss of control) and 14% reported loss of control (regardless of overeating). In total, 6% of participants reported binge eating (overeating and loss of control). These prevalence rates are
somewhat lower than found in previous research with community-based populations (section 3.3). One explanation for this finding is that few of the previous population-based studies had defined binge eating as suggested by the DSM-IV-TR (i.e., presence of both overeating and loss of control). Rather, binge eating was assessed by means of a single item, such as the ChEAT item “I have gone on eating binges where I feel that I might not be able to stop” (e.g., Maloney et al., 1989). In the current study, participants were also instructed to only report overeating and/or loss of control if they had experienced them *often* during the past two months prior to participating in the study, as opposed to *ever* having experienced overeating and/or loss of control episodes (refer Appendix B). As such, these results may more accurately reflect the prevalence of children engaging in problematic eating behaviour, as opposed to infrequent binge eating.

The prevalence rates in this study are also lower than those found with samples of overweight and obese children and adolescents (e.g., Morgan et al., 2002; Severi et al., 1993). It is a reasonable expectation however that prevalence rates would be lower for a community-based sample of children than for either non-clinical or clinical groups of overweight and obese children and adolescents. In support, Tanofsky-Kraff et al. (2004), with their sample of non-clinical overweight and normal weight children, found prevalence rates closer to this study (9% reported loss of control with or without overeating; 20% reported overeating only).

A concerning result in the present study was that for the 22% of participants reporting overeating and/or loss of control, over one third reported eating that way twice or more a week, with 6% reporting that they ate that way almost every day. In addition, 15% reported feeling at least moderately upset by this behaviour. Overeating and/or loss of control was also significantly associated with eating much more quickly than usual, eating until uncomfortably full, eating large amounts of food when not hungry, eating alone due to embarrassment of amount eaten, and feeling disgusted, sad or guilty with self after overeating for a substantial number of participants.

This study also investigated whether gender differences existed between participants reporting binge eating behaviour and those reporting no binge eating behaviour (research question 2b). Results revealed some significant differences. For example, a significantly higher percentage of boys reported overeating (19% compared to 8% for girls) and binge eating (9% compared to 2% for girls) than girls. No significant gender differences were found for loss of control (15% for boys compared to
13% for girls). It is difficult to compare these findings to previous research, as the
definition and measurement of binge eating has been so varied, many of the studies
were conducted with obese children or adolescents, and past research findings have
been contradictory.

Two previous studies however have similarly found that boys reported binge
eating more than girls in their non-clinical samples of children (Childress et al., 1993;
Maloney et al., 1989), although neither study defined binge eating as suggested by the
DSM-IV-TR. Other studies have found either no gender differences (Decaluwe et al.,
2002; Isnard et al., 2003) or more commonly, that females show a higher prevalence of
binge eating behaviours (Britz et al., 2000; Severi et al., 1993). The literature seems far
from conclusive regarding such differences.

The present study suggests that boys engage in more binge eating and overeating
behaviour than girls. These results may reflect a trend toward increased eating
pathology for preadolescent males, or may reflect variations in the interpretation of
binge eating. It is also plausible to suggest that boys more accurately reported their
overeating or binge eating behaviour than girls, due to decreased stigmatisation for boys
surrounding weight and dietary issues. Childress et al. (1993) suggested that increased
reports of binge eating in males in their study might have been representative of the
large caloric requirements of growing young males. However, given that growing young
girls also have large caloric requirements, this result may simply support the idea that
boys feel more comfortable reporting overeating behaviours, understanding that they are
at an age where it is “expected” that they have increased nutritional needs.

Results also found that boys reported eating much more quickly than usual
during episodes of overeating and/or loss of control compared to girls, while girls
reported feeling disgusted, sad, or guilty after overeating more than boys. Girls
also reported significantly greater levels of distress in relation to both overeating and
loss of control than did boys. Thus, while boys appear to be engaging in more binge
eating behaviour than girls, the behaviour is associated with significantly more negative
feelings and distress for girls, suggesting that at this age group there are important
gender differences in relation to the experience and interpretation of binge eating
episodes.

An important research question in this study was whether significant weight
differences would be found between participants reporting binge eating behaviour and
those reporting no binge eating behaviour (2c). Interestingly, no weight differences
were found between participants reporting the presence or absence of binge eating, overeating, or loss of control. Given that weight gain often occurs several years after the onset of binge eating behaviour (Mussell et al., 1995), these results are not entirely surprising. However, past research with children has been varied, with some studies finding a link between weight status and binge eating behaviour (Field et al., 2003; Morgan et al., 2002), and others finding no relationship (Berkowitz et al., 1993; Decaluwe et al., 2002). Morgan et al. (2002) found that overweight children who reported loss of control, regardless of overeating, had greater BMI and greater adiposity. One explanation for the current findings is that the sample is too young to have yet established a link between their binge eating and weight. However, past studies have found a relationship between binge eating behaviour and weight in children as young as five years (Lamerz et al., 2005). A second explanation might be that the sample size of children reporting binge eating, overeating or loss of control was too small, and thus lacked the statistical power to detect significant differences. A third explanation is that BMI is not a direct risk factor for binge eating. While Stice et al. (2002) found that body mass predicted binge eating onset in a sample of adolescent girls, Stice (2002), in his review paper of risk and maintenance factors for eating pathology, concluded that body mass did not appear to be a risk factor for eating pathology. Rather his review suggested that “body mass may play a more important role in promoting the risk factors for eating pathology than in directly fostering or maintaining eating disturbances” (Stice, 2002, p.828). Results of the SEM and MANOVAs in this study lend further support to this theory.

Of interest though, the current study did find significant weight differences for some of the other items related to binge eating experiences. For example, overweight participants reported “feeling disgusted, sad or guilty with self after overeating” more frequently than either obese or normal weight participants. In addition, significant differences were found between normal weight and overweight participants on reported feelings of distress in relation to overeating, and between normal weight and overweight, and normal weight and obese participants on reported feelings of distress in relation to loss of control, with heavier participants being more upset by this behaviour than normal weight participants. As such, while binge eating behaviour may not be physically related to weight in this study, it appears to be related psychologically, leading to greater distress in heavier participants.
Research question (2d) asked if there was a relationship between SES and binge eating behaviour. No significant SES differences were found for binge eating or overeating, however differences were found for loss of control. Specifically, 66% of participants who reported loss of control attended schools in average socioeconomic suburbs, 23% attended schools in low socioeconomic areas, and 11% attended schools from high socioeconomic areas. Previous studies have been contradictory in relation to SES, some finding a significant inverse relationship (e.g., Story et al., 1995) and others finding no relationship (e.g., Hay, 1998). However, to the author’s knowledge, no previous study has investigated the relationship between SES and loss of control, regardless of overeating. The meaning of the current findings is unclear, and is muddled by measurement issues (discussed in the limitations section of this chapter). However, results suggest that higher SES may serve as a protective factor in relation to the loss of control aspect of binge eating. In support, Story et al. (1995) found that higher SES adolescents in their study were less likely to engage in unhealthy weight control practices and binge eating behaviour. They suggested that possible reasons for this might be that higher SES adolescents have greater access to health resources, including health information, which may impact on their health behaviours, including dieting practices (thus also impacting on their risk for binge eating). All the same, further research is required to better elucidate the role of SES in binge eating.

A final research question in relation to binge eating prevalence was (2e) whether binge eating syndrome would be found in this non-clinical sample of preadolescent school children. The term binge eating syndrome was used rather than BED for three reasons: (a) objective measures of overeating (as generally determined by clinical interviews) were not assessed, (b) a more limited time frame was assessed than proposed by the DSM-IV-TR due to the young age of the study sample, and (c) questions on the QEWP-R regarding purging and compensatory behaviours were omitted from the study questionnaire for reasons provided earlier (section 4.2.10). Referring to the DSM-IV-TR research criteria for a diagnosis of BED (refer to Appendix A), 86% of participants fulfilled no criteria. Of the 6% (32 participants) who reported binge eating (presence of both overeating and loss of control), eight participants fulfilled one criterion, twelve fulfilled two criteria, eight fulfilled three criteria, and two participants fulfilled four of the five research criteria (excluding compensatory items) for a diagnosis of BED, thus meeting criteria for binge eating syndrome. These results are slightly lower than previous research with child and
adolescent samples, which have found prevalence rates between 1-5%. It might be expected that a preadolescent sample would display lower prevalence rates for binge eating syndrome than adolescent samples, although two recent American studies with a clinical (Decaluwe & Braet, 2003) and non-clinical (Morgan et al., 2002) group of overweight children found higher prevalence rates of binge eating syndrome and BED. The higher prevalence rates found may be explained by the fact that the populations being studied were overweight or obese. For example, research with adult populations shows that BED is significantly higher in obese persons, particularly obese persons seeking treatment (Spitzer, Yanovski, et al., 1993). Morgan et al. (2002) also noted in their study that their prevalence rates might have been inflated due to measurement issues. Similarly to the current study, Morgan et al. (2002) utilised a self-report measure of BED, while Decaluwe & Braet (2003) screened their participants using a child version of the Eating Disorder Examination. In support, Tanofsky-Kraff et al. (2004), with a study population of overweight and normal-weight children, found no instances of BED.

To the author’s knowledge, this is the first study to show that binge eating syndrome is evident in a non-clinical sample of preadolescent Australian children. In this study, the two cases of binge eating syndrome were both male, whereas previous research with children has indicated that higher prevalence rates were found for females (Decaluwe & Braet, 2003). It is always a concern when the occurrence of eating pathology is detected, particularly for such a young group of children (mean age = 11 years). Although much focus is placed on eating disorder intervention at the secondary school level (Smolak, Levine, & Schermer, 1998), these findings support the need for interventions directed toward children during preadolescent years, at least in the later primary school years (grades 5 and 6). How to address this issue with young children, without actively promoting eating pathology or weight concerns is a sensitive one, and beyond the scope of this thesis, but is clearly worthy of future attention. Findings from the current study do however suggest that addressing psychological and psychosocial factors, such as learning how to accurately evaluate sociocultural messages (e.g., understanding that images promoted in the print media are often modified images, that create unrealistic ideals for the majority of the population), and learning healthy strategies for coping with negative experiences such as teasing, may be useful in indirectly addressing risk factors for both obesity and eating disturbance without directly focusing on weight or eating related issues. The following sections present a
discussion of the relationships between body weight, binge eating, and related psychological and psychosocial factors, and how they may be important when considering effective intervention strategies for children.

6.3 Relationships Between Body Weight, Binge Eating, and a Set of Physical, Psychological, and Psychosocial Factors

A third aim of the study was to develop and evaluate a model that could explain the relationships between body weight, binge eating, and a set of physical, psychological, and psychosocial variables including size-related teasing experiences, internalisation of sociocultural messages, body dissatisfaction, depression, dieting attitudes and behaviour, and emotional eating. Four research hypotheses were illustrated in the model, which suggested that (3a) parents’ body size would be related to the child’s body weight and binge eating behaviour; (3b) BMI would be either directly or indirectly related to binge eating and the set of psychological and psychosocial variables; (3c) binge eating would be either directly or indirectly related to BMI and the set of psychological and psychosocial variables; and (3d) that the psychological and psychosocial variables would be directly related to each other, and possibly mediate the relationship between BMI and binge eating. A final research question was posed, addressing the possibility of gender differences in the hypothesised model (3e).

The hypothesised model, with some minor modifications, was found to fit the study population well, suggesting that it did adequately explain the relationships proposed between BMI, binge eating, and the set of physical, psychological, and psychosocial factors. As such, support for all research hypotheses was found. Further, while the model was found to adequately explain the relationships for both males and females, some gender differences were detected.

In summary, the analyses found the following results:

(3a) Parent body size was positively associated with BMI and binge eating;
(3b) BMI was directly and positively associated with size-related teasing experiences, body dissatisfaction, and internalisation of sociocultural messages. BMI was also found to be directly and negatively associated with emotional eating. BMI was indirectly and positively associated with depression, dieting attitudes and behaviour, and binge eating.
(3c) Binge eating behaviour was directly and positively related to emotional eating and depression, and negatively related to body dissatisfaction. A direct positive relationship was also found between body dissatisfaction and loss of control. Binge eating behaviour
was indirectly and positively associated with BMI, size-related teasing experiences, internalisation of sociocultural messages, and dieting attitudes and behaviour. 

(3d) The majority of the psychological and psychosocial variables were also found to have direct links with one another. For example, size-related teasing experiences was directly associated with internalisation of sociocultural messages, depression, and dieting attitudes and behaviour. Internalisation of sociocultural messages was directly related to body dissatisfaction, dieting attitudes and behaviour, and depression. Body dissatisfaction was directly and positively related to depression, and dieting attitudes and behaviour was directly related to depression. Emotional eating was not found to be related to any of the psychological or psychosocial variables.

(3e) Finally, some gender differences were found. For example, parent body size was found to be directly related to BMI and binge eating for girls but not for boys. Size-related teasing experiences was related to dieting attitudes and behaviour for boys only, while internalisation of sociocultural messages was related to body dissatisfaction, dieting attitudes and behaviour, and depression for girls only. Body dissatisfaction was related to depression for girls only, while it was no longer found to be directly related to binge eating for either boys or girls. The relationship between body dissatisfaction and loss of control remained significant for boys, but not girls. Finally, emotional eating was significantly related to BMI for boys only. All other relationships in the model remained significant for both boys and girls.

Given the complexity of the relationships outlined above, a detailed discussion of these findings is provided in section 6.5 below, which integrates the SEM and MANOVA results, and discusses the role of each of the physical, psychological, and psychosocial factors investigated in this thesis.

6.4 Differences Between Binge Eaters and Non-Binge Eaters

A fourth aim of the study was to investigate differences between a non-clinical sample of preadolescent children reporting the presence or absence of binge eating, overeating (regardless of loss of control) and loss of control (regardless of overeating). One research question was posed (4a): Do participants who engage in binge eating behaviour (binge eating, overeating, loss of control) differ to participants who do not engage in binge eating behaviour on the following psychological and psychosocial variables: body dissatisfaction, dieting attitudes and behaviour, depression, size-related
teasing experiences, internalisation of sociocultural messages, or emotional eating behaviour?

Significant differences were found for binge eating, overeating, and loss of control, although the source of difference varied for each. Binge eaters (overeating associated with loss of control) reported significantly more depression, size-related teasing experiences, and internalisation of sociocultural messages than non-binge eaters, and a greater frequency of emotional eating in relation to anger and worry. No differences were found for body dissatisfaction, dieting attitudes and behaviour, or eating related to the emotions bored, happy or sad.

In contrast, overeaters were found to have significantly lower body dissatisfaction scores than non-overeaters, and reported significantly more emotional eating related to all four negative emotional eating items (boredom, sadness, angry, and worried). No differences were found for any of the other variables.

Participants who reported loss of control however were found to have significantly higher scores on measures of depression, body dissatisfaction, size-related teasing experiences, and internalisation of sociocultural messages than participants who did not report loss of control. No significant differences were found for dieting attitudes and behaviour or for emotional eating. While interaction effects between overeating and loss of control were also investigated, no significant results were found. As mentioned in section 6.3, a detailed discussion of each of these results is presented in the following section, in relation to each of the study variables.

6.5 The Contributions of Physical, Psychological, and Psychosocial Factors to Understanding Childhood BMI and Binge Eating.

This study has found that a set of physical, psychological, and psychosocial variables was significantly related (either directly or indirectly) to BMI and binge eating behaviour in a non-clinical sample of preadolescent Australian school children. A number of these variables were also found to be important in understanding differences between children engaging in binge eating behaviour compared to those not engaging in binge eating behaviour. The contribution of each of these variables to a greater understanding of childhood BMI and binge eating behaviour is discussed in the following sections.
6.5.1 Parent Body Size

Parent body size was found to be significantly and positively associated with both BMI and binge eating. Together with emotional eating, parent size explained 12% of the variance in BMI, while along with emotional eating, depression, and body dissatisfaction, it helped to explain 29% of the variance in binge eating. On examining gender differences however, it was found that parent body size was only significantly related to BMI and binge eating for girls.

The current study found that parent body size was not contributing to more than 23% of the variance in BMI, in conjunction with emotional eating (23% for boys, 9% for girls), and the relationship between parent body size and BMI failed to reach significance for boys. While the results provide some support for a small yet significant association between child’s BMI and parent body size, the relative weakness of the association is surprising given that the relationship between parent weight and child BMI is clearly demonstrated in the scientific literature (NHMRC, 2003b; Whitaker et al., 1997). Much of this research has discussed the relationship in terms of heritability, while other researchers have also noted the important contribution of the shared environment (Bouchard & Perusse, 1993). Nevertheless, the current study seems to suggest that parent body size does not contribute substantially to BMI for this sample of Australian school children, particularly for the boys. It is difficult to explain this result, except by suggesting that it should be interpreted with caution due to a number of methodological flaws in assessing parental body size. For example, no objective measure of parent size such as weight or height was available. Given that parent size was a reflection of children’s own perceptions of their parents’ body size, it is possible that boys and girls may evaluate their parents’ size in varied ways, or that they tended to underestimate their parents’ size. Another possible explanation for the result is that the environmental influences provided by parents may have exerted a stronger influence than genetic contribution, and that this influence was stronger for girls than boys. While a final possibility is that there is no relationship between parent size and BMI for boys, this seems an unlikely explanation. It seems prudent to refrain from drawing any firm conclusions without further investigating this relationship by collecting objective data from parents themselves. While previous research has employed a similar methodology (Wade & Lowes, 2002), the sample was older (11-16 years) which may have impacted on the accuracy of the measures obtained.
For the reasons provided above, caution also needs to be taken when interpreting the relationship between parent size and child’s reported binge eating behaviour. However, there is some evidence to suggest that a positive relationship does exist, supporting previous research which has found a link between maternal eating attitudes and behaviours and children’s own eating behaviour (Fulkerson et al., 2002; Lamertz et al., 2005; Stice, Agras, et al., 1999). Genetic and environmental contributions however cannot be determined without undertaking complex twin studies. All the same, there is enough evidence in the current study to warrant a more detailed investigation of the contribution of parents’ body size to their children’s weight and eating behaviours.

6.5.2 Body Dissatisfaction

In this study, body dissatisfaction was found to have a significant positive relationship with BMI and loss of control, and a significant negative relationship with binge eating. An indirect relationship between body dissatisfaction and binge eating was also found through their link with depression. For example, body dissatisfaction was directly and positively related to depression, which was directly related to binge eating. Body dissatisfaction was also found to be directly and positively related to internalisation of sociocultural messages. In examining gender differences, some discrepancies were noted. For example, body dissatisfaction was related to loss of control for boys only, it was no longer significantly directly related to binge eating for either boys or girls, although a weak indirect relationship through depression was found for girls, and it was related to internalisation of sociocultural messages and depression for girls only.

Further investigations into the importance of body dissatisfaction in binge eating using MANOVA revealed no significant differences for binge eaters compared to non-binge eaters on body dissatisfaction scores. However, overeaters reported significantly lower body dissatisfaction compared to non-overeaters, while in contrast, participants reporting loss of control reported higher body dissatisfaction scores than participants reporting no loss of control. Each of these findings will be discussed in this section.

The relationship between body dissatisfaction and BMI is firmly established in the body image literature for both boys and girls (section 2.4.1), and the current study found further support for this relationship. However, although previous research has predominantly found that the relationship is stronger for girls than boys, the current study found no significant gender differences in the strength of this association,
suggesting that increased body weight negatively and significantly impacts on body dissatisfaction for preadolescent boys and girls equally. This result does support findings by McCabe and Ricciardelli (2003), who similarly found no significant gender differences in body dissatisfaction (in relation to weight or muscles) in their sample of preadolescent Australian boys and girls. While previous research has also suggested that for boys body dissatisfaction may be related to either a desire to be bigger (i.e., more muscular) or thinner (McCabe & Ricciardelli, 2004a), this discrepancy was not addressed in the current study. It could be speculated however that given that a positive relationship was found between BMI and body dissatisfaction for boys, that the source of body dissatisfaction was a desire for a thinner or smaller body, rather than a larger body.

Partial support was also found for the role of sociocultural factors in the relationship. Other researchers have proposed that there is no direct causal relationship between weight and body dissatisfaction, but rather that the relationship is explained by factors such as sociocultural influences (Stormer & Thompson, 1996; Thompson et al., 1995). These theories have generally been tested on female populations. The current study found that the relationship between BMI and body dissatisfaction was partially explained by internalisation of sociocultural messages (predominantly from the print and video media), although not by size-related teasing experiences. However, when gender differences were explored, internalisation of sociocultural messages was related to body dissatisfaction for girls but not for boys. These results suggest that preadolescent girls are internalising sociocultural messages from their environment, particularly the print and video media, and comparing themselves to these ideals. Any discrepancies (either actual or perceived) are impacting on how they feel about their own bodies. These results support previous research with preadolescent girls (e.g., Martin & Kennedy, 1994; Sands & Wardle, 2003).

While BMI was certainly associated with internalisation of sociocultural messages for boys in this study, this internalisation appears to have had no further consequences. It might be simply that media messages and other sociocultural influences have a greater impact for girls than boys, or that for boys, sociocultural influences have a greater impact as they move into their adolescent or adult years. However, recent research found that perceived sociocultural pressures to lose weight predicted body dissatisfaction for both boys and girls (Ricciardelli et al., 2003). The discrepancy in findings could however be related to differing measures of sociocultural
influences between the two studies. For example, the measure used by Ricciardelli et al. (2003) combined sociocultural influences from peers, parents, and the media, while the current study examined size-related teasing experiences as a separate aspect of sociocultural influences on children. For boys, size-related teasing experiences, while not related to body dissatisfaction, were directly related to dieting attitudes and behaviour, suggesting that for boys the source of sociocultural messages is important. For example, current results suggest that immediate verbal feedback, in the form of teasing experiences, has a greater direct impact on boys’ thoughts and behaviours regarding eating practices and weight loss than messages provided through the video and print media.

Body dissatisfaction was also found to be weakly and negatively associated with binge eating (overeating and loss of control), and positively associated with loss of control (regardless of overeating). When examining gender differences, however, the relationship was no longer significant for boys or girls. Rather, body dissatisfaction was positively associated with loss of control for boys, and with depression for girls. Body dissatisfaction also mediated the relationship between BMI and depression for girls, and BMI and binge eating for boys, while depression mediated the relationship between body dissatisfaction and binge eating for girls, but not for boys. Few studies have investigated these relationships with children (section 3.6.1) but support has previously been found for both direct and indirect relationships between body dissatisfaction and binge eating. The current study partially supports the findings of Womble et al. (2001) who found, in their adult sample, that for women, the relationship between body dissatisfaction and binge eating was mediated by negative affect but also by dietary restraint, while for men, a direct relationship was found between body dissatisfaction and binge eating. This study also partially supports the findings of Morgan et al. (2002), who found that body dissatisfaction was related to loss of control, but not overeating. In the current study, the relationship between body dissatisfaction and loss of control for boys but not girls is a perplexing one. Most commonly, researchers explain the loss of control aspect of binge eating by suggesting that negative affect and/or dieting behaviour leads to cognitive changes regarding food and eating (section 3.6), but body dissatisfaction has not been implicated in this relationship. Although Womble et al. (2001) also found a direct relationship between body dissatisfaction and binge eating for men but not women, loss of control was not separately analysed in that study.
The current study does suggest that body dissatisfaction is a significant contributor to binge eating behaviour, and is deserving of further research attention. For example, children reporting overeating had lower body dissatisfaction scores than children reporting no overeating. This result seems plausible, as it might be expected that children who are unconcerned about their body image are also less concerned about their overeating behaviour in general. However, for children reporting loss of control during eating, body dissatisfaction scores were higher than for children not reporting loss of control. This finding is consistent with Morgan et al. (2002). Current diagnostic criteria for BED do not include criteria relating to weight concerns, unlike the criteria for BN (refer to Appendix A), and as such this relationship has received little attention in the literature to date. However, there is some supporting evidence in the adult literature that individuals with BED have higher body dissatisfaction that those without BED (Spitzer, Yanovski, et al., 1993). Although no differences were found between binge eaters and non-binge eaters in the current study, the significant relationship between body dissatisfaction and BMI, as well as body dissatisfaction and the loss of control aspect of binge eating, suggests that addressing body dissatisfaction in obesity prevention, as well as eating disorder prevention, is an important goal, both for males and females. This argument is further strengthened when considering that the current study also found that body dissatisfaction was significantly related to depression for girls (which in turn was related to binge eating).

6.5.3 Dieting Attitudes and Behaviour

Some of the most interesting and theoretically challenging findings were those related to dieting attitudes and behaviour. For example, in the current study, no direct relationship was found between BMI and dieting attitudes and behaviour. Rather, an indirect relationship was found whereby the relationship was mediated by internalisation of sociocultural messages and size-related teasing experiences. In other words, for the current non-clinical sample of preadolescent children, BMI did not directly impact on dieting attitudes and behaviour. Rather, dieting attitudes and behaviour were determined by sociocultural factors such as teasing experiences and level of acceptance of sociocultural messages, and it was these factors that were directly related to BMI. On further examination of gender differences, it was found that the relationship between BMI and dieting attitudes and behaviour was mediated by size-related teasing experiences, but not internalisation of sociocultural messages for boys
and by internalisation, but not teasing, for girls. Of further interest, no direct relationship was found between dieting attitudes and behaviour and binge eating. Rather, this relationship was mediated by depression. Additionally, dieting attitudes and behaviour was not related to body dissatisfaction or emotional eating, and no differences in dieting attitudes and behaviour were found between participants reporting the presence or absence of binge eating, overeating, or loss of control.

As with the body dissatisfaction literature, the relationship between BMI and dieting attitudes and behaviour has been firmly established (section 2.4.2), yet current results did not support this direct relationship. Further, while previous research suggests that body dissatisfaction may mediate the relationship (Thompson et al., 1995; van den Berg et al., 2002), this was also not supported in the current study. Rather, the role of sociocultural factors was again found to be important, with size-related teasing experiences (for boys) and internalisation of sociocultural messages (for girls) mediating the relationship between BMI and dieting attitudes and behaviour. The positive relationship found between internalisation of sociocultural messages and body dissatisfaction for girls has already been discussed, but the current results further support the significantly negative impact that sociocultural messages seem to have for preadolescent girls, and are consistent with the restraint model as discussed below.

Studies investigating size-related teasing have been limited with preadolescent populations, particularly boys. However, research with adolescent females shows a significant relationship between teasing and eating disturbance (Lunner et al., 2000; Thompson et al., 1995; van den Berg et al., 2002). The current study found evidence that this relationship exists for boys, but not for girls. Although it is somewhat surprising that the relationship was not significant for girls also, it does suggest that external factors may have different effects for boys and girls, particularly in preadolescence, as discussed in section 6.5.2 (i.e., boys may be more influenced by negative comments by others and girls may be more influenced by media messages such as those portrayed by the print and video media). All the same, both findings support the sociocultural approach to eating disturbance.

One particularly interesting result in the current study was that dieting attitudes and behaviour was not directly related to binge eating behaviour. Rather, this relationship was mediated by depression for both boys and girls. That is, dieting attitudes and behaviours were related to depression, and depression was related to binge eating. As discussed in chapter three, one of the most widely accepted models of binge
eating is the restraint model (Striegel-Moore, 1995), which proposes that internalising sociocultural ideals leads to dieting behaviour (of which some support was found in the current study as outlined above), which results in cognitive and affective changes that promote loss of control over eating, leading to binge eating behaviour (section 3.6.2). However, a second theory, the escape model (Heatherton & Baumeister, 1991), suggests that binge eating is used as a strategy to escape awareness of negative emotional states. Evidence has been found to support both models (section 3.6) and seems to suggest that binge eating can occur both in the presence and absence of dieting behaviour. In this study, support for the escape model was found, but partial support was also found for the restraint model. For example, while no direct pathway was found between dieting attitudes and behaviour and binge eating, the relationship was mediated by depression. Such a result is not incongruent with previous research, which does acknowledge the possibility of dual pathways to binge eating (section 3.6). However, when differences between binge eaters and non-binge eaters were investigated, binge eaters reported higher scores on measures of depression but not dieting attitudes and behaviour. This result was also significant for overeating and loss of control. These results provide stronger support for the role of negative affect as opposed to dietary restraint in the development and maintenance of binge eating behaviour in this non-clinical sample of preadolescent children.

This result is meaningful in a number of ways. Firstly, it may suggest that the current study is capturing those individuals who develop binge eating behaviours prior to dieting attitudes and behaviours, as opposed to those who diet prior to developing binge eating behaviours. Secondly, previous researchers have suggested that these two different pathways to binge eating may indicate different problematic eating behaviours in the future (Spurrell et al., 1997). Of concern is that some findings suggest that individuals who report binge eating prior to dieting have an earlier onset of binge eating, meet diagnostic criteria for BED at a younger age, and have a history of more psychiatric problems than those who report dieting prior to binge eating (Spurrell et al., 1997). Thirdly, these results suggest that negative affect is implicated in this first pathway to binge eating, which may explain the increased pathology seen in this group in previous studies (Spurrell et al., 1997). Such conclusions have previously been drawn based on retrospective studies.

The current study results do need to be viewed with some caution however. In this study, dieting attitudes and behaviour, as assessed by the total ChEAT score (a
more global measure of dieting behaviours, attitudes and associated eating disturbance), were used in the analyses, rather than a specific measure of dietary restraint alone. Perhaps the combined assessment of attitudes and behaviours in this study contributed to not finding a stronger relationship between dieting and binge eating. All the same, it can be argued that particularly for young children dieting cognitions and behaviours might be equally important in understanding the role of dieting in binge eating. The findings from the current study, exploratory in nature, suggest that longitudinal research should now be implemented to clarify these relationships and test for causality. Clearly, such longitudinal studies need to investigate preadolescent samples to capture the development of these different pathways to binge eating.

Finally, support was not found for a relationship between emotional eating and dieting attitudes and behaviour, in contrast to previous research with adolescent females (Stice et al., 2002). This relationship may not have been detected due to the chosen method of measuring emotional eating in this study (discussed in section 4.2.9 and in the limitations section 6.6 below) or due to the younger age of the current sample. However, as improved measures of emotional eating are now available for younger age-groups, this relationship also deserves future attention in correlational and longitudinal studies.

6.5.4 Depression

In the current study, BMI and depression were not directly related. Rather, depression was associated with size-related teasing experiences, internalisation of sociocultural messages, body dissatisfaction, and dieting attitudes and behaviour, and in turn these factors were either directly or indirectly associated with BMI. Thus, this suggests that an indirect relationship exists between BMI and depression, as mediated by these other factors (and illustrated in Figure 5.1). Upon examination of gender differences, it was found that the relationship between BMI and depression was partially mediated by size-related teasing experiences for boys and girls, and by internalisation of sociocultural messages, body dissatisfaction, and dieting attitudes and behaviours for girls only. However, as discussed in the previous section, depression was found to be a particularly important study variable in relation to binge eating. It was directly related to binge eating, and was also important when comparing participants reporting the presence or absence of binge eating behaviour. For example, binge eaters reported significantly higher scores on measures of depression than non-binge eaters. The same
result was also found for those reporting loss of control compared to those not reporting loss of control. No differences were found for overeaters compared to non-overeaters. Depression was not related to emotional eating.

While depression, like body dissatisfaction and dieting attitudes and behaviour, is one of the most commonly linked psychological factors to childhood overweight and obesity, the literature on this relationship is also the most contradictory (section 2.4.3). It is generally now acknowledged that obesity is related to depression in clinical populations, but not necessarily in non-clinical populations, although again results are contradictory. In the current study, only indirect associations between depression and BMI were found. Partial support for Erickson et al. (2000) was established, who found in their study with third-grade boys and girls, that after controlling for weight, overweight concerns were significantly associated with depressive symptoms for girls. Similarly, Thompson et al. (1995), in their study of adolescent females, also found that depression was only indirectly related to body weight. They found that both body dissatisfaction and teasing history mediated the relationship between depression and BMI. The negative impact of size-related teasing experiences, body dissatisfaction, and internalisation of sociocultural messages is clear in the current study, particularly for girls, and it is these factors, along with the depression they predict, that relate BMI to binge eating. It is also these factors that seem to relate depression to BMI. For these reasons, this study provides further support for the need to include psychological and psychosocial factors in obesity prevention programs. Such inclusion would also have the benefit of addressing issues also implicated in eating disturbance.

As highlighted in section 6.5.3, depression was one of the most significant factors related to binge eating for both boys and girls in the current study, with these findings providing strong support for the escape model of binge eating as opposed to the restraint model. They also lend support to numerous studies conducted with children and adolescents, which have all found a direct relationship between depressive symptoms and binge eating (Ackard et al., 2003; Berkowitz et al., 1993; Stice et al., 2002).

Nevertheless, depression was not found to be significantly associated with emotional eating. This is a somewhat surprising result, given that the escape model of binge eating suggests that people eat to avoid dealing with negative affect or in response to negative emotion. As discussed earlier, one explanation for this finding could be the
methodological limitations raised regarding the assessment of emotional eating in the current sample, or the young age of the participants.

6.5.5 Size-Related Teasing Experiences

Size-related teasing experience was a significant psychosocial factor in this study. Previous research has shown positive relationships between teasing experiences and increased body weight, body dissatisfaction, depression, and dieting behaviours (section 2.4.4). However, most of this research has been conducted with adult or adolescent populations. The current study has shown that many of these relationships also exist for preadolescent children. For example, size-related teasing experiences were significantly and positively related to BMI, internalisation of sociocultural messages, depression, and dieting attitudes and behaviour. In addition, size-related teasing experiences mediated the relationship between BMI and depression, and between BMI and dieting, as discussed in sections 6.5.3 and 6.5.4. Of particular significance, binge eaters reported more size-related teasing than non-binge eaters, while the same result was also found for those reporting loss of control compared to those not reporting loss of control. No differences were found for overeaters compared to non-overeaters. Size-related teasing was not related to emotional eating.

It is not surprising that a significant positive relationship was found between BMI and size-related teasing experiences, as the stigmatisation of overweight is widespread, experienced in all age groups and across the lifespan (Rand & Wright, 2000). It is also not surprising that a strong positive covariance between size-related teasing and internalisation of sociocultural messages was found, given their underlying commonalities. For example, experiences of teasing and internalisation of sociocultural messages such as those from the print and video media are both forms of social interactions with external sources. Whether these interactions occur with peers and family, or with the media and media’s representation of the world and its ideals (e.g., ideals of thinness or particular body shapes), each of these influences may impact on how children perceive themselves and their bodies.

Particularly concerning is the significant association between size-related teasing and depression (and thus binge eating), and the weaker, yet significant relationship between teasing and dieting attitudes and behaviour (particularly for boys), as well as the link between teasing and binge eating, and teasing and loss of control. As discussed in chapter two, being teased as a child has also been associated with increased
psychological distress in adulthood, albeit based on retrospective studies (e.g., Thompson et al., 1991).

This study (to the author’s knowledge) is the first to find a relationship between size-related teasing and binge eating behaviour in preadolescent children. Given the high prevalence of teasing experienced by overweight youth (Heinberg, 1996), this is a significant and concerning relationship. The findings also provide further support for an escape model of binge eating. It is important to note that teasing experiences in this study were related to size rather than weight, and thus are a reflection of participants’ teasing in regards to their height as well as weight. All the same, results show that teasing related to body size in general is likely to have negative psychological as well as psychosocial consequences, and could be a risk factor for depression, disturbed eating cognitions and behaviours, and binge eating behaviour. Clearly, a common theme in this study is that binge eating appears to be associated with various forms of negative experience or affect, and evidence collected in this study supports the need for further research.

6.5.6 Internalisation of Sociocultural Messages

As discussed throughout section 6.5, internalisation of sociocultural messages appears to be a significant factor in this study, with findings showing evidence for a significant positive relationship between BMI and internalisation for both boys and girls. In addition, internalisation was related to body dissatisfaction, dieting attitudes and behaviour, and depression, although on examination of gender differences the relationships were only found to be significant for girls. Evidence was also found for a relationship between internalisation of sociocultural messages and binge eating behaviour, both indirectly as illustrated in the structural models, and directly on binge eating and loss of control, but not overeating, as revealed by the MANOVAs.

Internalisation of sociocultural messages has received limited attention in preadolescent children. However, this study supports recent research with children (McCabe et al., 2005; Ricciardelli et al., 2003) that similarly found an association between weight and perceived sociocultural pressures to lose weight. Combined, these results suggest that increased BMI may actually increase children’s sensitivity to sociocultural messages in their environment. Alternatively, it could be argued that because of increased weight, children are more likely to experience teasing, which heightens their sensitivity to other sociocultural messages regarding appearance
standards. Future longitudinal research will be important to determine the causality and direction of these associations.

The current study also supports findings with adolescent and adult populations (e.g., Stice, 2002; Stice et al., 2002) that implicate sociocultural messages promoting a thin ideal in the development of eating pathology. Given the small yet significant relationship between internalisation and depression found in this study, it may be the associated distress of this internalisation process that significantly impacts on binge eating. These effects appear to be more important for girls than boys. As discussed earlier, for preadolescent boys in this study, messages portrayed in the media were not related to eating disturbance or negative affect, although teasing experiences were related. It is possible that sociocultural messages displayed in print and video media may become more influential for boys as they enter adolescence.

It is clear from this study that interventions are required that help children, particularly girls, learn to realistically evaluate media messages for what they are (e.g., often touched up images creating almost impossible perfection) and protect them from the powerful messages portrayed in their environments on a daily basis. Although preadolescent boys might not yet be internalising such messages, an intervention of this kind may possibly serve as a protective factor for their adolescent and adult years. This clearly raises the importance of intervention directed toward social change, rather than focus on individual or familial change alone.

6.5.7 Emotional Eating

Finally, emotional eating was found to be directly and negatively related to BMI and directly and positively related to binge eating, although evaluation of gender differences found that the relationship between emotional eating and BMI was only significant for boys. In addition, binge eaters reported more angry- and worried-related emotional eating than non-binge eaters, while overeaters reported all forms of negative emotional eating (bored, sad, angry, and worried) than non-overeaters. No differences were found for loss of control. Despite the methodological concerns raised regarding the measure of emotional eating used in the current study, it was clearly measuring something equivalent to emotional eating based on the above findings.

The direct inverse relationship between BMI and emotional eating seems contrary to expectation, however these findings provide partial support for previous studies conducted with child populations (Hill et al., 1994; Striegel-Moore et al., 1999).
For example, Hill et al. (1994) also found an inverse relationship between BMI and emotional eating, although this relationship was only significant for girls. Yet, in the current study, when gender differences were examined, the relationship remained significant for boys, but not for girls. Striegel-Moore et al. (1999) speculated that their own results might suggest that thinner girls feel more comfortable reporting that they engage in emotional eating than heavier girls, or that thinner girls engaged in increased dieting behaviour leading to the development of emotional eating. The latter is unlikely true for boys in this study, based on the current findings. For example, the results did not provide any evidence to suggest that thinner boys were engaging in increased dieting behaviour or that this was related to emotional eating. However, the former may possibly be true for boys in this study population. An alternative is that perhaps thinner boys were more likely to engage in emotional eating behaviour due to negative affect associated with being a smaller rather than larger body size. Given that the sociocultural ideal for boys is a lean, muscular shape, this is a possibility. While increased BMI was associated with increased body dissatisfaction for boys, as opposed to a smaller body size being associated with body disturbance, perhaps the relationship between emotional eating and BMI has captured a subset of the population dealing with body weight issues of a different kind. All the same, these hypotheses are speculations at this point. The explanation might simply be related to measurement problems.

The role of emotional eating in binge eating and BED is well established in the adult literature (section 3.6.6), with some evidence that emotional eating is also a risk factor for binge eating in adolescent females (Stice et al., 2002). This study also provides some support for a relationship between emotional eating and binge eating in preadolescent boys and girls. Results seem to suggest that the overeating component of binge eating, rather than loss of control, is associated with emotional eating. This makes sense, as you might expect that emotional eating would be related to overeating behaviours, particularly in the absence of hunger.

As already discussed throughout section 6.5, binge eating appears to be significantly related to emotional distress. It is also very concerning to find that a subset of this study population of preadolescent children appears to be using food in an attempt to deal with emotional distress. While emotional eating was found to be negatively related to BMI, it would be expected that if this behaviour were to continue throughout childhood into adolescence and adulthood that this behaviour will eventually be related to increased BMI, and could certainly be foreseen as a risk factor for future weight
problems. This hypothesis is further supported by the strong relationship found in this study between emotional eating and binge eating. An additional concern, however, is that these children may not have learnt to adopt alternative, healthier methods of coping with negative emotion or adversity. Although further study is required to better understand the relationship between emotional eating and other coping methods in preadolescent children, these results certainly suggest that future research is warranted to better understand the nature of the relationships between emotional eating and BMI, emotional eating and binge eating, and emotional eating and other coping methods for preadolescent children. Early findings as indicated in this study suggest that future interventions for overweight and obesity could benefit significantly by addressing the role of emotional distress and emotional eating in binge eating behaviour. An additional benefit of addressing these issues might be that skills are also taught in relation to effective methods for coping with negative experiences and adversity. Interventions for overweight and obesity, as well as eating disorders, would do well to build up protective factors, as well as work to reduce risk factors as discussed throughout this thesis.

6.6 Limitations of the Current Research

There were a number of possible limitations of the current research that need to be considered when interpreting and/or generalising the study results to the larger population. These limitations are addressed in this section.

Firstly, it should be noted that this study was exploratory in nature, given the relative infancy of research on binge eating behaviour in preadolescent children. As such, a cross-sectional study design was employed, to determine whether associations would exist between the study variables of interest in a non-clinical sample of preadolescent children. This was seen as a necessary and important first step before engaging in subsequent longitudinal studies to test for specific risk factors for binge eating and/or obesity, as noted by Kazdin (1998). Thus, while this study has discussed the relationships between BMI, binge eating, and a set of physical, psychological, and psychosocial variables, causality between the variables cannot be determined. Furthermore, the direction of relationships indicated in the structural equation models should not be mistaken for proof of causality.

In addition, caution should be taken in generalising the study population to the larger population of preadolescent Australian school children. This study collected data in metropolitan Melbourne, Australia, and it is possible that this is not representative of
states across the nation. Further, no information was collected on the children who were not permitted by their parents, or who themselves chose not to participate in this study. It is plausible to suggest that one of the reasons that they, or their parents, may have declined participation was due to their own concerns or issues regarding weight or eating issues (as mentioned in chapter four, discussions with grade teachers suggested that this was a likely situation for a significant number of non-participants). If this were the case, the prevalence of overweight, obesity, and binge eating may be underestimated in the current study. However, without any information on those refusing participation, no firm conclusions can be made.

Another limitation was the self-report nature of the study. Although steps were taken to increase confidence in the data collected (e.g., participants were weighed and measured by the researcher, and definitions of difficult study concepts were provided to participants), no information was collected from parents or teachers to validate children’s responses. In addition, a number of the assessment tools had to be modified for use with children in the current study, as there were no suitable measures available for use with children at the time of data collection. Although similar measures, or similar adaptations, have been made in previous studies, such modifications have not been validated. Specific concerns have also been raised throughout this thesis regarding the measurement of parents’ body size and emotional eating. In relation to emotional eating there are more suitable assessment tools now available that would be recommended for use in future research with this age group.

The use of self-report in determining binge eating behaviour also raises some concerns in relation to children’s interpretation of the study items, and to the accuracy of their responses, given that the items were completed in a group environment. In addition, information was not collected that could allow the objective (as assessed using clinical interviews) nature of the overeating episodes to be clarified. Rather, the current study measure relied on subjective report of overeating (i.e., based on their own perceptions of what constitutes overeating). Thus, it is possible that a higher number of “overeaters” were found in this study than representative of the general population. Items relating to purging or other compensatory behaviours were also excluded from the current study, meaning that the prevalence of BED could not be distinguished from possible BN in this study, allowing only for an assessment of binge eating syndrome. Given the exploratory nature of this study, a self-report measure of binge eating was regarded to be acceptable, and care was taken to explain each question during the
testing period. However, a subsequent longitudinal study with this population should include a structured clinical interview, such as the Children’s Eating Disorders Examination, and a measure of binge eating severity to address these issues.

6.7 Implications and Future Directions

The findings from the current study have numerous theoretical and practical implications. Firstly, the results have shown that overweight, obesity, and binge eating are a significant problem for a substantial number of non-clinical preadolescent Australian school children. Sufficient evidence has been found to suggest that parent body size, body dissatisfaction, size-related teasing experiences, internalisation of sociocultural messages, depression, dieting attitudes and behaviour, and emotional eating are related to childhood overweight, obesity, and binge eating behaviour in meaningful ways. Further, this evidence suggests that these variables relate childhood weight and binge eating behaviour to one another. These findings therefore provide strong support for the extension of this study in the future. A good next step would be the design and implementation of a longitudinal investigation of these relationships to further clarify the various contributions of each factor to childhood weight and binge eating behaviour, and to establish causality. It is clear that to capture the early development of binge eating behaviours, studies need to investigate samples of preadolescent children. Studies of adolescent populations are unlikely to capture the earliest occurrences of eating pathology.

This study also provides support for the theoretical concept of the presence of different pathways to binge eating. Indeed, it is also possible that this study has described a subset of binge eaters who have developed binge eating prior to dieting attitudes and behaviour. However, conclusions cannot be made based on the current exploratory, correlational study, and longitudinal studies would be required to determine the unique contribution of dieting and negative affect to binge eating. It is certainly clear from these findings that binge eating is related both directly and indirectly to distress (e.g., depression, body dissatisfaction, sociocultural factors). This raises the question, “Why are preadolescent children turning to food for comfort?”, or perhaps as a first question “Are preadolescent children turning to food for comfort?”. This is an important area for future directions of research, as it addresses issues relating to coping, resiliency, and general well-being, while also extending the understanding of
the implications of the different pathways to binge eating, and the relationship between obesity and binge eating.

The present findings also found support for examining the overeating and loss of control components of binge eating separately. While future research, with larger sample sizes, would further enhance our understanding of the unique contributions of overeating and loss of control to the assessment and interpretation of binge eating, evidence does suggest that the loss of control component is likely the cardinal feature of binge eating (Fairburn & Wilson, 1993; Pratt et al., 1998). The relationships found between loss of control and body dissatisfaction, depression, size-related teasing experiences, and internalisation of sociocultural messages suggest that loss of control in this study was related to negative affect as opposed to dieting attitudes and behaviour, and supports other early work in this area (Morgan et al., 2002). Further research in this area is needed to clarify whether it is those children who report loss of control over their eating who will have the greatest difficulties with binge eating or obesity in adulthood.

In regards to clinical application, the current study has provided evidence to show that children’s body weight and binge eating behaviour are related, albeit indirectly. This raises the question previously posed by Irving and Neumark-Sztainer (2002; Neumark-Sztainer, 2003, 2005a): “Can we simultaneously work toward the prevention of obesity and eating disorders in children and adolescents?” Given the potentially cyclical nature of the relationship between BMI and binge eating, it appears that obesity prevention programs would benefit from addressing eating pathology, and perhaps vice versa. There are a number of advantages to combining these prevention efforts. For example, a combined intervention in schools, as opposed to two separate programs, is likely to be more time-efficient, more cost-efficient, and also sends an integrated rather than opposing message to program participants (Neumark-Sztainer, 2005a). Such an integrated approach should be evidence-based, and well designed with the goal of undertaking effective and meaningful evaluations.

Current obesity prevention programs have focused almost solely on interventions related to dietary and physical activity habits (Summerbell et al., 2005). However, the current study suggests that programs should also address issues such as size-acceptance, evaluating sociocultural messages in a more realistic way, and learning healthy and effective ways to cope with negative affect. The study also supports the need for intervention at not just the individual level, but also needs to incorporate the family, school, and community environment. Again the argument for effective
evaluation of such interventions must also be made, as only through evaluations of future intervention programs will researchers and practitioners continue to be guided on what will best work in the fight against childhood overweight, obesity, and eating pathology.

6.8 Conclusions

The present study has examined the prevalence of childhood overweight, obesity, and binge eating behaviour, and investigated a set of physical, psychological, and psychosocial factors that could explain a link between obesity and binge eating. The results of this study have shown that overweight, obesity, and binge eating are indeed prevalent for a significant number of non-clinical preadolescent Australian school children. Although BMI and binge eating were not found to be directly related in this sample, this study did find that they both share common relationships with other physical, psychological, and psychosocial factors, linking them indirectly to each other. Further, emotional distress appeared to play an important role in binge eating for these children, particularly in relation to the loss of control aspect of binge eating. These findings point to the need to address psychological and psychosocial issues in future childhood obesity intervention efforts, and provide some evidence to suggest that these factors along with binge eating itself are some of the missing components of current intervention programs. It is hoped that the findings of this study will continue to promote evidence-based research and practice in this area, taking a more multidisciplinary focus to obesity prevention and management, and working toward a more integrated approach to obesity and eating disorder prevention. Recognising that psychological and psychosocial variables may be important factors to consider in the development and maintenance of both obesity and eating disorders is an important first step.
REFERENCES


*Pediatrics, 114*, 104-108.


APPENDIX A:

DSM-IV-TR CRITERIA FOR BINGE EATING DISORDER AND BULIMIA NERVOSA

Research Criteria for Binge Eating Disorder as Defined by the DSM-IV-TR (APA, 2000)

Text Removed
Diagnostic Criteria for Bulimia Nervosa as Defined by the DSM-IVTR (APA, 2000)

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APPENDIX B:
QUESTIONNAIRE PACKAGE
Cover Page

PRIMARY SCHOOL STUDENTS’

BEHAVIOURS & ATTITUDES

ABOUT

EATING, EXERCISE & LIFE

Kellie Zahra

Swinburne University of Technology
Study Information Page, with Consent, for Participants

The aim of this study is to find out about primary school students' eating and exercise attitudes and behaviours. It is also to see how you feel about different things in your life, such as how much you enjoy school. In this questionnaire you will be asked a number of questions about your own behaviours and thinking about these things.

- Your answers will remain anonymous, so no one will know which answers are yours. Please do not write your name anywhere on these papers.
- Your answers will also be confidential. That means that your answers will be private and the only people who will see them are the researchers.
- The questionnaire is not a test and there are no right or wrong answers. Please answer each question honestly and accurately as I am interested in finding out how you feel.
- For each question, circle the number that best describes how well the statement applies to you. Each number corresponds to a different answer. For example:

  I like watching T.V.

  1 Never  2 Rarely  3 Sometimes  4 Often  5 Very Often  6 Always

If you often like watching T.V., you would circle number 4.

- Try to answer each question and be sure to choose only one response for each question. If you make a mistake or change your mind, put an “X” through the incorrect answer and then draw a circle around the correct response.
- You can, of course, stop participating at any time, or you can refuse to answer any question that you don’t want to. If you have any questions please do not hesitate to ask for help.

Please indicate below whether you agree to participate in this study.

☐ Yes, I would like to take part in this study.

☐ No, I do not want to take part in this study.

THANK YOU FOR YOUR HELP
Demographic Questions and Height and Weight Items

Please answer the following questions:

1. How old are you? ___________ years ___________ months

2. How tall are you? ___________ cm
   (measured for you by the researcher)

3. How much do you weigh? ___________ kg
   (measured for you by the researcher)

4. What is your mother’s occupation? ____________________________

5. What is your father’s occupation? ____________________________

6. In what country was your mother born? ____________________________

7. In what country was your father born? ____________________________

8. In what country were you born? ____________________________

(PLEASE TURN OVER)
Contour Drawing Rating Scales

Image removed

Circle the number under the body which you think looks most like your mother's body now.

Image removed

Circle the number under the body which you think looks most like your father's body now.

(PLEASE TURN OVER)
Children’s Depression Inventory

Inventory Removed
Collins’ Figural Rating Scales – Girls Version

Please look at the following set of bodies.

Image Removed

Circle the number under the body which you think looks most like your own body now, i.e. your current body.

Image Removed

Circle the number under the body which you would most like to have now, i.e. your ideal body.

(PLEASE TURN OVER)
Collins’ Figural Rating Scales – Boys Version

Please look at the following set of bodies.

Image Removed

Circle the number under the body which you think looks most like your own body now, i.e. your current body.

Image Removed

Circle the number under the body which you would most like to have now, i.e. your ideal body.

(PLEASE TURN OVER)
Children’s Eating Attitudes Test

Scale Removed
Emotional Eating Items

Items Removed
Modified Version of the Sociocultural Attitudes Towards Appearance Questionnaire and Physical Appearance Related Teasing Scale – Girls Version

Scale Removed
Modified Version of the Sociocultural Attitudes Towards Appearance Questionnaire and Physical Appearance Related Teasing Scale – Boys Version

Scale Removed
Modified Items from the Questionnaire of Eating and Weight Patterns

Items Removed

This is the end of the questionnaire.

Thank you for completing our questionnaire on primary school students’ behaviours and attitudes about eating, exercise & life.

We appreciate your time very much.
APPENDIX C:
INTERNATIONAL REFERENCE STANDARD BMI CUT-OFF POINTS FOR OVERWEIGHT AND OBESITY FOR MALES AND FEMALES, AGED 9-14 YEARS

Table C.1
*International reference standard body mass index cut-off points for overweight and obesity for males and females, aged 9 to 14 years*

<table>
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<th>Males</th>
<th>Females</th>
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<td>24.0</td>
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<td>24.6</td>
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Source: Cole, Bellizzi, Flegal, and Dietz, 2000
APPENDIX D:
STUDY LETTERS
Letter to School Principals Requesting Participation in the Study

[ON SWINBURN University OF TECHNOLOGY LETTERHEAD]

PRINCIPAL NAME
SCHOOL ADDRESS

DATE

Dear PRINCIPAL NAME,

I refer to our telephone conversation on [DATE] and thank you for expressing an interest in my Swinburne University of Technology doctoral research project. I am writing to provide you with further information regarding this study and to seek permission to involve the Grade 5 and 6 students in your school in this project. The project, which has University Ethics Committee approval and approval from the Department of Education, Employment and Training (DEET) is entitled “Primary school students’ behaviours and attitudes about eating, exercise and life”. I have attached copies of both ethics approval letters for your information.

The aim of this study is to gain an understanding of the prevalence and causes of obesity and binge eating behaviour in Victorian primary school children. As you may be aware, obesity is an increasingly prevalent problem in society, especially in young children. Obesity has serious health consequences such as increased risk for heart disease and diabetes and is now considered a major public health issue. Obesity and binge eating behaviour also have numerous social consequences, such as low self-esteem, poor body image, susceptibility to peer teasing, and depression. Given the detrimental health and social consequences of these health problems, it is crucial to address these problems as early in life as possible. Therefore, as a result of this study, I hope to increase our understanding of these serious health concerns to aid the successful development of future health promotion/prevention programs in Victorian primary schools.

The research involves students completing a questionnaire package which takes between 45 minutes and 1 hour to complete. A copy of the questionnaire package is attached. Parental permission will be sought for children’s participation and an explanatory letter and informed consent form for parents is also attached.

Following the questionnaire testing session, I would like to run a class on “healthy lifestyle” issues which will cover the topics raised in the questionnaire package and will allow for discussion of any issues or concerns raised for the students during participation. This class has been put together by the researchers in collaboration with a dietitian, weight experts, teachers, and child development experts. It is anticipated this class will take approximately 20 to 30 minutes. I propose to discuss the contents of this class with teachers beforehand to gain approval and allow their input into the class material.

Students volunteering to participate (and who have parental permission) will remain anonymous, as no names are requested on any of the questionnaire materials. Further, students may withdraw from the study at any time during their participation.
Information collected will be confidential. It will be collated with results collected from other participating schools to provide statistics about Victorian primary school students as a whole. I would also like to emphasise that schools volunteering to participate will also remain anonymous and confidential, and no identifying names will be used in any reports.

I would like to be able to conduct the questionnaire testing session and “healthy lifestyle” debriefing session during school time. If possible, I would like to be allocated approximately 1 ½ hours of your class time, which would include adequate time for breaks for the students. I realise this is a substantial amount of time, however, and am happy to fit in with your timetable, or adjust my testing session time, if I have your approval for the project to go ahead.

Once the data collection and analysis phase of the study has been completed, I would be pleased to talk to teachers, parents, and/or students about my findings and their implications for health education.

Any questions about the project can be directed to myself on 9214-5554 or my research supervisor Naomi Crafti (9214-5355) at any time. Further, if you have any complaint at any time throughout the project or have any query that the research supervisor has been unable to satisfy, please contact The Chair, Human Experimentation Ethics Committee, Swinburne University of Technology, PO BOX 218, Hawthorn, 3122.

I will contact you by telephone within the next week to discuss your possible interest in this project and to answer any further questions you may have.

Yours sincerely,

Kellie Zahra  
Doctoral Student  
School of Social and Behavioural Sciences  
Swinburne University of Technology  
9214-5554
Information Letter for Parents, including Plain Language Statement

[ON SWINBURNE UNIVERSITY OF TECHNOLOGY LETTERHEAD]

Dear Parents,

Primary School Students’ Behaviours and Attitudes about Eating, Exercise & Life

As part of a doctoral research degree project at Swinburne University of Technology, I am conducting a study with primary school students about their behaviours and attitudes towards eating, exercise, and a healthy lifestyle. This letter is to inform you of the study and ask for your written permission for your child to participate in this study.

The aim of the study is to collect information to aid health promotion and prevention initiatives in Victorian primary schools regarding healthy lifestyle issues. Participation in the study involves completion of a number of questions about students’ thinking about eating, exercise, and healthy lifestyle issues. Further, to determine genetic weight make-up, participants will be shown a series of drawn figures and asked to identify which figure most resembles the body shape of their mother and father. The questionnaire takes approximately 45 minutes to 1 hour to complete and will be completed during class time. During this time, students will also be weighed and their heights measured, with their permission. All weighing and measuring will be conducted in a secluded area set up in the classroom, for complete privacy of results. If students feel uncomfortable about being weighed by the researcher, they can choose to weigh themselves, or they may choose not to be weighed and measured. A researcher will be present at all times to answer any queries or concerns the students may have about the questionnaire materials. If your permission is given, students are still free to decline participation in the study at any time in they wish to do so. Students’ answers will remain anonymous. No names will be written anywhere on any questionnaires and all answers will only be seen by the researchers. Results will be used for the purposes of research only and if published will contain no identifying information.

Following completion of the questionnaire, a class will be held by the researcher which will discuss healthy lifestyle issues, such as healthy eating, exercise habits, and being happy with our bodies. This class has been put together by the researcher in collaboration with dietitians, weight experts, teachers and child development experts. During this time, students can ask any questions or view any concerns that might have arisen during participation. This class will also have the input of your child’s class teacher, who will be present throughout the entire testing session.

If you grant permission for your child to participate in this study, would you please complete the attached consent form. If you would like more information, please contact myself (Kellie Zahra) on 9214-5554, or my supervisor, Ms. Naomi Crafti, Swinburne University of Technology, on 9214-5355 at any time.

Thank you,
Kellie Zahra
Doctoral Student
Institute of Social Research
Swinburne University of Technology
9214-5554

Naomi Crafti
Research Supervisor
School of Social & Behavioural Sciences
Swinburne University of Technology
9214-5355
Student Consent Form

I, ____________________________________________________________

have read and understood the information in the attached letter, regarding the project: Primary school students’ behaviours and attitudes about eating, exercise and life. Any questions I have asked have been answered to my satisfaction.

I agree for my child, ____________________________________________________________

to participate in this study and understand that their consent will also be requested before participation. I realise that my child is free to withdraw from the study at any time.

I agree that research data collected from the study may be published or provided to other researchers on the condition that no identifying names are used.

________________________
Signature

________________________
Date

Principal Investigators:

Kellie Zahra
Doctoral Student
Institute of Social Research
Swinburne University of Technology
9214-5554

Naomi Crafti
Research Supervisor
School of Social and Behavioural Sciences
Swinburne University of Technology
9214-5355
Thank-You Letter to School Principals

[ON SWINBURNE UNIVERSITY OF TECHNOLOGY LETTERHEAD]

PRINCIPAL NAME

SCHOOL ADDRESS

Dear PRINCIPAL NAME,

Primary school students’ behaviours and attitudes about eating, exercise and life.

I am writing to thank you once again for your school’s participation in my doctoral research project “Primary school students’ behaviours and attitudes about eating, exercise and life”. I also extend my sincere thanks to [PARTICIPATING GRADE TEACHERS], and all the students who gave their time.

Although I am sure that the majority of students will have no concerns arising from their participation, there may be a number of students, or their parents, who express a concern, or would like more information about obesity, binge eating or other eating disorders. Further, teachers also may require some additional resources to deal with these pertinent social and health issues either now, or in the future. Therefore, I have listed below a number of contacts for your information.

Anorexia & Bulimia
Foundation of Victoria (Inc).
1513 High Street
GLEN IRIS VIC 3146
Ph: 9885-0318

Body Image & Health Inc.
c/- Royal Women’s Hospital
132 Grattan St
CARLTON VIC 3053
Ph: 9344 2668

Body Image & Health Inc. also has a resourceful website which has numerous fact sheets relating to the promotion of healthy eating habits and exercise behaviours in schools, fostering positive body image, etc. There is also a very useful resource list of books, which might be of interest. The website is: http://www.rch.unimelb.edu.au/BIHinc

Thank you again. It is through the willing participation of primary schools in health research that we will begin to understand more about the causes and correlates of obesity and binge eating in primary school children. More importantly, this research will help us understand how we can address these serious social and health problems in young children.

Once the data collection and analysis phase of the study has been completed, I would be pleased to talk to teachers, parents, and/or students about my findings and their implications for health education. I will also send out a summary report of the research findings for your information.

Please do not hesitate to contact myself or my research supervisor, Ms. Naomi Crafti (Ph: 9214-5355), if you have any queries or concerns in relation to this research, or you would like further information about useful contacts or resources.

Sincere thanks,

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