

**FACTORS INFLUENCING DISORDERED
EATING IN YOUNG WOMEN WITH AND
WITHOUT TYPE 1 DIABETES**

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Abstract

In recent years there have been growing concerns about the impact of disordered eating in female populations and the harmful consequences of disordered eating in females with type 1 diabetes. However, the emphasis of diabetes research in this area has been focused on eating issues and associated risk factors in adolescent populations or combined age ranges from young adolescents to older adults, while the young adulthood phase, an important transitional period has been mostly neglected. There are relatively few studies that have looked at eating disturbances and associated risk factors in Australian community samples. Overseas research has indicated that there is a higher incidence of eating disturbances in females with type 1 diabetes compared to females without type 1 diabetes but there have been no previous Australian studies that have specifically examined these issues in young women aged 18 to 25 years with type 1 diabetes.

The primary aim of the current study was to investigate whether having type 1 diabetes made any additional contribution to disordered eating after taking into account the contribution of known risk factors including body dissatisfaction, depressive symptoms, perceived maternal influence, attachment to peers, and perfectionism. The second aim was to investigate the influence of disordered eating and other risk factors including body dissatisfaction, depressive symptoms, and diabetes onset age on diabetes management and metabolic control levels. Two models were developed to test these aims.

A total of 42 young women with type 1 diabetes were recruited from two diabetes clinics, the Diabetes Education Service at the Western Hospital and the Young Person's

Diabetes Clinic at the Royal Melbourne Hospital. The study recruited 66 undergraduate female students without any chronic illnesses from Victoria University St Albans and Footscray campuses. Demographic information was obtained from all participants, including additional information from the diabetes participants such as their metabolic control levels and diabetes onset age. Standardized questionnaires were used to obtain information to measure disordered eating levels, body dissatisfaction, depressive symptoms, perceptions of maternal influence, attachment to peers, and diabetes-related self care.

Hierarchical multiple regression analysis was used to test the two proposed models and the combined risk factors explained 57% and 22% of the variance in disordered eating and diabetes management respectively. Body dissatisfaction and depressive symptoms significantly influenced disordered eating patterns in the combined sample of young women with and without diabetes but the presence of type 1 diabetes did not make any additional contribution. For the current diabetes sample disordered eating did not contribute to overall diabetes management, but was linked to certain aspects of how young women managed their illness. In contrast depressive symptoms were a strong influence on how young women managed their diabetes.

While the study has some limitations it offers important insights into the impact of risk factors on disordered eating and aspects of diabetes management in Australian young women with and without type 1 diabetes. The implications of these findings and directions for future research were discussed.

Student Declaration

Doctor of Psychology Declaration

“I, Sonal Sachdeva, declare that the Doctor of Psychology (Clinical Psychology) thesis entitled *Factors Influencing Disordered Eating in Young Women with and without Type 1 Diabetes* is no more than 40,000 words in length including quotes and exclusive of tables, figures, appendices, bibliography, references and footnotes. This thesis contains no material that has been submitted previously, in whole or in part, for the award of any other academic degree or diploma. Except where otherwise indicated, this thesis is my own work”.

Signature:

Date: 28th AUGUST 2009

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1 Introduction

The issue of eating disturbances that do not meet clinical diagnostic criteria has been an area of research interest for a few decades (Fairburn & Bohn, 2005; Rosen, Gross, & Vara, 1987; Thompson, Covert, Richards, Johnson, & Cattarin, 1995). Studies have found that these subclinical eating disturbances may have an influence on a woman's well-being similar to, even though possibly not as severe as, clinical eating disorders (Fairburn & Bohn, 2005; Striegel-Moore, Silberstein, Frensch, & Rodin, 1989).

More recently, subclinical eating disturbances have been suggested as a common presentation in female populations with type 1 diabetes (M. J. Jones, Lawson, Daneman, Olmsted, & Rodin, 2000; Nielsen, 2002; Rydall, Rodin, Olmsted, Devenyi, & Daneman, 1997). A few studies have indicated that eating disturbances are higher in female populations with type 1 diabetes compared to those without this illness (Engstrom, et al., 1999; M. J. Jones, et al., 2000). It has been suggested that the dietary focus of a chronic illness such as type 1 diabetes may increase the risk of developing disturbed eating patterns (Antisdel & Chrisler, 2000; Smith, Latchford, Hall, & Dickson, 2008). Eating disturbances in this population have been associated with poor control or management of diabetes (e.g. Marcus, Wing, Jawad, & Orchard, 1992). Research confirms an increased risk for earlier than expected serious diabetes-related morbidity and mortality with this dual diagnosis of diabetes and eating disturbances due to an array of possible debilitating complications ranging from diabetic ketoacidosis, hypoglycemia, frequent hospitalizations, delays in development, osteoporosis, retinopathy, nephropathy, and comorbid disturbances in psychological functioning (Daneman, 2002; Rydall, et al., 1997).

A variety of factors have received attention and empirical support as possible causal influences for disordered eating and body dissatisfaction. However, few studies have examined eating disturbances in young women with and without type 1 diabetes using an integrative theoretical model representing risk factors that might work together (e.g. van den Berg, Thompson, Obremski-Brandon, & Coover, 2002). Some of the influential risk factors for eating disturbances that earlier studies have suggested include: body dissatisfaction (Meltzer, et al., 2001; Thompson, 1992), perfectionism (Davis, Claridge, & Fox, 2000), depressive symptoms (Ackard, Croll, & Kearney-Cooke, 2002; Hillege, Beale, & McMaster, 2008), maternal influence (Benedikt, Wertheim, & Love, 1998; Maharaj, Rodin, Connolly, Olmsted, & Daneman, 2000), and peer influences (Dorli, Hammen, Davila, & Daley, 1997).

The current study will examine the risk factors for disordered eating in an Australian sample of young women with and without type 1 diabetes and will also investigate specific risk factors for poor diabetes management in young women with type 1 diabetes.

1.1 Disordered Eating

Eating disturbances have been a significant health problem among adolescent girls and young women. In the Diagnostic and Statistical Manual of Psychological Disorders (DSM-IV-TR) eating disturbances are classified into three main clinical categories: anorexia nervosa restrictive type and binge-eating/purging type, bulimia nervosa purging and non-purging type, and eating disorder not otherwise specified that includes binge-eating disorder (American Psychiatric Association, 2000). Contemporary studies have identified eating disorder not otherwise specified and eating disturbances

that do not meet definite diagnostic criteria as the most frequent presentations in clinical settings as well as community settings (Fairburn, et al., 2007; Shisslak, Crago, & Estes, 1995; Turner & Bryant-Waugh, 2004). Along with evidence suggesting that disordered eating pathology that does not meet clinical criteria is common, Fairburn and Bohn (2005) also argued that these problems are not mild or unimportant and emphasized the need for changes in the diagnostic criteria in research as well as clinical practice. In considering disordered eating issues, two important aspects have been highlighted. These include, firstly, whether disordered eating patterns can progress to full syndrome eating disorders (Rastam, Gillberg, van Hoeken, & Hoek, 2004), and secondly, whether young women who present with disordered eating patterns have a tendency to conceal or minimize their eating problems as identified among women with full syndrome eating disorders (E. A. Becker, Thomas, Franko, & Herzog, 2005; Rastam, et al., 2004).

1.1.1 Definition of disordered eating.

Although there are clear definitions and symptoms that describe anorexia nervosa or bulimia nervosa (American Psychiatric Association, 2000), there seems to be no exact definition for disordered eating. Often terms such as sub-threshold or sub-clinical eating disorders are used to imply that a person has some disturbances in their eating related attitudes or behaviors but all the criteria required for an eating disorder diagnosis have not been met. Some researchers have attempted to provide definitions of disordered eating based on existing diagnostic criteria for eating disorders. For instance, criteria for a subthreshold eating disorder was specified as occasional bingeing and purging over the past three months (minimum three episodes), repeated chewing and spitting of food to prevent weight gain (at least once a week over the preceding three months or twice a

week over past four weeks), and regular extreme dietary restraint or excessive exercise for the purpose of weight loss over the past four weeks in the absence of binge eating (M. J. Jones, et al., 2000). This definition is focused solely on specifying behavioral symptoms of a lesser degree than those present in clinical eating disorders. However, there is evidence indicating that young women could use any combination of the above mentioned typical behaviors or all of them at a lower frequency (Fairburn & Bohn, 2005). Such a definition does not include distorted thoughts related to eating disturbances, such as the intense fear of gaining weight in anorexia nervosa or the sense of lack of control in bulimia nervosa (American Psychiatric Association, 2000). The prospect of understanding causal factors underlying these behavioral symptoms or changes in the behaviors based on established external factors such as media influence (Carney & Louw, 2006; Jackson & Chen, 2008; Jackson, Weiss, Lunquist, & Soderlind, 2005), maternal or family influence (Pike & Rodin, 1991; Wertheim, Martin, Prior, Sanson, & Smart, 2002), and peer or social influence (Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999; van den Berg, Thompson, et al., 2002) is thus limited.

In contrast to the specific definition provided by Jones et al. (2000) Rodin, Silberstein, and Striegel-Moore (1984) conceptualized disordered eating along a continuum ranging from normal eating and a lack of concern with weight at one end, followed by “normative discontent” with weight and moderately deregulated/restrained eating, and with clinically diagnosable levels of eating pathology at the other extreme of this continuum. More generally, disordered eating could signify harmful eating patterns affecting women’s health and well-being that are similar to those present in full syndrome eating disorders (Fairburn, et al., 2007). In other words disordered eating may encompass varying degrees

of behaviors such as dieting, binge eating, purging, avoidance and restriction of certain foods, or excessive exercise. The specific eating patterns would possibly depend on the extent of distortion in thoughts and perceptions regarding one's body and distortions about food and its impact on the body. In the absence of a comprehensive diagnostic definition for disordered eating, numerous studies of disordered eating (e.g., Thompson, et al., 1999, p. 311; Tylka & Subich, 2004; van den Berg, Thompson, et al., 2002) have focused on the eating disturbances, thought processes, perceptions, and influential factors underlying such eating patterns.

Disturbed thoughts and attitudes have been implicated as the underlying causal and maintenance factors for clinical eating disorders and disordered eating (e.g. Fairburn, 1997; C. Jones, Leung, & Harris, 2007). Fairburn (2008, p. 12) has described these distorted thoughts as the "over-evaluation of shape and weight and their control" and distinguished them from the more common disliking for one's appearance seen in the general female population. Given the strong evidence (Berger, Weitkamp, & Strauss, 2009; L. D. Cohen & Petrie, 2005; Fairburn, 1997, 2008; Gustafsson, Edlund, Kjellin, & Claes, 2008; C. Jones, et al., 2007) suggesting the direct impact of disturbed eating thoughts and attitudes on eating behavior symptomatology, there is a need to better understand the risk factors that are associated with such distorted attitudes.

1.1.2 Impact of disordered eating.

Long term follow up studies have indicated that among women disordered eating patterns seem to persist (Heatherton, Mahamedi, Striepe, Field, & Keel, 1997; Striegel-Moore, et al., 1989; Yager, Landsverk, Edelstein, & Jarbik, 1988). These studies used large samples and were mainly focused on eating pathology that included concerns or

dissatisfaction with weight and body image, dieting, drive for thinness, binge eating and purging. The 20-month follow-up study by Yager et al. (1988) of 628 young women with eating pathology classified 392 women into a bulimia group, 202 women into a subthreshold eating disorder group, and 34 women into an anorexia nervosa with bulimic features group. Results from the study demonstrated that at follow up the prevalence of physical problems related to eating behaviors such as irregular menses was similar for the subthreshold eating disorders group and the bulimia group, but there was a higher prevalence in the anorexia group. A comparison of psychological aspects (including depression, suicidality, anxiety, obsessive-compulsive behaviors, and interpersonal difficulties) assessed at initial and follow up collection points suggested that these aspects increased to a lesser degree in the subthreshold group compared to the bulimia and anorexia groups. The authors had also found similar patterns of substance use among the three groups over the 20 month period. Striegel-Moore et al. (1989) had collected data from 672 college students, including 330 young women aged 17 to 19 years, at the start and end of their university freshman year. The authors found that disordered eating symptoms were higher among women (64.5% dieting and 43.4% binge eating) compared to men (19.4% dieting and 17% binge eating) at the initial collection point. At follow up there was an increase in the incidence of disordered eating among women, suggesting that women with no eating disturbances at initial assessment were demonstrating symptoms at follow up. Importantly, the authors described no increase in actual weight from the first to the second data collection point even though women were more dissatisfied with their bodies and displayed an increase in their efforts to control their weight at follow up. The authors also suggested that an increase in disordered eating

symptoms at follow up was associated with increased negative feelings about weight and higher perceived stress. Heatherton et al. (1997) followed up a sample of 715 college students (including 509 women) after ten years and argued that eating problems diminished over ten years among women due to the maturational process and changes in role status. However, their study also indicated that at follow up a third of the women participants continued to be physically underweight; almost 30% of women self-categorized themselves as overweight; 68% continued to have a desire to lose weight; and the percentage of women who had been dieting during college was only slightly reduced after ten years. A recent Australian study of 415 young women (aged 19 to 24 years) examining the relationship between stress, coping, and disordered eating found that approximately 40% of the sample continued to demonstrate disordered eating symptoms at six month follow up (Ball & Lee, 2002).

In the last decade, the focus of research has shifted from investigation of the effects of disordered eating towards understanding the risk factors for such eating patterns in community and subclinical samples. Many of these studies (Keery, van den Berg, & Thompson, 2004; Shroff & Thompson, 2006; Thompson, et al., 1995; Tylka & Subich, 2004; van den Berg, Thompson, et al., 2002; Veron-Guidry, Williamson, & Netemeyer, 1997) looking at variables associated with the presentation of disordered eating have shown that women with disordered eating have a strong sense of dissatisfaction with their bodies.

1.2 Body Dissatisfaction

1.2.1 What is body dissatisfaction?

Body dissatisfaction is a widely used term for a disturbance in an individual's body image perception. Garner et al. (1983) described body dissatisfaction as a belief that specific parts of the body are "too large" (e.g. hips or stomach) and associated this belief with changes in body shape or increased fatness. However, research has suggested that dissatisfaction with one's body or shape among young women can exist in the absence of any actual weight changes (Striegel-Moore, et al., 1989). Hence, body dissatisfaction can be described as an individual's perception that their body shape or weight is different from their preferred or acceptable ideal and that this belief influences their attitudes and behaviors. Young women's dissatisfaction with their bodies may be due to a perception that they are heavier than their actual size or alternatively due to an ideal body image that is unattainable, and perhaps, unhealthily thin. The study by Heatherton et al. (1997) had found support for the above explanation at their first data collection point where 98.7% of the young women in their college sample (n = 509) were average weight or underweight but approximately 52% reportedly believed themselves to be overweight and 82% had a desire to lose at least 5 kilos of their body weight. Similar to the description of disordered eating (J. Rodin, et al., 1984), a continuum has been considered as the most appropriate way to conceptualize body dissatisfaction where levels of disturbance range from none to extreme, and higher levels of disturbance are indicative of possible clinical problems (Thompson, et al., 1999)

1.2.2 How is body dissatisfaction linked to disordered eating?

Disordered eating patterns and weight-control strategies have been identified as secondary to young women's concerns with their body shape and weight (Rosen, 1992). Thompson (1992) has agreed with Rosen (1992) in describing body dissatisfaction as a primary influence in the development of eating disorders and identified it under the separate construct named "body image disorder". It seems plausible that when young women feel dissatisfied with their bodies, they make attempts to correct the situation by dieting or other means. If there is excessive body dissatisfaction then eating patterns, thoughts, and other behaviors might also be extreme. Several studies of risk factors for the development of eating disorders support the above argument and have reported body dissatisfaction as a predictor for onset of disordered eating patterns (Stice & Bearman, 2001; Thompson, et al., 1995; van den Berg, Thompson, et al., 2002). For instance, a three year longitudinal study of female adolescents (aged 13 to 18 years) found that body dissatisfaction predicted the onset of restrictive eating behaviors (Cattarin & Thompson, 1994). Another study that followed 116 girls for eight years through young adolescence (aged 12 to 15 years), mid-adolescence (aged 15 to 17 years), and young adulthood (aged 21 to 23 years) found that levels of dissatisfaction with one's body were significantly related to eating disturbances at all three collection points (Graber, Brooks-Gunn, Paikoff, & Warren, 1994). Similar results were found in a large scale study that examined the onset of eating disturbances among 543 female adolescents aged 13 to 17 years who were followed up for three consecutive years from a baseline assessment point (Stice, Killen, Hayward, & Taylor, 1998). As in the case of disordered eating patterns, the above

longitudinal studies also indicate that body dissatisfaction is a persistent issue among women over longer periods of time.

While body dissatisfaction has been strongly associated with the development of disordered eating symptoms (e.g. van den Berg, Thompson, et al., 2002), it has been suggested that body dissatisfaction mediates the relationship between several other risk factors and eating disturbances. Social pressure for thinness, low self-esteem, and depression have been shown to have an impact on disordered eating through body image disturbances in preadolescent girls (Veron-Guidry, et al., 1997). Similarly, studies using female adolescent and adult samples (Coomber & King, 2008; Keery, et al., 2004; Shroff & Thompson, 2006; van den Berg, Thompson, et al., 2002; Yamamiya, Shroff, & Thompson, 2008) that have been based on the tripartite influence model of body image and eating disturbance (Thompson, et al., 1999), have described body dissatisfaction as a possible mediator for the influence of peer, family, media, and depressive symptoms on disordered eating symptoms.

Given the achievement orientation evident among women with eating and body image concerns, some of the above studies have also considered the personality factor perfectionism as influencing body dissatisfaction and disordered eating (Graber, et al., 1994; Keery, et al., 2004; van den Berg, Thompson, et al., 2002).

1.3 Perfectionism

Perfectionism has been defined as a “personality construct that is characterized by excessive concern over making mistakes, high personal standards, and a self critical nature” (Frost, Martin, Lahart, & Rosenblate, 1990, p. 465).

1.3.1 Perfectionism and eating.

Perfectionism was initially studied as a factor associated with anorexia nervosa given that women with these presentations were high achievers who presented a public image of perfection (Cockell, et al., 2002; F. P. Sullivan, Bulik, Fear, & Pickering, 1998). Long term studies of women with bulimia nervosa (e.g. Joiner, Heatherton, & Keel, 1997) have also noted perfectionism as a persistent factor in this disorder. Moreover, the levels of perfectionism reported in recovered eating disorder patients have been described as more than that observed in comparison community samples (Bachner-Melman, Zohar, Kremer, & Ebstein, 2007; F. P. Sullivan, et al., 1998). There is also current evidence suggesting perfectionism is prominent among clinical samples of adolescents with diagnosed eating disorders (especially Anorexia Nervosa) (Kirsh, McVey, Tweed, & Katzman, 2007); among adult women with eating disorders (especially Bulimia Nervosa and Eating Disorder Not Otherwise Specified) (Nevonen, Clinton, & Norring, 2006); and among female relatives of women with eating disorders (Shroff, et al., 2006).

1.3.2 Perfectionism, body dissatisfaction and disordered eating.

In recent years research interest has been extended from clinical eating disorders to subclinical disorders and non-clinical samples and has examined the association of perfectionist characteristics with body image issues and disordered eating among young women (Davis, et al., 2000; Peck & Lightsey, 2008). In non-clinical female samples perfectionism has been associated with weight-related anxiety (Pumariega & LaBarbera, 1986), weight preoccupation (Davis, Shuster, Dionne, & Claridge, 2001), and a drive for thinness (Davis, et al., 2000; Garner, Olmsted, Polivy, & Garfinkel, 1984). Results from longitudinal studies have demonstrated that perfectionism is a common trait among

young women with disordered eating patterns (Joiner, Heatherton, & Keel, 1997; Kaminiski & McNamara, 1996; Santonastaso, Friederici, & Favaro, 1999). In an Australian study of 142 young women (mean age 16 years) there was a discrepancy between participant's ideal figure and the figure they perceived as attractive only among those who had high perfectionism scores (Tiggemann & Dyer, 1995). The authors suggested that women with high perfectionism scores wished to be thinner than what they considered as attractive and described young women's search for physical perfection as the underlying motivation for disturbed eating patterns. Another large scale study that collected data from 890 participants (including 435 women in 1982 and 455 women in 1992) identified perfectionism as a risk factor for disordered eating among women who perceived themselves as overweight, but not among those who did not think they were overweight (Joiner, Heatherton, Rudd, & Schmidt, 1997). The authors also highlighted that actual weight did not have the same influence as perceived weight status. More recent studies, indicating a direct association of perfectionism with body dissatisfaction and disordered eating among young women, suggest a tendency in these women with perfectionist personality patterns to perceive themselves as imperfect in terms of weight or body shape, and to consequently, develop disordered eating patterns in an attempt to achieve their unrealistic body shape or weight (Davis, et al., 2000; Pearson & Gleaves, 2006).

Several studies have also shown that people with a chronic illness are more susceptible to developing body image disturbances compared to age matched comparison groups (Erkolahti, Ilonen, & Saarijarvi, 2003; Neumark-Sztainer, Story, Resnick, Garwick, & Blum, 1995; Wolman, Resnick, Harris, & Blum, 1994). In a study of young

women (aged 12 to 27 years) with type 1 diabetes perfectionism was related to drive for thinness and body dissatisfaction (Pollock-Barziv & Davis, 2005).

1.4 Type 1 Diabetes

1.4.1 What is type 1 diabetes?

Diabetes Mellitus (DM) is a chronic medical condition where the body is unable to automatically regulate blood glucose levels due to lack of or inadequate response to the hormone insulin, resulting in excessive glucose in the blood and consequential health problems (International Diabetes Institute, 2004). While there are several types of DM, the two main categories are type 1 diabetes and type 2 diabetes. Type 1 diabetes, frequently called insulin-dependent diabetes mellitus or juvenile-onset diabetes, has been shown to account for 5-10% of those with diabetes and results from “a cellular-mediated autoimmune destruction of the beta cells in the pancreas, usually resulting in absolute insulin deficiency” (American Diabetes Association, 2008, p. 56). In contrast, type 2 diabetes, frequently called non-insulin-dependent diabetes mellitus or adult-onset diabetes, has been shown to account for approximately 90-95% of those with diabetes and “ranges from an insulin resistance along with a relative (rather than absolute) insulin deficiency to predominantly an insulin secretory defect with insulin resistance” (American Diabetes Association, 2008, p. 56). Compared to other types of diabetes, type 1 diabetes is more likely to first present in childhood and has a more severe treatment regimen with lifetime health implications. The current study focuses only on type 1 diabetes.

1.4.2 Incidence and prevalence of type 1 diabetes.

During a seven year period (2000-2006) the National Diabetes Register recorded 6,279 new cases of type 1 diabetes among children under 14 years of age and 8,826 new cases among people aged 15 years and over (Australian Institute of Health and Welfare, 2008). This report from the Australian Institute of Health and Welfare (2008) estimated that the total number of new type 1 diabetes cases equates to more than two new cases per day for children under 14 years of age and three per day for people 15 years of age and over. Among children less than 14 years of age there have been 22.4 new cases per 100,000 population each year, for people aged 15 – 19 years of age there have been 16.7 new cases per 100,000 each year, and there have been approximately four to six new cases each year for people in the older age group. Moreover, the report predicted a 2.7% average annual increase in incidence rates for the group aged less than 14 years, indicating a significant increase in the incidence of type 1 diabetes among children compared to young adults. These statistics highlight that the peak incidence rate for type 1 diabetes occurs before the age of 15 years.

At present, there are no studies specific to Melbourne or Victoria that demonstrate the exact prevalence rates of type 1 diabetes in young women aged 18 to 25 years. However, the total number of type 1 diabetes registrants on the National Diabetes Register for Melbourne between the years of 1999 – 2005 in the age group of 0 – 14 years was recorded as 1,042 and in the age group of 15 – 39 years was recorded as 1,117 (National Institute of Health and Welfare, Catanzariti, Faulks, & Waters, 2007).

1.4.3 Type 1 diabetes treatment - insulin therapy.

Due to the absolute lack of insulin production resulting from autoimmune destruction of the pancreatic cell (Crow, Keel, & Kendall, 1998), people with type 1 diabetes depend on external insulin replacement as their only available treatment prospect for survival. The treatment involves exogenous insulin injected at regularly scheduled times during the day using syringes or insulin pens. An alternative to injections is the insulin pump, which is a small computerized device that delivers a continuous low dose of insulin through a cannula attached to the body via a small needle inserted into the skin (Juvenile Diabetes Research Foundation International, n.d.). With an insulin pump, pressing a pump button delivers an extra amount of insulin to meet the carbohydrate intake during meal times, similar to the insulin injection procedure. Insulin treatment also involves frequent blood-glucose monitoring, regular health check-ups, specific dietary constraints, and exercise. Failure to maintain appropriate insulin levels results in either high or low blood glucose levels which can lead to medical complications. High glucose levels (hyperglycemia) can result in diabetes ketoacidosis, seizures, coma, or death; whereas low glucose levels (hypoglycemia) can cause a decrease in the supply of glucose to the brain and can progressively result in confusion, inability to concentrate, seizures, coma, or death (Weinger & Jacobson, 1998). It has been suggested that people with type 1 diabetes have a constant risk of developing both hypoglycemia and hyperglycemia as the regulation of glucose metabolism by the body's endogenous insulin production cannot be perfectly replicated by exogenous insulin therapy (Weinger & Jacobson, 1998).

The young onset age of type 1 diabetes means that maintaining blood glucose levels and management of the diabetes treatment is more difficult and generally requires parental involvement.

1.4.4 Impact of age of diabetes onset.

There has been limited research effort towards understanding how the age of onset affects the impact a diagnosis of diabetes can have on children or adolescents. An Australian study of 106 children found onset age related differences among their three study groups, less than 4 years of age, between 4 to 11 years of age, and 11 to 14 years of age (Northam, Anderson, Adler, Werther, & Warne, 1996). Northam et al (1996) explained that children under 4 years of age display a heightened response initially which resolved as they become accustomed to the diabetes life-style. In contrast, the authors suggested that young adolescents are less troubled initially due to their ability to understand their sickness and its management, but display increasing externalizing behaviors over time, possibly due to their resentment of the restrictions imposed by diabetes management and their recognition of the implications of diabetes for their future lives. Northam et al. (1996) had also indicated that in their study, contrary to previous research, girls diagnosed with type 1 diabetes between 4 – 11 years of age displayed more social withdrawal and disruptive behaviors at the time of diagnosis and at one year follow-up compared to those in the other age groups and to boys in the same age group.

Similarly, a six year longitudinal study of 95 children (aged 8 to 14 years at initial assessment) with type 1 diabetes found that over the study period participants exhibited an increase in mild depressive symptoms while anxiety symptoms increased only among

female participants (Kovacs, et al., 1990). Kovacs et al. (1990) also reported that participants found the implications of having diabetes and maintaining regimen more difficult with time, especially females, who were found to be more upset by their illness compared to boys. Evidence from a study of females aged between 12 – 18 years has suggested that perception of low bodily control as well as overall control is associated with poorer metabolic levels when diabetes was diagnosed within the three years before or after the onset of puberty (Schwartz, Weissberg-Benchell, & Perlmutter, 2002). A recent four year longitudinal study of 132 adolescents (70 girls and 62 boys) with type 1 diabetes, aged 10 to 14 years at the start of study, found that diabetes management and metabolic control levels declined as age of the participant increased and that this decline was associated with eating disturbances, depression and poor peer relations (Helgeson, Siminerio, Escobar, & Becker, 2009). Thus, it is likely that an earlier age of diabetes onset may lead to emotional difficulties among young women owing to their perceived loss of control because of diabetes.

In the above study by Schwartz et al. (2002) females with type 1 diabetes experiencing a lower sense of overall control and control over their body also reported more severe disordered eating patterns.

1.4.5 Impact of type 1 diabetes treatment.

As noted above, the onset of type 1 diabetes usually occurs prior to the age of 30 years but is generally diagnosed in childhood, and in most cases parents, especially mothers, tend to be intensely involved in the required treatment regimen (Seiffge-Krenke, 2002; Wiebe, et al., 2005). Insulin therapy requires dedication from patients, their families and treating medical professionals towards the patient's continuous maintenance

of behaviors in multiple domains including restricted food choices, physical activity, medications, glucose monitoring, and symptom management (Weinger, Butler, Welch, & La Greca, 2005). As females mature and become autonomous, there is a need to manage a delicate balance between a young woman's capacity to manage her own treatment and a reduction in the involvement of others. Disordered eating has been described as an opportunity for young women with type 1 diabetes to strengthen a sense of control in areas that have been regularly experienced as controlled by others (Schwartz, et al., 2002). Some studies have also indicated that having type 1 diabetes can often lead to conflicts in personal relationships and that negative interactions can have a significant impact on young women's diabetes management (Hillege, et al., 2008; Kay, Davies, Gamsu, & Jarman, 2009).

In contrast to the weight loss experienced prior to the diagnosis and treatment of type 1 diabetes, research suggests that a common consequence of necessary insulin therapy is weight gain (Diabetes Control and Complications Trial Research Group, 2001; Domargard, et al., 1999; Engstrom, et al., 1999). Weight gain could be distressing for young women depending on their eating related thought processes, interpersonal experiences that emphasized thin ideals and other psychological factors (Hillege, et al., 2008; Kay, et al., 2009). In a population-based study of young women aged 14 to 18 years with and without type 1 diabetes, Engstrom et al. (1999) found significantly higher drive for thinness and body dissatisfaction in the diabetes group compared to an age-matched control group. These authors noted that females in the diabetes group generally weighed more than females in the age matched control group and highlighted the finding

that the eating disturbances in the diabetes group were linked to the weight gain from insulin treatment.

The combination of disordered eating and a diagnosis of type 1 diabetes has become an area of research interest with evidence suggesting that up to one third of young women with type 1 diabetes have eating disturbances, which may be affecting their management of diabetes (e.g. Rydall, et al., 1997).

1.4.6 Type 1 diabetes and disordered eating.

Research suggests that the strong focus on dietary management in chronic illnesses such as type 1 diabetes may adversely affect eating attitudes and behaviors, possibly increasing young women's susceptibility to the development of disordered eating patterns (Antisdel & Chrisler, 2000). Steel et al. (1987) reported that several young women with type 1 diabetes who presented with eating pathology, believed that they had developed eating problems "because they were diabetic and had to think all the time about food". Moreover, weight gain as a side effect of necessary insulin therapy has resulted in some young women having reportedly associated the administration of insulin into their bodies with weight gain (Steel, et al., 1987). Several studies have shown that the prevalence of disordered eating as well as clinical eating disorders is higher among women with type 1 diabetes compared to their peers without this chronic illness (Colton, Olmsted, Daneman, Rydall, & Rodin, 2004; M. J. Jones, et al., 2000; Rydall, et al., 1997). A large sample study comparing 356 females with type 1 diabetes and 1098 age-matched peers between the ages of 12 to 19 years found that clinical levels of eating disorders and disordered eating patterns were almost twice as common among those with type 1 diabetes (24%) compared to age-matched peers (12%) (M. J. Jones, et al., 2000).

Conversely, some studies have found no difference between female populations with diabetes and control samples (Fairburn, Peveler, Davies, Mann, & Mayou, 1991; Marcus, et al., 1992; Meltzer, et al., 2001; Peveler, Fairburn, Boller, & Dunger, 1992). Although there seems no precise reason as to why this inconsistency exists, there were some differences between those studies that found a higher level of eating disturbance in diabetes groups compared to studies that found similar levels in the diabetes and control groups. Firstly, the studies that have found a difference between their diabetes and control samples were more recent than the studies that did not find a difference. Secondly, in some studies where a difference has been reported the results have not been based on comparisons with contemporaneous control groups. The study by Meltzer et al. (2001) had compared the scores from a sample of adolescents aged 11 to 19 years with diabetes to the norms obtained in an earlier study (Rosen, Silberg, & Gross, 1988). Similarly, the study by Marcus et al. (1992) had also used the norms from an early study (Garner, et al., 1983) as a comparison for the data they obtained from their sample of adults with diabetes.

In recent times, the considerable research interest in the group of young women with type 1 diabetes and disordered eating stems from the recognition that for young women with this comorbid presentation there are more complexities in terms of weight loss strategies and mortality risk compared to their counterparts without diabetes. An important difference is that young women with type 1 diabetes and disordered eating patterns have an additional hazardous weight loss method at their disposal in the form of underuse, misuse, or omission of insulin. Several studies have indicated that young women resort to insulin manipulation or insulin omission to eliminate calories and reduce

weight (Bryden, et al., 1999; Herpertz, et al., 1998; Hillege, et al., 2008; M. J. Jones, et al., 2000; Kay, et al., 2009; Neumark-Sztainer, et al., 2002). Bryden et al. (1999) reported that 30% of the women in their eight year follow-up study had admitted to insulin underuse as a means for controlling their weight. Similarly, Jones et al. (2000) reported that 11% of their sample of 356 young women with type 1 diabetes had reported intentional omission or under-dosing of insulin for weight loss. Another study of 70 young women with type 1 diabetes (aged 12 to 21 years) confirmed an association between disordered eating, insulin manipulation or omission, and poor metabolic control levels with 37.9% participants reporting disordered eating patterns, 10.3% reporting they had skipped insulin and 7.4% reporting they took less insulin to control their weight (Neumark-Sztainer, et al., 2002). While interviewing Australian young women with type 1 diabetes Hillege et al. (2008) reported insulin omission and misuse to be common among those with disordered eating. The authors quoted one participant as stating “you find a lot of young women skip their needles” and comparing insulin omission to vomiting as a means for weight loss.

A second important difference is that young women with type 1 diabetes and disordered eating patterns have poor diabetes management, and therefore, a higher risk of mortality and morbidity through their increased susceptibility to microvascular and macrovascular complications associated with diabetes (Lawson, Rodin, Rydall, Olmsted, & Daneman, 1994; Peveler, 2000; G. Rodin, Craven, Littlefield, Murray, & Daneman, 1991; Rydall, et al., 1997; Steel, et al., 1987; Ward, Troop, Cachia, Watkins, & Treasure, 1995). In a study of 91 young women with type 1 diabetes aged between 12 to 18 years at baseline, who were followed up after four years, the long-term persistence of disordered

eating patterns was linked to a higher risk of developing diabetes related retinopathy (Rydall, et al., 1997). At their follow up after eight years, Bryden et al. (1999) had found microvascular complications among 45% of their female participants with insulin manipulation issues.

Some of the above studies have indicated possible underlying body image concerns among young women with type 1 diabetes that influenced their disordered eating patterns and diabetes management (Bryden, et al., 1999; Engstrom, et al., 1999; Neumark-Sztainer, et al., 2002).

1.4.7 Type 1 diabetes and body dissatisfaction.

The influence of diabetes necessitated dietary focus and weight gain due to insulin therapy can be distressing to young women who desire a certain body shape or weight, especially if this desired body image is unattainable (Engstrom, et al., 1999; Neumark-Sztainer, et al., 2002). Compared to the evidence of disordered eating among young women without type 1 diabetes, fewer studies have focused on demonstrating an association between type 1 diabetes and body dissatisfaction among young women. Nevertheless, while reviewing existing literature on eating disorders and women with type 1 diabetes, Daneman (2002) identified body dissatisfaction as a core feature of eating and weight psychopathology among young women with type 1 diabetes. In a follow up study of 32 women with newly developed type 1 diabetes prior to insulin therapy and 12 months later, participants presented with body image issues that were found to influence their eating disturbances and were associated with their poor metabolic control (Steel, Lloyd, Young, & MacIntyre, 1990). A study by Meltzer et al. (2001) of 152 adolescents (81 females) aged 11 to 19 years indicated that body dissatisfaction

exists even after the first year of insulin therapy. The authors also identified body dissatisfaction as a significant predictor of disordered eating among female study participants. In a recent study that interviewed young women aged 18 to 24 years with type 1 diabetes, the authors described a sense of hatred or dislike among some of the participants towards their bodies along with a prioritization of body weight over their health and medical concerns (Kay, et al., 2009).

Studies focusing on young women with type 1 diabetes have also identified depressive symptoms as a factor which may be related to or may possibly increase the risk of disordered eating among women (G. Rodin, et al., 2002; Villa, et al., 1995).

1.5 Depressive Symptoms

1.5.1 Depressive symptoms and disordered eating.

The dissatisfaction with one's body and concomitant disordered eating patterns have been linked with depressive feelings among women (Ackard, et al., 2002; Faust, 1987; van den Berg, Wertheim, Thompson, & Paxton, 2002). Several studies have found depressive symptoms to be a risk factor or contributor towards disordered eating patterns. A study of Australian prepubescent children (237 boys and 270 girls) aged 8 to 11 years found 50% of the female participants had either thought of or were using strategies to lose weight and negative affect appeared to be closely related to body changing strategies, especially intentions to lose weight among girls (McCabe & Ricciardelli, 2003). The association between depressive symptoms and disordered eating has also been supported in studies of older age groups. VanBoven and Espelage (2006) described a significant association between depressive symptoms and disordered eating in a large sample of 392 undergraduate women (mean age of 19.6 years). A longitudinal study of

disordered eating symptoms that followed 117 young women (mean age 18 years at initial assessment) for a period of 20 months also identified depression as a risk factor for increased disordered eating (Cooley, Toray, Valdez, & Tee, 2007). The relationship between depressive symptoms and eating disturbances is also supported in clinical samples of females with anorexia nervosa or bulimia nervosa, indicating that eating disturbances at all levels are associated with negative affect among women (Herzog, 1982; Hsu, Crisp, & Callender, 1992; Stice & Agras, 1999).

Given the previously discussed research findings supporting a strong association between body dissatisfaction and disordered eating, as might be expected there has been evidence linking depressive symptoms with body dissatisfaction among young women (e.g. van den Berg, Thompson, et al., 2002).

1.5.2 Depressive symptoms and body dissatisfaction.

Longitudinal studies have supported the existence of depressive symptoms among young women with body dissatisfaction and disordered eating (e.g. Allison & Park, 2004). In recent times, research has shifted focus towards investigating the causal relationships among depressive symptoms, body dissatisfaction, and disordered eating.

One of the pathways indicated by research findings is that body dissatisfaction influences women to feel depressed, and can consequently result in disturbed eating patterns and attitudes. Evidence supporting this pathway was found in studies focused on adolescent girls aged 13 to 17 years followed up at two ten month intervals (Stice, 2001; Stice & Bearman, 2001), girls aged 11 to 13 years who were followed up at 16 to 18 years (Paxton, Neumark-Sztainer, Hannan, & Eisenberg, 2006), and adolescent females aged 10 to 18 years (Thompson, et al., 1995). However, in the study by Paxton et al.

(2006) the older adolescent females aged 14 to 16 years at initial assessment who were followed up when aged 19 to 21 years did not show a clear pathway between body dissatisfaction and depressive mood from initial assessment to follow up. This result might suggest that, due to puberty and the associated body changes, a stronger association between depressive symptoms and body dissatisfaction occurs among prepubescent and young adolescent girls (Graber, et al., 1994; Levine, Smolak, Moodey, Shuman, & Hessen, 1994; Stice & Shaw, 2002). A study of 138 undergraduate women (aged 18 to 48 years) found that participants with body image disturbances became depressed only after they were shown appearance-related television commercials (Heinberg & Thompson, 1995). This evidence suggests that possibly the pathway from body dissatisfaction to depression may also be triggered by additional factors which were not considered in the above mentioned studies that support this direction of influence. An intervention intended to treat body dissatisfaction that was aimed at consequently reducing depression and eating disturbances among young women (aged 17 to 20 years) failed to demonstrate a consistent decrease in depression over a period of 6 months even though body dissatisfaction and eating disturbances were reduced post-treatment (Bearman, Stice, & Chase, 2003). These results indicate that a different interactional mechanism may exist between depressive symptoms and body dissatisfaction among young adult women.

The alternate pathway suggested from research findings indicates that females who present with depressive symptoms are vulnerable to developing a sense of dissatisfaction with their bodies and consequently can engage in disordered eating patterns. Body dissatisfaction has been positively predicted by depressive symptoms

among 294 adolescent girls aged 14 to 19 years (Lee & Lee, 1996). Franko and Omori (1999) found that body dissatisfaction was high among college women who were classified into groups of dieters-at-risk (8.1%), intensive dieters (24%), and casual dieters (8.8%) compared to non-dieters (59.2%) in their sample of 207 women; but high depression scores were reported only among the groups described as dieters-at risk and intensive dieters. This result supports the assumption that depressive symptoms might have contributed towards participants' increased body dissatisfaction and disordered eating, resulting in their being categorized under the dieters-at-risk and intensive dieting groups. Similar results were found in another study of 345 college women (aged 18 to 45 years) which identified depressive symptoms as a possible underlying cause for frequent dieting and body image disturbances (Ackard, et al., 2002). Depressive symptoms have been described as a factor which influences body image issues in models assessing risk factors for eating disturbances. In a study evaluating the tripartite influence model of body image and eating disturbance among 196 young women (aged 18 to 22 years) a significant direct pathway was demonstrated from depressive symptoms to body dissatisfaction (van den Berg, Thompson, et al., 2002). A recent large scale study that assessed 2046 young women aged 21 to 23 years, after they were categorized as having mild, moderate or no depression between the ages 16 to 18 years, found that the depressed groups presented with higher levels of body dissatisfaction and eating disturbances at follow up (Franko, et al., 2005). These results support the suggestion that depressive symptoms result in a female perceiving her body as less than ideal, and consequently, internalizing or feeling threatened by messages that support this belief (Durkin & Paxton, 2002; Paxton, et al., 2006). The above evidence suggests that in young

adult women it is more likely for depression to influence body dissatisfaction rather than vice versa.

Previous studies have also indicated that people with type 1 diabetes are more likely to experience depressive symptoms compared to those without this illness (Anderson, Freedland, Clouse, & Patrick, 2001) and have linked depression with poor glycemic control as well as diabetes-related complications (De Groot, Anderson, Freedland, Clouse, & Lustman, 2001; Lustman, et al., 2000).

1.5.3 Depressive symptoms and type 1 diabetes.

Depression is often considered as a prevalent co-morbid condition with type 1 diabetes (Lustman & Clouse, 2002; Massengale, 2005). Massengale (2005) has identified type 1 diabetes as a psychologically and behaviorally demanding chronic illness where a majority of patients experience depressive symptoms post diagnosis that are resolved within six to nine months, although some individuals may have depressive symptoms that increase as the illness progresses. Management of type 1 diabetes can become difficult in the presence of depressive symptoms and there is evidence suggesting that the consequent poor glycemic control can lead to diabetes related medical complications, such as retinopathy (Hillege, et al., 2008; Kyrios, Nankervis, Reddy, & Sorbello, 2006; Roy, Roy, & Affouf, 2007). Depressive symptoms are considered to be a poorly managed aspect of diabetes with prevalence rates as high as one in three young adults with two-thirds of these possibly untreated (Anderson, et al., 2001). Comparison studies have shown that youth with type 1 diabetes are almost three times as likely to develop depressive symptoms compared to their counterparts without diabetes (Grey, Whittemore, & Tamborlane, 2002). A study of 98 females aged 13 – 19 years with and

without type 1 diabetes found that the risk of developing depression was almost double based on the existence of a diabetes diagnosis (Villa, et al., 1995). Similar results were also found in a more recent review study (Anderson, et al., 2001). Importantly, depressive symptoms are more common in young women and adolescent girls compared to males (Anderson, et al., 2001; Enzlin, Mathieu, & Demyttenaere, 2002; La Greca, Swales, Klemp, Madigan, & Skyler, 1995; Lawrence, et al., 2006).

1.5.4 Depressive symptoms and body dissatisfaction in young women with type 1 diabetes.

Although there have been numerous studies that have examined the association and directionality between depressive symptoms and body dissatisfaction in community samples, there has been limited research examining this association among young women with type 1 diabetes. Research efforts have focused more specifically on investigating eating disturbances among women or adolescents with type 1 diabetes (Grylli, Hafferl-Gattermayer, Wagner, Schober, & Karwautz, 2005; M. J. Jones, et al., 2000) and less emphasis has been given to associated body dissatisfaction or depressive symptoms among this group. However, an early study assessing adjustment in 105 females aged 12 – 16 years with type 1 diabetes found that participants who reported more depression, compared to females with healthier adjustment, were found to present with poorer body image (B. J. Sullivan, 1979). Despite the limited research findings in this area, it is expected that, as observed among those without diabetes, depressive symptoms in young women with type 1 diabetes would be linked to body dissatisfaction.

Previous studies have also indicated a link between onset age of type 1 diabetes and levels of depressive symptoms among young women with type 1 diabetes (Korbel, Wiebe, Berg, & Palmer, 2007; B. J. Sullivan, 1979).

1.5.5 Depressive symptoms and age of diabetes onset.

Several studies have suggested that the duration of type 1 diabetes and earlier age of onset have an impact on an individual's diabetes management as well as overall functioning (Goldston, Kovacs, Obrosky, & Iyengar, 1995; Hanson, et al., 1989; Holmes, Cant, Fox, & Lampert, 1999), but only a few studies have examined the influence of diabetes onset on depression. In the previously cited study examining the effect of diabetes onset age on adjustment among adolescent females (aged 12 to 16 years) with type 1 diabetes, Sullivan (1979) found that body image dissatisfaction and depression levels varied according to age of diabetes onset (ranging from 0 to 14 years) with poorer body image and depression problems being reported with earlier disease onset. More recently, a study of 65 male and 62 female adolescents aged 10 to 15 years with type 1 diabetes found that among females older age predicted an increase in depression and a decrease in diabetes adherence while the reverse results were observed in the case of males (Korbel, et al., 2007).

Apart from individual factors such as depressive symptoms, researchers in the area of eating disturbances have also examined the influence of family factors. In particular considerable research has been focused on the role of the mother-daughter relationship in the development of disordered eating and body dissatisfaction among young women (Daneman, 2002; Kichler & Crowther, 2001; G. Rodin, et al., 2002).

1.6 Perceived Maternal Influence

1.6.1 Perceived maternal influence on body dissatisfaction and disordered eating in young women.

The mother-daughter relationship has often been implicated in the development of body image-related dissatisfaction (Haudek, Rorty, & Henker, 1999; Kichler & Crowther, 2001; Zakin, 1989) and disturbed eating patterns among young women (Benedikt, et al., 1998; Jacobi, Agras, & Hammer, 2001; Mukai, Crago, & Shisslak, 1994; Tucker & McNamara, 1995). Previous studies have been more focused on finding an association of body dissatisfaction and disordered eating with maternal influence rather than examining the possible mediational role of body dissatisfaction in the association between maternal influence and disordered eating. An exception has been the tripartite influence model used by Keery et al. (2004) in a study that measured maternal weight and shape concerns along with other possible parental influences and found that body dissatisfaction mediated the role of parent influence on eating disturbances.

Researchers have highlighted two processes in the mother-daughter relationship as underlying young women's body dissatisfaction and disordered eating patterns. Firstly, negative communication within the family, especially in the mother-daughter dyad, pertaining to the daughter's weight, shape, encouragement to diet, as well as teasing has been identified by a number of authors (Hanna & Bond, 2006; Kichler & Crowther, 2001; Wertheim, Mee, & Paxton, 1999). In an Australian sample of 315 women aged 14 to 28 years, Hanna and Bond (2006) found that participants' perceptions of negative maternal verbal messages were an important contributor to disordered eating symptomatology including drive for thinness, body dissatisfaction, and bulimic symptoms. An earlier

study comparing mothers of female adolescents with and without disordered eating symptoms ($n = 39$ and $n = 38$ respectively) found that mothers of females with disordered eating patterns thought that their daughters were less attractive and should lose more weight compared to mothers of females who did not report eating disturbances (Pike & Rodin, 1991).

Secondly, studies have shown that daughters may be modeling perceived or actual maternal attitudes and behaviors (Jacobi, Schmitz, & Agras, 2008; Kichler & Crowther, 2001; Wertheim, et al., 2002). The study by Wertheim et al. (2002) focused on parent influences in the transmission of weight related values and behaviors among 1206 Australian adolescents (619 girls) with a mean age of 12.8 years. Their study results confirmed that maternal dieting and drive for thinness were significantly related to eating disturbances in almost half of the adolescent girls who had started menstruating. The authors also reported that compared to premenstrual girls and all boys, postmenarcheal girls displayed a higher degree of body dissatisfaction and disordered eating. Studies using older aged female samples also provide evidence for this link between maternal influence and disordered eating. In a study of adolescent girls aged approximately 16 years, most adolescents in the sample reported that they engaged in frequent conversations with their mother about food and dieting and 50% reported being encouraged by their mother to lose weight even though the researchers found them to be normal or underweight (Mukai, et al., 1994). In another study of Australian females aged 15 to 17 years and their mothers, moderate weight loss attempts and associated body dissatisfaction in females was significantly related to their mother's actual and perceived encouragement of their weight loss (Benedikt, et al., 1998). In the same study daughters

with extreme weight loss behaviors had mothers who themselves reported body dissatisfaction and weight loss behaviors.

It is notable that in the above studies involving participation of both mothers and daughters (Benedikt, et al., 1998; Kichler & Crowther, 2001; Pike & Rodin, 1991; Wertheim, et al., 2002; Wertheim, et al., 1999) there was acceptable consistency between information provided by parent and child. Such consistency might indicate that daughters have a capacity to report accurate information pertaining to their mothers. However, despite this accuracy young women's perceptions of maternal attitudes and behaviors are likely to have the same or even greater influence than the mother's actual words or actions. The importance of perceptions is evident in some of the above studies where the objective has been to assess perceived maternal influence by asking young women relevant questions about their own as well as maternal eating or body image patterns (Hanna & Bond, 2006; Haudek, et al., 1999; Mukai, et al., 1994; Zakin, 1989).

Maternal encouragement of daughters' weight loss and body-related preoccupations have also been identified as factors that might contribute to eating disturbances among young women with type 1 diabetes (e.g. G. Rodin, et al., 2002).

1.6.2 Perceived maternal influence on body dissatisfaction and disordered eating in young women with type 1 diabetes.

While relatively few studies have looked at the influence of maternal eating pathology and body image concerns on young women with type 1 diabetes, there is some evidence suggesting an association between the mother-daughter relationship and disordered eating and body dissatisfaction among young women (e.g. Daneman, 2002). As observed in studies of young women without diabetes, a recent study focused on

adolescent girls aged 11 to 17 years with type 1 diabetes found that body image dissatisfaction moderated the relationship between negative communication by mothers pertaining to weight or shape and disturbed eating patterns among daughters (Kichler, Foster, & Opiari-Arrigan, 2008).

Mothers who are preoccupied with their body image and attempt weight-loss behaviors can indirectly communicate the thinness ideal to daughters diagnosed with type 1 diabetes (G. Rodin, et al., 2002). Such maternal influences can be problematic for young women with type 1 diabetes as they are likely to be heavier than peers without diabetes, due to the previously discussed weight gain that is often associated with insulin therapy (Diabetes Control and Complications Trial Research Group, 2001). In a study of female adolescents (mean age = 15 years) with type 1 diabetes, mothers' disturbed eating and weight-control behavior was a significant predictor of eating disturbances among daughters (Maharaj, et al., 2000). Another study found that mothers of females (aged 11 to 19 years) with eating disturbances and type 1 diabetes reported more dissatisfaction with their own weight, were more likely to diet, engage in binge eating, and exercise for weight-control purposes compared to the mothers of participants without eating disturbances (Maharaj, Rodin, Olmsted, Connolly, & Daneman, 2003). Similar to findings from studies of young women without diabetes, in both the above studies (Maharaj, et al., 2003; 2000) there was consistency between the information provided by females and their mothers.

The studies described above have focused on the important influence of the mother-daughter relationship on body dissatisfaction and disordered eating in females with and without type 1 diabetes. However, during adolescence and young adulthood,

relationships outside the family such as with peers have been identified as particularly relevant for young women with (Greening, Stoppelbein, & Reeves, 2006) and without (O'Koon, 1997) type 1 diabetes.

1.7 Peer Influence

Adolescence and young adulthood are important developmental periods when peer relations and the social environment becomes increasing salient (H. S. Sullivan, 1953). Evidence suggests that during this period young women develop their sense of self in the context of their relationships (Gilligan, Lyons, & Hammer, 1990). There are several aspects of peer relations that have been suggested to have associations with young women's disordered eating patterns and body dissatisfaction. Some studies have suggested that peer attitudes and behaviors influence body image concerns and disordered eating among women (Dorli, et al., 1997; Keery, et al., 2004; Levine, et al., 1994; Mukai, et al., 1994; Shroff & Thompson, 2006). Peer pressure around eating and weight-related behavior has been shown to involve peer modeling, weight-related peer-teasing, popularity of idealized thin body shape, and peer reinforcement of a girl's social conformity (Lieberman, Gauvin, Bukowski, & White, 2001; Shisslak, et al., 1998). An Australian study also described body-related social comparison among females as a "destructive body-comparison trap" (Schutz, Paxton, & Wertheim, 2002). The impact of the above mentioned peer behaviors has been studied extensively.

A large scale study of 711 adolescent females (aged 11 to 17 years) found that higher peer modeling among females was related to more negative body esteem whereas higher levels of reported social reinforcement was associated with a more positive body esteem (Lieberman, et al., 2001). According to the authors these results indicate that girls

who were associated with peers who engaged in disordered eating and had body dissatisfaction felt worse about their own bodies, while girls who were encouraged by peers to diet and perceived a peer expectation to be thin were more positive about their own bodies. This evidence is also supported by another large scale study of 2,248 females (mean age = 15 years) where reported high body satisfaction was linked to peer attitudes that encouraged healthy eating and exercising to be fit (Kelly, Wall, Eisenberg, Story, & Neumark-Sztainer, 2005). The encouragement and support received from peers can be seen as a positive connection these females developed with their peers, which may have served to improve their body image. Furthermore, probably the positive aspects of the peer relationship itself are likely to contribute towards young women feeling better about their own bodies. Given the evidence suggesting that it is the relationships with peers that are crucial during adolescence, especially for women, there is a need to increase understanding of the influence attachment to peers has on women's body image and eating patterns.

1.7.1 Peer attachment.

Peer attachment has been defined as an enduring affectional bond of significant intensity that develops during adolescence and young adulthood (Armsden & Greenberg, 1987). Research suggests that there is a gradual process of transferring attachment-related functions from parents to peers during adolescence and the development of a sense of perceived security in peers (Farley & Davis, 1997). Compared to males young women have demonstrated a stronger attachment to peers and often considered female friends as their intimate confidants (Monck, 1991; O'Koon, 1997). The study by O'Koon (1997), involving 167 adolescents (95 females) aged 16 to 18 years, found a strong association

between poor body image and negative peer attachment among females participants. Similar results were found in a recent five year longitudinal study of females (aged 6 to 12 years at initial assessment), where peer rejection predicted an increased desire to lose weight after controlling for several other examined factors (Mikami, Hinshaw, Patterson, & Lee, 2008). Moreover, among clinical samples of young women with eating disorders, insecure attachment styles and difficult peer relationships have been associated with the severity of eating problems (B. Becker, Bell, & Billington, 1987; Pike, 1995; Troisi, et al., 2006).

Some of the above studies also suggested the existence of depressive symptoms among female adolescents who experienced difficulties in their peer relationships (Mikami, et al., 2008; Monck, 1991).

1.7.2 Peer attachment and depression.

Attachment to peers has been considered an important aspect in understanding depression among young women (Eberhart & Hammen, 2006; Strahan, 1995). An Australian study of 249 young people aged 17 to 30 years, including 172 young women, found that current peer attachment mediated the relationship between the quality of early attachment with parents and depressive symptoms (Strahan, 1995). In a later study comparing parent and peer attachments among 89 adolescents (aged 14 to 18 year) results showed that females (N = 46) scoring high on peer attachment but low on parent attachment were less depressed than those high on parent attachment but low on peer attachment (Laible, Carlo, & Raffaelli, 2000). Studies that have suggested positive peer attachment among young women was associated with lower levels of depression (Nada Raja, McGee, & Stanton, 1992; Shen, Lui, & Xu, 2008) are consistent with findings from

studies of clinically depressed women where there has been a reported association between reduced peer attachment and depressive symptoms (Armsden, McCauley, Greenberg, Burke, & Mitchell, 1990; Rosenfarb, Becker, & Khan, 1994).

1.7.3 Peer attachment and diabetes.

A search of online psychology database PsychINFO using the key-words “peer attachment” and “diabetes” did not reveal any relevant articles. However, there has been research indicating that, as for young people without diabetes, peers are an important aspect in the lives of those young people who are diagnosed with type 1 diabetes (Hartman-Stein & Reuter, 1988). Youth with type 1 diabetes have identified their peers as an important source of companionship and emotional support (La Greca, Auslander, et al., 1995). A peer group intervention approach involving adolescents with type 1 diabetes and their best friends was successful at increasing diabetes knowledge and social support while reducing reported diabetes-related conflicts (Greco, Pendley, McDonnell, & Reeves, 2001).

In a recent review of studies of youth with type 1 diabetes peer support was an important factor affecting different facets of diabetes adherence, especially in social situations (Greening, et al., 2006). There has been evidence suggesting that adolescents with type 1 diabetes (aged between 11 to 19 years) experienced difficulties around diabetes management in the peer context due to a fear of negative reaction from peers towards their illness (Hains, et al., 2007; Kristoffer, et al., 2006). Hains et al. (2007) suggested that this fear of negative reaction was probably linked to the anticipated diabetes adherence-related difficulties. The authors also found that as friend support increased for adolescents with diabetes so did their diabetes-related stress and poor

metabolic control, highlighting that friend support could have been ineffective or possibly that adolescents with diabetes disliked the added attention received because they had an illness.

There is a lack of research specifically examining peer attachment in young people with type 1 diabetes but the studies cited above suggest that peer relationships have similar importance for youth with type 1 diabetes as for their counterparts without diabetes, while highlighting that diabetes and its related self-care activities can possibly have a negative impact on peer relationships.

1.8 Rationale

Previous studies have provided evidence of a high incidence of disordered eating among women and identified potential risk factors including body dissatisfaction, depressive symptoms, perceived maternal influence, levels of peer attachment, and perfectionism. Some of the studies reviewed above have developed models to understand how certain factors combine to influence different aspects of disordered eating (e.g. Keery, et al., 2004; Shroff & Thompson, 2006; Stice, 2001; van den Berg, Thompson, et al., 2002). There has been evidence indicating that higher levels of disordered eating and body dissatisfaction exist among women with type 1 diabetes compared to those without this chronic illness and that the presence of disordered eating in young women with type 1 diabetes potentially has serious long term psychological and health implications.

Although some studies have examined one or more risk factors for body dissatisfaction and disordered eating among young women with type 1 diabetes, there is a lack of studies that have investigated how these risk factors in combination affect diabetes management and disordered eating. There is a need to increase our understanding of risk factors that

contribute towards the distorted thoughts and attitudes associated with disordered eating among young women in general and especially those with type 1 diabetes.

Research in disordered eating and related aspects has focused on examining preadolescent or adolescent females as puberty has been considered a critical period for the development of eating disturbances. In comparison, fewer studies have investigated the impact of these risk factors among young women even though evidence suggests that eating disturbances tend to persist, and possibly, increase with time. Therefore, there is a need for more research to understand how these risk factors influence disordered eating among older age groups (e.g. young women aged 18 to 25 years). In the case of women with type 1 diabetes the period of young adulthood, which involves increased independence from parents, is particularly important because of the typical experience of mothers being closely involved in the earlier diabetes management for their daughters. Moreover, there is evidence suggesting a decline in metabolic control levels and diabetes management as the duration of diabetes increases. Hence, there is a need to assess the influence of risk factors on diabetes management in older populations of females with type 1 diabetes.

Most of the above mentioned studies have been conducted with American or European samples. There are very few Australian studies that have reported on body dissatisfaction (Ball & Lee, 2002; Coomber & King, 2008; McCabe & Ricciardelli, 2003; van den Berg, Wertheim, et al., 2002), depressive symptoms (Northam, et al., 1996; Strahan, 1995; van den Berg, Wertheim, et al., 2002), perceived maternal influence (Benedikt, et al., 1998; Coomber & King, 2008; Hanna & Bond, 2006; Wertheim, et al., 2002), peer attachment (Strahan, 1995), perfectionism (Tiggemann & Dyer, 1995), and

disordered eating (Ball & Lee, 2002; Coomber & King, 2008; Hillege, et al., 2008; van den Berg, Wertheim, et al., 2002). Of these only two studies have examined an Australian sample with type 1 diabetes (Hillege, et al., 2008; Northam, et al., 1996). There has been one study that examined a model based on the tripartite influence design (Thompson, et al., 1999) for the role of sisters in eating issues (Coomber & King, 2008) and another for risk factors for eating disturbances in adolescent females (van den Berg, Wertheim, et al., 2002). Further study specific to Australian populations would provide essential information regarding the influence of risk factors on disordered eating as well as diabetes management in young women with and without type 1 diabetes.

1.9 Aims

The current study aimed to determine the contribution of various risk factors (including body dissatisfaction, perceived maternal influence, depressive symptoms, perfectionism, and peer attachment) to disordered eating among young women. The focus of the current study was disordered eating thoughts and attitudes rather than behaviors. A primary aim was to investigate whether a diagnosis of type 1 diabetes makes any additional contribution towards disordered eating, after examining the influence of the other risk factors. A further aim of the study was to understand how disordered eating influences diabetes management and metabolic control levels taking into account the contribution of age of diabetes onset, depressive symptoms, and body dissatisfaction. The following two models were developed based on existing research evidence.

1.9.1 Proposed Model 1.

The first model (figure 1) was proposed to explain the influence of risk factors on disordered eating for the entire sample, young women with and without diabetes. Based

on the existing literature on maternal influence, it is likely that mothers who experienced body image or eating issues have indirectly modeled for or directly encouraged their daughters to be aware of physical appearance from an early age. The mother-daughter interaction being considered as an important relationship may become the primary influence experienced by daughters from an early age. An internalization of the high expectations around physical appearance may contribute to the development of perfectionist personality patterns that may progressively define all aspects of a young women's life. The failure to achieve expected high goals, especially the perceived inability to achieve or maintain specific body image or eating behaviors, may lead to young women feeling depressed. The presence of depressive symptoms may impede a young women's ability to connect with peers, as observed among studies of clinically depressed samples, and lead to young women with depressive symptoms finding it difficult to develop and maintain healthy attachment with their peers. As identified in previous studies dissatisfaction with their bodies may be an underlying core feature among young women that combines with the other risk factors of perceived maternal influence, perfectionist personality patterns, depressive symptoms, and peer attachment to contribute to the development of disordered eating patterns. It was expected that the impact of managing a difficult chronic illness would contribute further to the development of disordered eating among young women with type 1 diabetes.

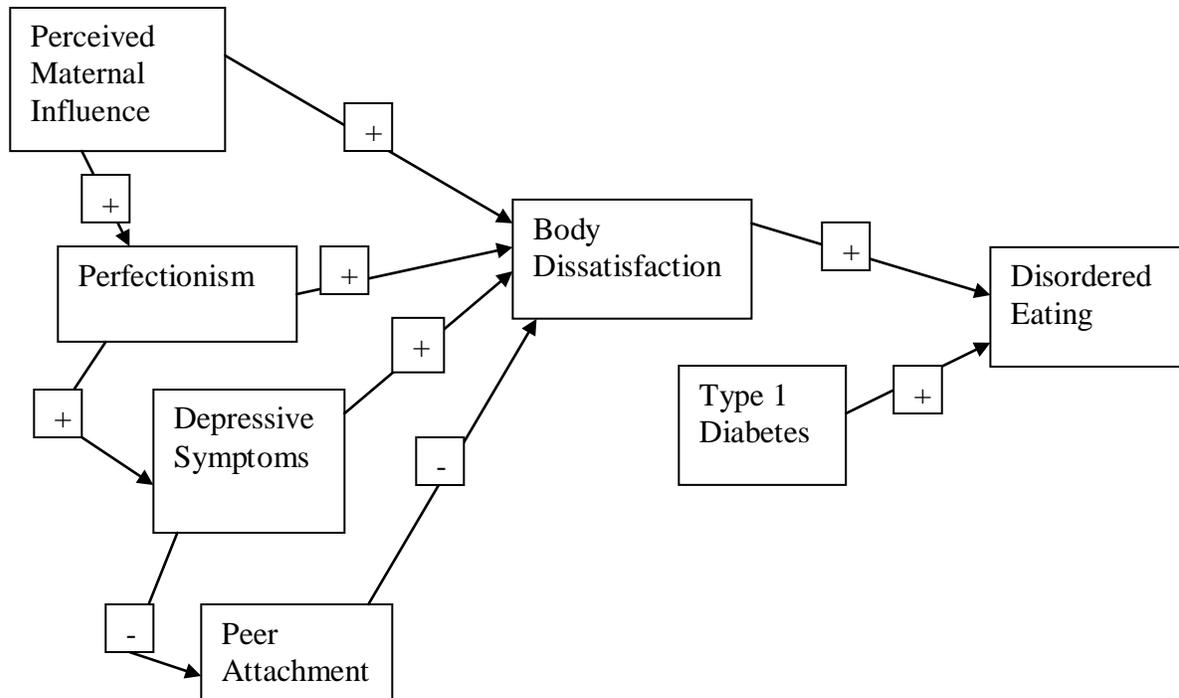


Figure 1. Risk Factors Contributing to Disordered Eating through Body Dissatisfaction.

1.9.2. Hypotheses specific to Model 1.

Based on the first model (Figure 1), the following hypotheses were generated:

1. There will be a significant positive association between perceived maternal influence and perfectionism.
2. There will be a significant positive association between perfectionism and depressive symptoms.
3. There will be a significant negative association between depressive symptoms and peer attachment.
4. Each of the risk factors perceived maternal influence, perfectionism, and depressive symptoms will be significantly associated body dissatisfaction.

5. There will be a significant negative association between peer attachment and body dissatisfaction.
6. There will be a significant positive association between body dissatisfaction and disordered eating.
7. A diagnosis of type 1 diabetes will be positively associated with disordered eating over and above the effects of negative maternal influence, perfectionism, depressive symptoms, and peer attachment.
8. The six hypothesized risk factors would make significant contributions towards predicting disordered eating among young women.

Potential indirect pathways were examined through the following hypotheses:

9. The association between maternal influence and disordered eating will be mediated by body dissatisfaction.
10. The association between perfectionism and disordered eating will be mediated by body dissatisfaction.
11. The association between depressive symptoms and disordered eating will be mediated by body dissatisfaction.
12. The association between peer attachment and disordered eating will be mediated by body dissatisfaction.

1.9.3 Proposed Model 2.

The second model (figure 2) was proposed to explain the influence of specific risk factors on diabetes management and metabolic control levels in the subsample of young women with type 1 diabetes. As pointed out in studies that have looked at the impact of diabetes onset age, it was expected that the younger women were at the time of diabetes

diagnosis the more dissatisfied they would be with their bodies. Similarly, it was expected that young women who have been diagnosed with diabetes at an earlier age would be more depressed. As in the previous model depressive symptoms and body dissatisfaction among young women with type 1 diabetes were expected to influence their disordered eating patterns. Young women with type 1 diabetes who have disordered eating patterns may prioritize their physical appearance over the necessary insulin therapy. Evidence from previous studies has indicated that these young women have reported manipulating their insulin. Thus, it is expected that these young women may not take adequate diabetes-related self care measures and this would be supported by their difficulty achieving required metabolic control levels.

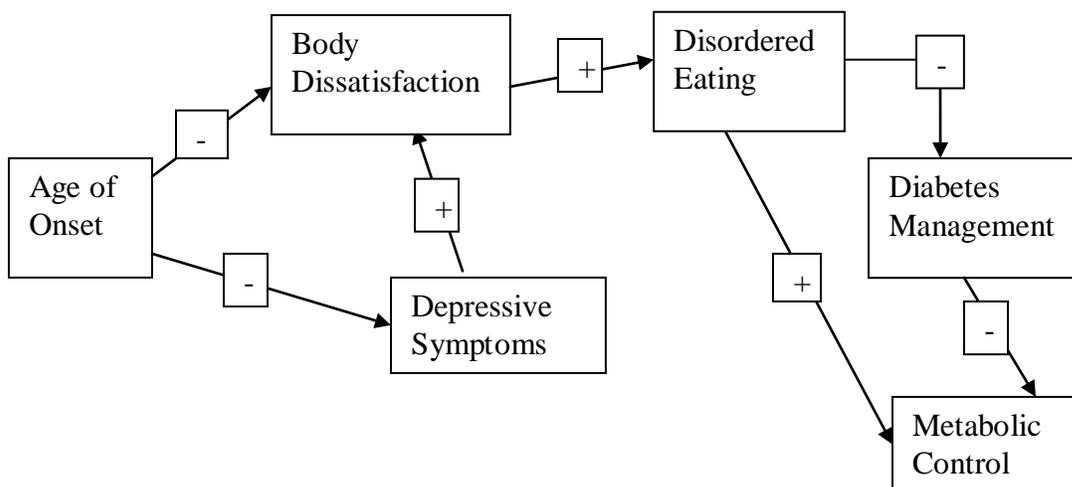


Figure 2. Impact of Disordered Eating and Other Risk Factors on Diabetes Management.

1.9.4 Hypotheses specific to Model 2.

Based on the second model specifically for the sub-sample of young women with type 1 diabetes the following hypotheses were generated:

13. There will be a significant negative association between age of diabetes onset and body dissatisfaction.
14. There will be a significant negative association between age of diabetes onset and depressive symptoms.
15. There will be a significant positive association between body dissatisfaction and depressive symptoms.
16. There will be a significant positive association between body dissatisfaction and disordered eating.
17. There will be a significant negative association between disordered eating and diabetes management.
18. There will be a significant positive association between disordered eating and metabolic control levels.
19. There will be a significant negative association between diabetes management and metabolic control levels.
20. The four hypothesized risk factors will make significant contributions towards predicting diabetes management and metabolic control among young women with type 1 diabetes.

Potential indirect pathways were examined through the following hypotheses:

21. The association between age of diabetes onset and disordered eating will be mediated by body dissatisfaction.
22. The association between age of diabetes onset and body dissatisfaction will be mediated by depressive symptoms.

2 Method

2.1 *Participants*

Participants were young women, aged between 18 to 25 years, with ($n = 42$) and without ($n = 66$) a diagnosis of type 1 diabetes. Young women, who had been diagnosed with type 1 diabetes before the age of 15 years, were recruited from two local diabetes clinics: the Diabetes Education Service at Western Hospital and the Young Person's Diabetes Clinic at Royal Melbourne Hospital. The diabetes service run by Western Hospital caters to the needs of people residing in the western regions of Melbourne with type 1, type 2 or gestational diabetes. The diabetes service run by Royal Melbourne Hospital specifically caters to the needs of people with type 1 diabetes who are under 25 years of age.

Undergraduate students without any chronic illnesses, including a diagnosis of type 1 diabetes, were recruited from Victoria University St Albans and Footscray campuses. Due to their educational experiences and knowledge of medical or health subjects, students enrolled in psychology and other health related courses such as nursing or allied health were excluded from the study. A general inclusion criterion was sufficient proficiency in English to understand what the study involved and to complete the research questionnaire.

2.2 *Measures*

Questionnaires were presented in booklet form with one version for participants with diabetes and another for participants without diabetes. In both versions, the background questionnaire measure appeared first followed by one of six sequences of

other questionnaires. These six questionnaire sequences were achieved by assigning an arbitrary number to each questionnaire and randomly picking numbers from a bowl. The six random sequenced questionnaire sets (three for each sample group) were aimed at minimizing the effect of participant fatigue and the loss of concentration from completing a number of questionnaires. All of the measures used in the current study are listed below. Measures which were only included in the booklets for participants with type 1 diabetes are marked with an asterisk (*).

2.2.1 Background Questionnaire. (See Appendix: 1)

The Background Questionnaire was developed for the current study to collect the following information: date of birth, educational level, marital status, living arrangements, employment status, country of birth, ethnicity, birth order, height and weight. Additional questions were included for the diabetes group to provide information on age at which diabetes was diagnosed, current diabetes treatment regimen, frequency of diabetes clinic attendance, age when self management for diabetes and diet were initiated, hospitalizations and complications related to diabetes. Possible options were provided for questions that could have variable responses and participants selected the one appropriate to their situation. Participants were also provided an “other” option with blank space for a brief description in cases where the options specified were not relevant to the participant.

2.2.2 Eating Disorder Examination – Questionnaire (EDE-Q) (Fairburn & Beglin, 1994). (See Appendix: 2)

The EDE–Q, a 36 item self report questionnaire, was developed to measure eating disturbances in community and clinical samples. It is derived from the Eating Disorder Examination (EDE) interview measure (Fairburn & Cooper; 1993), which has been

described as a “gold standard” for assessing eating pathology (Fairburn, et al., 2007). The EDE has been considered to be more reliable in diabetes samples due to its ability to provide more accurate estimates of eating disturbances compared to other scales such as EAT (Eating Attitudes Test) and EDI (Eating Disorder Inventory – Drive for Thinness & Bulimia Subscales) that simply indicate the presence or absence of certain eating behaviors (Crow, et al., 1998). Similar to the EDE, the EDE-Q is focused on the past 28 days and is scored using the same seven point forced choice rating scheme that ranges from “did not apply to me at all” to “applied to me very much or most of the time”. The four subscales of EDE-Q comprise 22 items that focus on restraint (6), eating concerns (6), shape concerns (6), and weight concerns (4). These scales address the “attitudinal aspects of eating-disorder psychopathology” (Mond, Hay, Rodgers, & Owen, 2006, p. 55) in contrast to the remaining items which assess the frequency of eating disorder behaviors. In the current study only the total EDE-Q score, calculated by summing subscale scores and dividing by the number of subscales (i.e. four), was used. A total scale score of four or higher is considered to be in the clinical range. A sample item from the EDE-Q scale is “Over the past 4 weeks have you tried to avoid eating any foods that you like, whether or not you have succeeded?” In a recent Australian community sample study comparing EDE-Q and EDE, the internal consistency of EDE-Q was high, with a Cronbach alpha coefficient for the global scale of .93, compared with a value of .90 for EDE (Mond, Hay, Rodgers, Owen, & Beumont, 2004). Based on a sample of female undergraduates Luce and Crowther (1999) reported 2-week test-retest reliability coefficients from 0.81 to 0.94 and Cronbach alphas for the four EDEQ subscales ranging from .78 to .93. Additionally, in two recent studies involving women with type 1 diabetes

(aged 11 to 19 years) the EDEQ was shown as a reliable measure (Schwartz, et al., 2002; Smith, et al., 2008). In the current study, the Cronbach alpha value for the EDE-Q was .97.

2.2.3 Eating Disorder Inventory – Body Dissatisfaction subscale (EDI-BD) ***(Garner, et al., 1983). (See Appendix: 3)***

The EDI-BD is a nine item scale that measures satisfaction with the size of specific body parts such as waist, thighs, and hips. It provides a score of overall satisfaction with appearance and body, but unlike the EDE-Q without referring to any specific time frames, and weight or shape related attitudes. Respondents use a six point rating scale ranging from “never” to “always” to indicate how often each item applied to them with high scores indicating greater degree of body dissatisfaction. The EDI-BD is scored by taking all the 1, 2, or 3 responses and assigning a score of 0. A response of 4 receives a score of 1, a response of 5 receives a score of 2, and a response of 6 receives a score of 3. Scale scores are the summation of all the EDI-BD item scores. A sample item from the EDI-BD is “I think my thighs are too large”. In the original study, reliability was demonstrated with a Cronbach alpha coefficient of .90 for diagnosed anorexia nervosa patients and .91 for a female non-clinical comparison group. According to Wear and Pratz (1987), the EDI-BD had good 3-week test-retest reliability, correlation coefficient .97, for their sample of undergraduate participants. The EDI-BD has been reliably used in previous studies for young women aged 12 to 20 years with Type 1 Diabetes (M. J. Jones, et al., 2000; Olmsted, Daneman, Rydall, Lawson, & Rodin, 2002). The EDI-BD had a Cronbach alpha value of .89 in the current study.

2.2.4 *Eating Disorder Inventory – Perfectionism subscale (EDI-P) (Garner, et al., 1983). (See Appendix: 4)*

The EDI-P subscale of the Eating Disorder Inventory was designed to measure excessive personal expectation and need for superior achievement. Respondents are required to rate the six items of the subscale using a six point rating scale ranging from “never” to “always” indicating the likelihood of each item applying to them, with high scores indicative of a greater degree of perfectionism. The EDI-P was scored in the same way as described for the EDI-BD scale mentioned above. A sample item of the EDI-P is “I feel that I must do things perfectly or not do them at all”. In the original study the Cronbach alpha was reported as .82 for diagnosed anorexia nervosa patients and .73 for a female comparison group. According to Wear and Pratz (1987) the EDI-P had good 3-week test-retest reliability, correlation coefficient of .88, for their sample of undergraduate participants. This scale has not been used with young women with type 1 diabetes. In the current study, the Cronbach alpha value for EDI-P was .86.

2.2.5 **Self-Care Inventory Revised – Type 1 Diabetes (SCIR) (Weinger, et al., 2005). (See Appendix: 5)*

The SCIR is a brief measure developed to assess perceptions of adherence to recommended diabetes self-care behaviors by adults with type 1 diabetes. The 15 items reflect how well the respondent followed recommendations for self-care during the past month with each item rated on a 5 point Likert scale from 1 indicating “never do it” to 5 indicating “always do this as recommended, without fail” The 15 items in SCIR address diet issues (4), glucose monitoring (2), medication administration (3), exercise (1), glucose levels (2), and the preventative or routine aspects of self-care (3). The total scale

score was calculated as per the procedure described by the authors i.e. $([\text{mean raw score} - \text{minimum}] \times 100) / (\text{maximum} - \text{minimum})$. A sample item from SCIR-T1 is “how often do you: take correct dose of insulin”. The original study (Weinger, et al., 2005) reported adequate psychometric properties for the SCIR with a Cronbach’s alpha of .87. In the current study, the Cronbach alpha value for SCIR was .75.

2.2.6 *Metabolic Control.

Metabolic level is generally reported in terms of a percentage of glycosylated hemoglobin or HbA1c level. Young women with type 1 diabetes are usually asked to provide a blood sample at every hospital/ clinic visit to test their metabolic levels along with other diabetes related assessments. In the current study, participants provided their HbA1c measurements on the day of the assessment and in some cases, where assessments were not conducted on the day of clinic visit, the measures were requested from the diabetes educator for the clinic visit closest to participants’ recruitment date (i.e. within 3 months). Previous research indicates that HbA1c levels ranging from 4% to 6% are considered average for people without diabetes (Ellis, Chang, Cogionis, & Daneman, 1997; Maharaj, Olmsted, Daneman, & Rodin, 2004). An HbA1c level <7% is the recommended level for adults with type 1 diabetes to effectively reduce long-term complications of diabetes (American Diabetes Association, 2006; Nathan, et al., 2005).

2.2.7 *Depression Anxiety Stress Scale – Depression Subscale (DASS-D)* ***(Lovibond & Lovibond, 1995). (See Appendix: 6)***

DASS is a 42 item self report scale developed to measure the three negative emotional states of depression, anxiety, and stress. The scale is focused on the current degree of depression, anxiety, and stress symptoms experienced by respondents over a

period of one week. There are three subscales each consisting of 14 items that respondents rate using a 0 – 3 scale, with 0 indicating “did not apply to me at all” and 3 indicating “applied to me very much or most of the time”. The subscale items are added to provide a total scale score for each subscale. Only the depression subscale score was used in the current study. A sample item from the DASS depression subscale is “I found it difficult to work up the initiative to do things”. The DASS has consistently shown good to excellent internal consistency in previous studies. In a recent study using a large adult non-clinical sample of 1,771 participants (965 females) a Cronbach’s alpha of .95 was reported for the depression subscale (Crawford & Henry, 2003). Although depression has been measured in samples of adolescents (La Greca, Swales, et al., 1995; Tercyak, et al., 2005) and adults with type 1 diabetes (Karlsen, Bru, & Hanestad, 2002; Tercyak, et al., 2005), there is no study as yet that has administered the DASS to young women with type 1 diabetes. In the current study, the Cronbach alpha value was .94 for the DASS Depression subscale.

2.2.8 *Daughter’s Perception of Maternal Influence (DPMI) (based on Benedikt, et al., 1998). (See Appendix: 7)*

The DPMI measure was modified for the present study due to a lack of any existing scales to assess daughter’s perception of maternal influence pertaining to maternal eating and weight concerns. It is based on a measure developed by Benedikt et al. (1998) for a previous Australian study that examined the association of eating attitudes and weight-loss attempts between mothers and their daughters. The original measure was untitled and consisted of seven items. It was described as “maternal struggle with weight and dieting” (5 items) and “maternal encouragement of their daughters to lose weight” (2

items). The authors had developed parallel items for daughters using the same seven items from the maternal scale. A sample item from the original measure assessing maternal issues was “Are you very watchful of your weight?” and the corresponding item on the daughter’s scale was “Is your mother very watchful of her weight?” The current study has adapted the original items to examine how young women perceive their mother’s personal struggle with weight and diet issues. The adapted version of the sample item mentioned above for the current study is “My mother is very watchful of her weight”. Similar to the original study, participants in the current study were asked to indicate on a five point rating scale, ranging from “never” to “very often”, their responses to these seven items. The items for the two scale dimensions (1. daughter’s awareness of maternal struggle with weight and dieting; 2. daughter’s awareness of their mother’s encouragement of their weight loss) were summed to produce a total scale score. One of the items of the former dimension “it is acceptable to my mother to be overweight” was reversed scored. In the original study correlations between ratings of mother’s report and daughter’s perception of the same seven items were all found to be significant ($p < .05$). The measure has not previously been used in a sample with a diagnosis of type 1 diabetes. In the current study the Cronbach alpha value for DPMI was .80.

2.2.9 Inventory of Parent and Peer Attachment – Peer Attachment (IPPA-Peer) (Armsden & Greenberg, 1987). (See Appendix: 8)

The Inventory of Parent and Peer Attachment (IPPA) was developed to measure attachment in late adolescence and young adulthood. It comprises two subscales, the parent attachment subscale (IPPA-Parent) that focuses on the parent/child relationship and the peer attachment subscale (IPPA-Peer) that focuses on the participant’s

relationship with peers; only the IPPA-Peer subscale was used in the current study. The 25 item IPPA-Peer subscale assesses the positive and negative affective and cognitive dimensions of close relationships with friends based on the three dimensions of trust, communication and alienation. Scores on these three subscales were summed to generate a total peer attachment score. A sample item from IPPA-Peer is “I can count on my friends when I need to get something off my chest”. For each item respondents are required to rate the degree to which each item is true for them on a five-point rating scale ranging from “almost always or always true” to “almost never or never true”. The internal consistency of the original peer attachment subscale for students aged 16 – 20 years was good with Cronbach alpha of .91, .87, and .72 for trust, communication, and alienation subscales respectively. Three-week test-retest reliability for a sample group aged 18 – 21 years revealed an alpha reliability score of .86 for the peer attachment subscale. Although the IPPA has been used frequently with the general population (Beitel & Cecero, 2003; Bilgin & Akkapulu, 2007), there are no previous studies that have used the peer attachment subscale with a type 1 diabetes sample. In the current study the Cronbach alpha value for the peer attachment subscale was .92.

2.3 Procedure

Prior to commencement of the current study, approval was obtained from the Melbourne Health MHREC (Mental Health Research and Ethics Committee) and the Victoria University HREC (Human Research Ethics Committee).

Letters were posted from the Diabetes Units of Western Hospital and Royal Melbourne Hospital to eligible young women with type 1 diabetes advising them of the current study and providing contact information (see Appendix 9). Additionally, posters

with information about the research and the researcher contact details (see Appendix 10) were pinned on notice boards around patient waiting areas at the hospitals. When eligible women attended their diabetes appointments they were advised by the diabetes nurse or educator that the researcher was present at the clinic and were asked to approach the researcher for further information if interested. If these young women were interested in knowing more about the research or participating, the researcher provided them with necessary information and answered any questions. Young women who were willing to participate in the study were asked to sign a consent form, agreeing to complete the research questionnaire and to provide their latest metabolic control level. Participants completed the questionnaires in the presence of the researcher when they attended the clinic for their routine diabetes assessments.

Undergraduate students from Victoria University were informed of this research initially through posters (see Appendix 11) pinned on notice boards in common student areas. The researcher also approached teaching staff at the St Albans and Footscray campuses who then advised their students of the research project that was being conducted. Interested students were invited to contact the researcher and arrange a convenient time to obtain further information and complete the questionnaires once they provided consent. The participants completed their questionnaires in the presence of the researcher.

2.3.1 Research design.

A cross sectional design was utilized in the current study with a sample of young women with type 1 diabetes and a control sample of young female undergraduate students without diabetes. Both samples completed the questionnaires as described above.

Two models were developed to determine a) the contribution of risk factors towards disordered eating and the additional influence of type 1 diabetes on disordered eating after controlling for the influence of known risk factors (Figure 1) and b) the effect of disordered eating and specific risk factors on diabetes management and metabolic control (Figure 2).

2.3.2 *Statistical analyses.*

The first step in the preliminary analysis plan was to generate descriptive statistics for all variables for the total sample and the two sub-samples. The next step involved assessing the reliability of the measures used in current study by checking their internal consistencies. Pearson product-moment correlations were conducted to assess the strength and direction of the association between the specified model variables. After checking that the basic assumptions of multiple regression were met, hierarchical multiple regression was used to test the two proposed models. Where relevant mediation analyses based on the procedure by Baron and Kenny (1986) were conducted to test the hypothesized indirect pathways.

2.3.3 *Power analyses.*

Power analyses were conducted to assess sample recruitment requirements (J. Cohen, 1992; J. Cohen, Cohen, West, & Aiken, 2003; Green, 1991). Based on recommendations made by Cohen (1992, p.158) the first model (figure. 1), which consists of six predictors, required a minimum of 97 participants for an alpha level of .05 with statistical power .80 and a medium effect size (f^2) of .15. Similarly, the second model (figure. 2), which consists of four predictors, required a minimum of 38

participants for an alpha level of .05 with statistical power .80 and a large effect size (f^2) of .35.

3 Results

3.1 *Sample Characteristics*

3.1.1 *Demographic information.*

A total of 108 participants were recruited for the current study. The sample included 42 young women with type 1 diabetes recruited from Western Hospital Diabetes Clinic ($n = 7$) and Royal Melbourne Hospital Young Person's Diabetes Clinic ($n = 35$). The remaining participants were undergraduate students recruited from Victoria University ($n = 66$). Demographic information was obtained from all participants. Of the 108 participants, 82% ($n = 88$) had completed high school (Year 12), 13% ($n = 14$) had completed tertiary education, and a small percentage reported that they had completed Year 10 and Year 11 (5.6%, $n = 6$). Half of the diabetes participants ($n = 21$) were not studying at the time of recruitment. In the undergraduate group, almost 44% ($n = 29$) were pursuing Arts degrees and the remaining participants were enrolled in Science (27.3%, $n = 18$), Commerce (21.2%, $n = 14$), or other specialized degrees (7.5%, $n = 5$).

In the diabetes group, 76.2% of the participants were employed either full time ($n = 16$) or part time ($n = 16$) and 23.8% ($n = 10$) of the participants were full time students. In contrast, 56.1% ($n = 37$) of the participants in the undergraduate group were employed part time and 40.9% ($n = 27$) were full time students. A majority of the diabetes and undergraduate participants lived with their parents (66.7% and 69.7% respectively). In both the diabetes and undergraduate groups most participants reported that they were single (81% and 66.7% respectively) at the time of recruitment. A higher percentage of

undergraduate participants (19.7%, $n = 13$) compared to diabetes participants (9.5%, $n = 4$) reported their status as dating.

A majority of the total sample was Caucasian (76.9%, $n = 83$). The sample also included young women from other ethnic groups: Asian (10.2%, $n = 11$), North African (6.5%, $n = 7$), African (4.6%, $n = 5$), and Aboriginal (1%, $n = 1$). Eighty-one percent of the participants were born in Australia ($n = 87$), with a large proportion of the total sample being first (38.9%, $n = 42$) or second (39.8%, $n = 43$) born and the remainder being born third (14.8%, $n = 16$) or later (6.5%, $n = 7$) in their families.

Information regarding age and reported physical characteristics is presented in Table 1. Weight (measured in kilograms) was divided by height squared (measured in meters) to calculate the body mass index (BMI) score for each participant (Turner & Bryant-Waugh, 2004; VanBoven & Espelage, 2006). The mean BMI score for the total study sample ($M = 24.14$, $SD = 5.13$) is similar to that reported in a previous study ($M = 24.5$, $SD = 4.6$) of young women with type 1 diabetes aged 17 to 25 years (Bryden, Dunger, Mayou, Peveler, & Neil, 2003). The mean BMI for the undergraduate sample in the current study was 23.80 which was slightly higher than the mean BMI of 22.98 ($SD = 4.44$) reported in a recent Australian study of young women aged 18 to 25 years without diabetes (Coomber & King, 2008).

Table 1.

Summary of sample characteristics.

Variable	N	Mean	Standard Deviation	Min Score	Max Score
Age	108	21.28	2.22	18	25
<i>Diabetes Only</i>	42	21.31	2.20	18	25
<i>Undergrad Only</i>	66	21.26	2.29	18	25
Height	108	165.52	7.11	151	183
<i>Diabetes Only</i>	42	163.52	6.82	151	174
<i>Undergrad Only</i>	66	166.87	7.03	151	183
Weight	108	65.45	14.34	40	112
<i>Diabetes Only</i>	42	66.02	13.63	40	112
<i>Undergrad Only</i>	66	65.06	14.89	45	110
BMI	108	24.14	5.13	16	43
<i>Diabetes Only</i>	42	24.63	4.39	16	39
<i>Undergrad Only</i>	66	23.80	5.60	17	43

3.1.2 Demographic information specific to the diabetes group.

In the diabetes group, the mean age of diabetes onset was 10.07 years ($SD = 4.19$) and ranged between 1 to 14 years. Most of the participants reported having initiated self management of their insulin medication by the age of 13 years ($M = 12.9$, $SD = 3.13$) and diet by the age of 14 years ($M = 14.41$, $SD = 3.38$). The metabolic control level (HbA1C percentage) ranged from 5 % to 10.10% with a mean of 7.91 ($SD = 1.04$). The HbA1c levels are similar to the mean (8.1, $SD = 1.7$) reported in a previous study of females aged 12 to 27 years (mean age 21.5 years) without eating disorder symptoms (Pollock-Barziv & Davis, 2005). A majority of the diabetes group was using insulin injections (71.4%) compared to insulin pumps (28.6%). In general, young women attended diabetes clinic

appointments once in two months (35.7%), once in six months (33.3%), or once in three months (21.4%). A minority of the diabetes participants reported being hospitalized (16.7%) in the past three years for reasons including diabetic ketoacidosis, hypoglycemia, and hyperglycemia. Weight gain, diabetic retinopathy, and microalbuminuria were identified as complications as a result of diabetes in the last three years by 11.6% of the diabetes participants.

Participants with diabetes were asked about their adherence to diabetes self-care behaviors in the areas of insulin and diet management as a part of the diabetes self care measure used (Weinger, et al., 2005). At the time of recruitment, 61.9% ($n = 26$) of the diabetes participants reported they did not always eat recommended food portions and 50% ($n = 21$) of the total diabetes sample reported they were not always eating meals or snacks at recommended times. Approximately 14% ($n = 10$) of the diabetes group reported not always carrying fast acting sugar food items to deal with low blood glucose experiences. Insulin was not administered at the right times by 16.6% ($n = 7$) of the participants. Two of the participants (4.8%) reported not taking correct insulin doses while one participant (2.4%) reported not always treating her low blood glucose levels.

3.2 Preliminary Analyses

3.2.1 Data screening.

Prior to conducting statistical analyses the study variables were examined through SPSS (Version 17) for accuracy of data entry and missing values. Random missing values on less than 5% of the cases existed for maternal influence, perfectionism, depressive symptoms, peer attachment, body dissatisfaction, and disordered eating. SPSS missing value analyses was used to predict these missing values by the regression method

(Tabachnick & Fidell, 2001) in order to retain all the cases for analyses. The values of skewness for all but one variable fitted into an appropriate range (i.e. less than 1) suggesting that scores from the sample were probably normally distributed. The depressive symptoms variable revealed skewness of greater than 2 (skewness = 2.15) indicating that most of the participants were not likely to be clinically depressed. Tabachnick and Fidell (2001) have identified that skewness will not make a “substantive difference” to the analyses in samples of 100 or more cases, and hence, data transformation was not necessary. Transformed depression scores could have impacted the meaning of data and made it difficult to interpret. Univariate analyses of the variables were conducted to inspect the distributions of scores and check for outliers.

The univariate outliers found on the depression variable ($n = 7$) in the total sample were expected and these were considered as higher scores that are a part of the normal population. There were no multivariate outliers and none of the variables exceeded critical values recommended for Mahalanobis distance (Pallant, 2005; Tabachnick & Fidell, 2001). Scatter plots demonstrated that the assumptions of linearity and homoscedasticity were not violated. Although the body dissatisfaction variable and disordered eating variable were significantly correlated, these correlations were not high enough to violate the multicollinearity assumption i.e. they were less than .90 (Tabachnick & Fidell, 2001).

ANOVA and t -test were conducted to determine if there was any statistically significant difference on the basis of all the demographic variables between participants with and without diabetes. These comparisons revealed no statistically significant difference in mean scores apart from the expected difference between the diabetes and

undergraduate participants in regard to current education, with 50% of the diabetes participants not currently studying.

Estimates of internal consistency were examined for all the measures used in the current study. The alpha coefficients for each measure are reported in the Method section.

3.2.2 Descriptive statistics.

The descriptives for study variables used for both models are presented in Table 2. The mean for the dependent variable disordered eating ($M = 2.42$) was identical in both groups. This mean was significantly higher than reported means for an Australian EDEQ norms study for a sample of young women aged 18 - 22 years ($M = 1.59$, $SD = 1.32$; $t = 6.06$, $p < .05$) (Mond, et al., 2006) but comparable to a sample of adolescent females with type 1 diabetes aged 12 to 18 years ($M = 2.03$, $SD = 1.51$; $t = 1.38$, $p > .05$; $t = 1.38$, $p > .05$) (Schwartz, et al., 2002). The mean for body dissatisfaction ($M = 10.30$) was comparable to the mean reported by Franko and Omori (1999) for college women (mean age = 18.5 years, $SD = 2.27$) grouped as non-dieters in their study ($M = 9.1$, $SD = 7.4$; $t = 1.07$, $p > .05$). The mean for perfectionism ($M = 5.32$) was similar to mean scores for non-clinical samples in an early study by Garner et al. (1984) ($M = 5.6$, $SD = 0.42$; $t = -.68$, $p > .05$) and in the more recent study by Ackard et al. (2002) ($M = 5.80$, $SD = 4.04$; $t = -.81$, $p > .05$). In the current study the mean for depressive symptoms ($M = 6.63$) using the DASS was comparable to norms reported by Crawford and Henry (2003) for a non-clinical sample of females aged 15 to 91 years ($M = 5.55$, $SD = 7.48$; $t = 1.41$, $p > .05$). The mean for peer attachment ($M = 100.18$, $SD = 13.87$) was comparable to the mean reported by Beitel and Cecero (2003) for a sample of women under 21 years of age ($M = 102.50$, $SD = 14.30$; $t = -.127$, $p > .05$). As observed in Table 2, the variable means for

the two samples of young women with diabetes and undergraduate students were almost identical and results from the independent sample t-tests comparing the two study groups revealed no significant differences in the mean scores. The mean for diabetes management ($M = 63.21$, $SD = 12.79$) for the type 1 diabetes group was similar to the mean from the original study by Weinger et al. (2005) ($M = 65$, $SD = 15$; $t = -.74$, $p > .05$). The mean HbA1c for diabetes participants in the current study ($M = 7.91$) was comparable to the mean HbA1c ($M = 8.5$, $SD = 2.21$; $t = -1.60$, $p > .05$) reported in a recent Australian study of adult women aged 18 to 40 years (Tahbaz, Kreis, & Calvert, 2006).

Table 2.

Descriptive statistics for all study variables.

Variable	N	Mean	Standard Deviation	Possible Range	Min Score	Max Score	<i>t</i> scores
Maternal Influence	108	18.35	6.04	7 – 42	8	35	-.11 (p>.05)
<i>Diabetes Only</i>	42	18.43	5.18	7 – 42	9	28	
<i>Undergrad Only</i>	66	18.30	6.56	7 – 42	8	35	
Perfectionism	108	5.32	4.87	0 – 18	0	18	-1.15 (p>.05)
<i>Diabetes Only</i>	42	6.00	5.05	0 – 18	0	18	
<i>Undergrad Only</i>	66	4.89	4.75	0 – 18	0	18	
Depressive Symptoms	108	6.63	8.01	0 – 42	0	41	.50 (p>.05)
<i>Diabetes Only</i>	42	6.14	7.88	0 – 42	0	35	
<i>Undergrad Only</i>	66	6.94	8.23	0 – 42	0	41	
Peer Attachment	108	100.18	13.87	25 – 125	61	119	-1.31 (p>.05)
<i>Diabetes Only</i>	42	102.36	13.53	25 – 125	67	119	
<i>Undergrad Only</i>	66	98.79	14.01	25 – 125	61	118	
Body Dissatisfaction	108	10.30	7.48	0 – 27	0	27	-.30 (p>.05)
<i>Diabetes Only</i>	42	10.57	6.96	0 – 27	0	26	
<i>Undergrad Only</i>	66	10.12	7.85	0 – 27	0	27	
Disordered Eating	108	2.42	1.76	0 – 6	0	6	-.15 (p>.05)
<i>Diabetes Only</i>	42	2.42	1.53	0 – 6	0	5	
<i>Undergrad Only</i>	66	2.42	1.91	0 – 6	0	6	
Diabetes Management *	42	63.21	12.79	15 – 100	38	92	
HbA1c ^a *	42	7.91	1.04	–	5.00	10.10	
Diabetes Onset Age*	42	10.07	4.19	1 – 14	1	14	

* Variable pertaining to diabetes sample only. ^a HbA1c raw scores reported.

3.3 Model 1 Analyses

The first model (Figure 1) was developed to examine variables contributing to disordered eating: maternal influence, perfectionism, depressive symptoms, peer attachment, body dissatisfaction, and presence of type 1 diabetes. The model was tested on the complete study sample ($n = 108$).

3.3.1 Correlational analyses.

The intercorrelations among Model 1 predictors maternal influence, perfectionism, depressive symptoms, peer attachment, body dissatisfaction, presence of type 1 diabetes and the dependent variable disordered eating are reported in Table 3.

Table 3.

Pearson r Correlation Coefficients for Model 1 ($n = 108$).

Variable	1	2	3	4	5	6	7
1. Disordered Eating	-						
2. Maternal Influence	.41**	-					
3. Perfectionism	.26**	.27**	-				
4. Depressive Symptoms	.34**	.13	.15	-			
5. Peer Attachment	-.27**	-.17	-.17	-.30**	-		
6. Body Dissatisfaction	.72**	.44**	.25**	.22*	-.17	-	
7. Presence of T1D ^a	.00	.01	.11	-.05	.13	.03	-

* $p < .05$. ** $p < .01$. (2-tailed). ^a T1D = type 1 diabetes.

As hypothesized from previous literature disordered eating was significantly positively associated with maternal influence, perfectionism, depressive symptoms, and significantly negatively associated with peer attachment. There was a strong positive association between body dissatisfaction and disordered eating. Body dissatisfaction was significantly positively associated with other predictor variables with the exception of

peer attachment and presence of diabetes. Maternal influence was significantly positively associated with perfectionism and depressive symptoms were significantly negatively associated with peer attachment. However, there was no significant association between depressive symptoms and perfectionism. Contrary to hypothesized relationships, having type 1 diabetes (i.e. Presence of T1D) was neither significantly associated with the dependent variable disordered eating nor any of the other predictor variables.

3.3.2 Regression analyses.

Hierarchical multiple regression was used to test Model 1 with the predetermined order of entry as follows: Step 1, maternal influence; Step 2, perfectionism; Step 3, depressive symptoms; Step 4, peer attachment; Step 5, body dissatisfaction and; Step 6, presence of type 1 diabetes. Disordered eating was treated as the dependent variable in this regression analysis.

As presented in Table 4, the entry of maternal influence in Step 1 accounted for 17% of the variance in disordered eating ($R^2 = .17$, $df [1, 106]$, $b = .08$) and reliably predicted a significant portion of the variance in disordered eating. The inclusion of perfectionism at Step 2 contributed another 2% to the variance in the outcome variable and did not reliably improve prediction of the outcome variable over and above the variable entered in Step 1. Together steps 1 and 2 in this model, accounted for 19% of the outcome score variance ($R^2 = .02$, $df [1, 105]$, $b = .05$). In the third step, depressive symptoms explained an additional 8% of the variance in the disordered eating scores and reliably predicted a significant portion of the variance in disordered eating ($R^2 = .08$, $df [1, 104]$, $b = .16$). With the addition of peer attachment in the fourth step, another 1% of the outcome variance was accounted for and did not reliably improve prediction of the

outcome variable disordered eating ($R^2 = .01$, $df [1,103]$, $b = -.09$). In the fifth step, body dissatisfaction explained an additional 29% of the variance in the disordered eating scores after controlling for the variance accounted for by the previous steps and reliably predicted a significant portion of the variance in disordered eating ($R^2 = .29$, $df [1, 102]$, $b = .62$). In the final step, the presence of type 1 diabetes did not account for any additional variance in the outcome variable and did not reliably improve prediction of the outcome variable disordered eating ($R^2 = .00$, $df [1, 101]$, $b = -.00$).

Table 4.

Hierarchical multiple regression results predicting disordered eating symptoms.

Step	Variable	R^2	R^2 change	F	B	SE B	β
1	Maternal Influence	.17	.17***	21.04	.03	.02	.08
2	Perfectionism	.19	.02	3.26	.02	.03	.05
3	Depressive Symptoms	.27	.08*	10.60	.04	.02	.16*
4	Peer Attachment	.28	.01	1.87	-.01	.01	-.09
5	Body Dissatisfaction	.57	.29***	70.02	.15	.02	.62***
6	Presence of Type 1 Diabetes	.57	.00	.01	-.02	.24	-.01

*** $p < .001$. * $p < .05$.

To summarize, this model accounted for a total of 57% of the variance in disordered eating scores. The largest unique contribution to disordered eating scores was made by body dissatisfaction which uniquely contributed 29% of the variance ($p < .001$), followed by depressive symptoms which uniquely contributed 8% of the variance ($p < .05$) in the disordered eating scores. Based on these significant direct pathways, a revised model is reported in Figure 3.

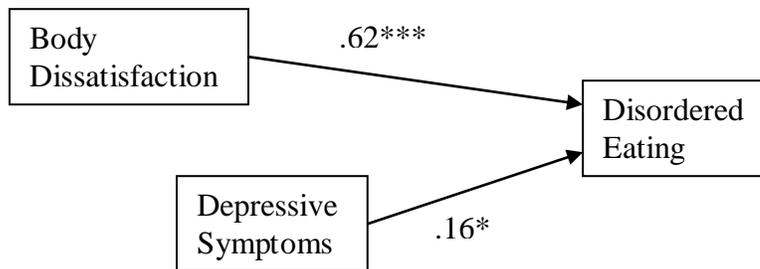


Figure 3. Revised Model 1 based on Hierarchical Regression Analyses indicating the standardized beta weight for the significant pathways. *** $p < .001$. * $p < .05$.

3.3.3 Mediation analyses.

The proposed model was further examined for potential indirect pathways. Using the method proposed by Baron and Kenny (1986) body dissatisfaction was tested as a potential mediator of the relationship between the outcome variable, disordered eating, and each of the hypothesized predictor variables maternal influence, perfectionism, depressive symptoms, and peer attachment.

According to Baron and Kenny (1986), “a given variable may be said to function as a mediator to the extent that it accounts for the relation between the predictor and criterion”

(p. 1176). The authors described mediation as a “three-variable system” (Figure 4) and described the three conditions that needed to be satisfied if mediation was present:

1. The independent variable is significantly associated with the presumed mediator (i.e. Path a)
2. The presumed mediator is significantly associated with the outcome (dependent) variable (i.e. Path b)
3. When Path a and b are controlled, a previously significant association between the independent and outcome variables becomes non-significant.

A partial mediation occurs when the relation between the independent variable and outcome variable remains significant but the size of the association is reduced (Baron & Kenny, 1986; Frazier, Barron, & Tix, 2004).

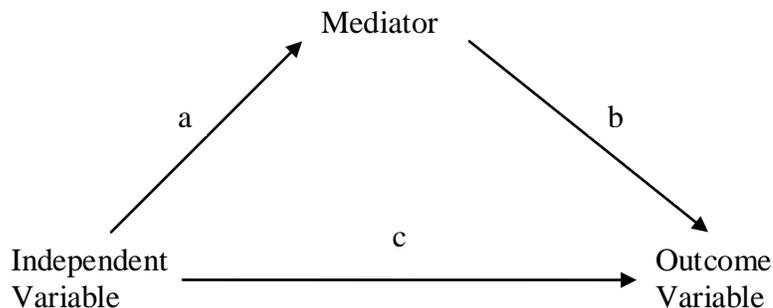


Figure 4. Path diagram depicting mediation (Baron & Kenny, 1986 p. 1176).

Examination of the correlation matrix (see Table 3) revealed significant relationships between the predictor variables (maternal influence, perfectionism, and depressive symptoms) and body dissatisfaction and disordered eating. As shown in Table 3 peer attachment was not significantly associated with body dissatisfaction and so the first condition outlined by Baron and Kenny (1986) was not met and no further testing of

the proposed mediation pathway between peer attachment and disordered eating was necessary. A series of regression models were tested to examine the remaining hypothesized mediation pathways for Model 1 with body dissatisfaction as a mediator.

The mediating role of body dissatisfaction in the association of maternal influence with disordered eating was tested using the steps outlined by Baron and Kenny (1986). Firstly, a regression analysis was conducted to assess the association between maternal influence and body dissatisfaction ($R^2 = .20$, $df [1, 106]$, $b = .44$). As this association was significant condition 1 for mediation was met. A separate regression analysis conducted to assess the association between body dissatisfaction and disordered eating was significant after controlling for the contribution of maternal influence ($R^2 = .53$, $df [1, 105]$, $b = .67$), thus satisfying condition 2. A third regression analysis was conducted to assess the association between maternal influence and disordered eating while controlling for the contribution of body dissatisfaction ($R^2 = .53$, $df [1, 105]$, $b = .11$). Results from this regression analysis revealed a non-significant association between maternal influence and disordered eating, thus satisfying condition 3. On the basis of these results it was concluded that body dissatisfaction fully mediates the relationship between maternal influence and disordered eating (Figure 5).

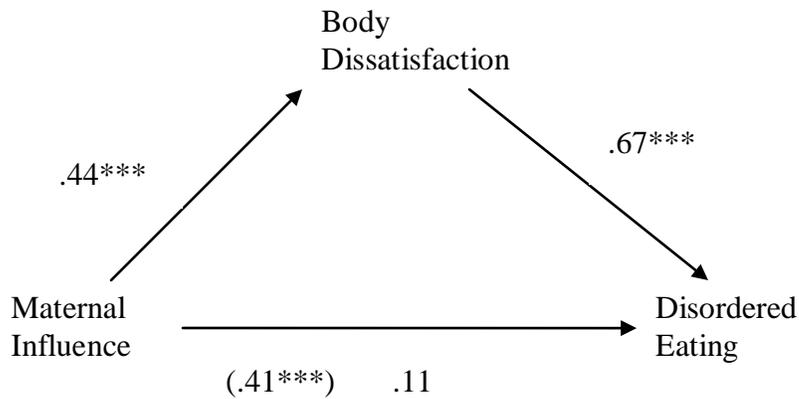


Figure 5. *Body Dissatisfaction as a Mediator of the Relationship between Maternal Influence and Disordered Eating.* The number in parentheses is the standardized beta weight for the direct relationship between the independent and outcome variables. *** $p < .001$.

Similarly, the mediating role of body dissatisfaction in the association of perfectionism with disordered eating was assessed using a series of regression analyses. Condition 1 for inferring mediation was satisfied as perfectionism was significantly associated with body dissatisfaction ($R^2 = .06$, $df [1, 106]$, $b = .25$). In the second regression analysis, body dissatisfaction was significantly associated with disordered eating after controlling for the contribution of perfectionism ($R^2 = .52$, $df [1, 105]$, $b = .70$), thus meeting condition 2. As perfectionism was no longer significantly associated with disordered eating when the contribution of body dissatisfaction was controlled for ($R^2 = .52$, $df [1, 105]$, $b = .09$) condition 3 was also satisfied. As all the conditions outlined by Baron & Kenny (1986) were confirmed, it was concluded that body dissatisfaction fully mediates the relationship between perfectionism and disordered eating (Figure 6).

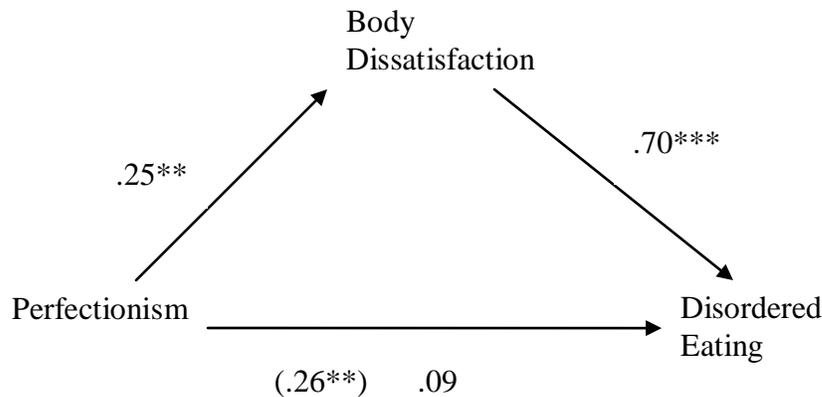


Figure 6. *Body Dissatisfaction as a Mediator of the Relationship between Perfectionism and Disordered Eating.* The number in parentheses is the standardized beta weight for the direct relationship between the independent and outcome variables. *** $p < .001$. ** $p < .01$.

The mediating role of body dissatisfaction in the association of depressive symptoms with disordered eating was also assessed using regression analyses. Condition 1 was met as depressive symptoms was significantly associated with body dissatisfaction ($R^2 = .05$, $df [1, 106]$, $b = .22$). In the second regression analysis, body dissatisfaction was significantly associated with disordered eating after controlling for the contribution of depressive symptoms ($R^2 = .55$, $df [1, 105]$, $b = .68$), thus satisfying condition 2. In the third regression analysis depressive symptoms continued to demonstrate a significant association with disordered eating even after controlling for the contribution of body dissatisfaction ($R^2 = .55$, $df [1, 105]$, $b = .19$). However, while the association between depressive symptoms and disordered eating remained significant the effect was reduced. Thus, based on the condition outlined for partial mediation (Baron & Kenny, 1986; Frazier, et al., 2004), it was concluded that body dissatisfaction partially mediates the relationship between depressive symptoms and disordered eating (Figure 7).

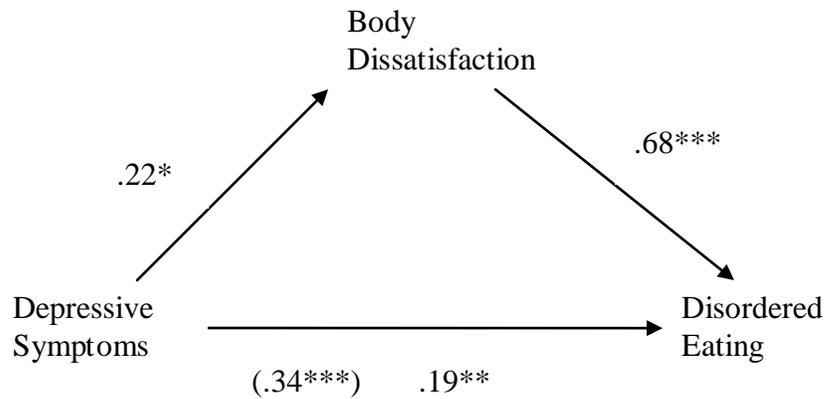


Figure 7. *Body Dissatisfaction as a Mediator of the Relationship between Depressive Symptoms and Disordered Eating. The number in parentheses is the standardized beta weight for the direct relationship between the independent and outcome variables. *** $p < .001$. ** $p < .01$. * $p < .05$.*

Based on the above regression and mediational analyses, a parsimonious final model is presented as a revision of the initial hypothesized model (Figure 1). This model (Figure 8) consists of significant direct pathways from body dissatisfaction and depressive symptoms to disordered eating. There are two indirect pathways from maternal influence and perfectionism to disordered eating that are fully mediated by body dissatisfaction. There is also an indirect pathway from depressive symptoms to disordered eating, partially mediated by body dissatisfaction.

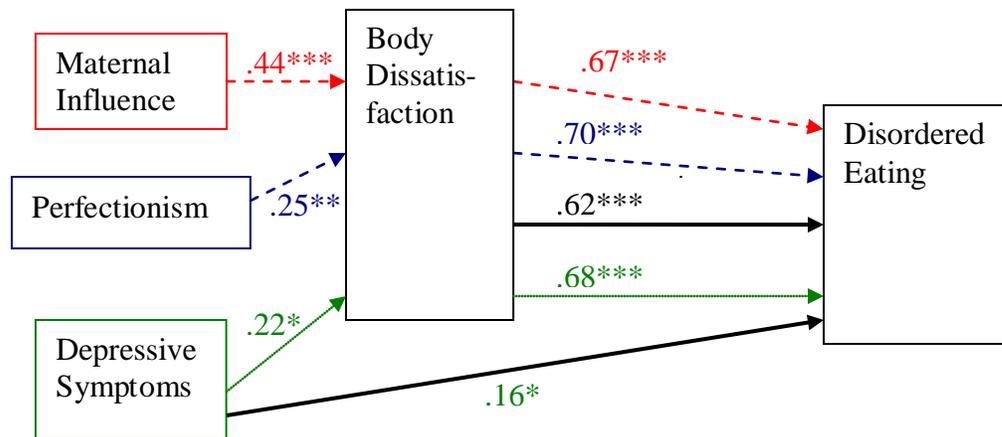


Figure 8. Final Model showing the contribution of risk factors to disordered eating via direct and indirect pathways.

*** $p < .001$. ** $p < .01$. * $p < .05$.

→ Direct Pathways - - - - - Indirect Pathways (fully mediated)
 → Indirect Pathways (partially mediated)

3.4 Model 2 Analyses

The second model (Figure 2) was developed to examine the contribution of disordered eating to diabetes management and metabolic control (HbA1c) while accounting for the contributions of diabetes onset age, body dissatisfaction, and depressive symptoms. The model was tested on the sub-sample of participants with diabetes ($n = 42$).

3.4.1 Correlational analyses.

The intercorrelations among Model 2 variables diabetes onset age, body dissatisfaction, depressive symptoms, disordered eating, diabetes management, and metabolic control levels (HbA1c) are reported in Table 5. Contrary to hypotheses diabetes onset age was neither correlated with body dissatisfaction nor depressive symptoms. There were significant positive associations between disordered eating and both depressive symptoms and body dissatisfaction. Contrary to expectations, disordered

eating was not related to either diabetes management or metabolic control levels.

However, diabetes management was negatively associated with depressive symptoms.

There was a significant negative association between diabetes management and metabolic control.

Table 5.

Pearson r Correlation Coefficients for Model 2 (n = 42).

Variable	1	2	3	4	5	6
1. Diabetes Onset Age	-					
2. Body Dissatisfaction	-.30	-				
3. Depressive Symptoms	-.02	.22*	-			
4. Disordered Eating	-.09	.72**	.34**	-		
5. Diabetes Management	.01	-.28	-.42**	-.25	-	
6. HbA1c Levels ^a	-.09	.15	.28	.18	-.35*	-

* $p < .05$. ** $p < .01$. (2-tailed). ^a HbA1C divided into the two categories.

3.4.2 Regression analyses.

Hierarchical multiple regression was used to test Model 2 with the predetermined order of entry as follows: Step 1, diabetes onset age; Step 2, body dissatisfaction; Step 3, depressive symptoms; Step 4, disordered eating. To maximize the potential of the small sample size two regression analyses were conducted, one with metabolic control as the dependent variable and another with diabetes management as the dependent variable.

There was a better fit for the theorized model using diabetes management as the dependent variable and this analysis is presented below.

As presented in Table 6, entry of diabetes onset age in the first step accounted for 1% of the variance in diabetes management and did not reliably improve prediction of the

outcome variable diabetes management ($R^2 = .01$, $df [1, 40]$, $b = -.07$). In the second step body dissatisfaction was found to explain an additional 7% of the variance in diabetes management scores but did not reliably improve prediction of the outcome variable diabetes management ($R^2 = .07$, $df [1, 39]$, $b = -.29$). With the inclusion of depressive symptoms another 14% of the variance in the outcome variable was accounted for so that the first three steps explained 22% of the variance in diabetes management ($R^2 = .14$, $df [1, 38]$, $b = -.40$). The third step reliably predicted a significant portion of the variance in diabetes management. In the final step, disordered eating did not make any additional contribution to the variance in the outcome variable and did not reliably improve prediction of the outcome variable diabetes management ($R^2 = .00$, $df [1, 37]$, $b = .08$).

Table 6.

Hierarchical multiple regression results predicting diabetes management.

Step	Variable	R^2	R^2 change	F	B	SE B	β
1	Diabetes Onset Age	.01	.01	.29	-.23	.47	-.07
2	Body Dissatisfaction	.08	.07	3.57	-.53	.37	-.29
3	Depressive Symptoms	.22	.14**	6.71	-.65	.26	-.40*
4	Disordered Eating	.22	.00	.16	.70	1.72	.08

** $p < .01$. * $p < .05$.

To summarize, this model accounted for a total of 22% of the variance in diabetes management scores. The largest unique contribution to diabetes management scores was made by depressive symptoms which contributed 14% of the variance ($p < .05$). In contrast to hypotheses, the remaining model variables did not make any unique significant contribution towards diabetes management. Based on the results from the above regression a revised model is presented below in Figure 9.

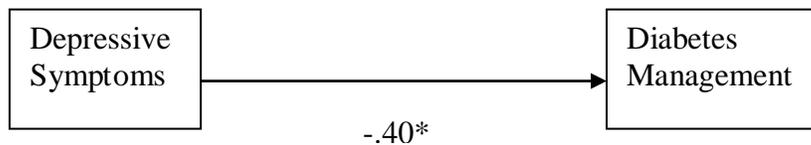


Figure 9. Final pathways for contribution of risk factors to diabetes management. * $p < .05$.

A second regression analysis was conducted with metabolic control as the outcome variable. The entry of diabetes onset age in the first step did not account for any variance in metabolic control and did not reliably improve prediction of the outcome variable ($R^2 = .00$, $df [1, 40]$, $b = .00$). In the second step, body dissatisfaction accounted for 1% of the variance and did not reliably improve prediction of the outcome variable in metabolic control ($R^2 = .01$, $df [1, 39]$, $b = .20$). In the third step, depressive symptoms accounted for 4% of the variance and did not reliably improve prediction of the outcome variable metabolic control ($R^2 = .04$, $df [1, 38]$, $b = .25$). In the final step, disordered eating accounted for 2% of the variance and did not reliably improve prediction of the outcome variable metabolic control ($R^2 = .02$, $df [1, 37]$, $b = -.19$). Overall this alternative

model accounted for a total of 7% of the variance in metabolic control levels with none of the four model variables making a significant contribution towards metabolic control.

3.4.3 Mediation analyses.

It was hypothesized that there could be indirect pathways in Model 2 with body dissatisfaction mediating the pathway from diabetes onset age to disordered eating and depressive symptoms mediating the pathway from diabetes onset age to body dissatisfaction. As the correlation matrix (Table 5) reveals that there was no significant relationship between diabetes onset age and the outcome variable disordered eating or body dissatisfaction, there could be no mediated pathways.

3.5 Post-Hoc Analyses

3.5.1 Links between diabetes self care aspects and risk factors.

There was no association between the diabetes management variable and several of the hypothesized risk factors but as diabetes management covered a wide spectrum of required care behavior a correlation analyses was conducted using only the self care aspects linked to eating and insulin use. Results from this analysis showed that there were significant relationships between individual self care aspects and the variables of body dissatisfaction and disordered eating (Table 7). Additionally depressive symptoms was found to be significantly linked with some diabetes self care behaviors (Table 7).

Table 7.

Pearson r Correlation Coefficients for eating and insulin management self care items and study variables.

Diabetes Self Care Item (SCIR)	Depressive Symptoms	Body Dissatisfaction	Disordered Eating
“Carry quick acting sugar for lows”	ns	-.43**	-.41**
“Treat low blood glucose”	-.66**	ns	ns
“Eat meals/snacks on time”	-.39*	ns	ns
“Take insulin at right time”	-.31*	ns	ns

** $p < .01$. * $p < .05$. ns = not significant.

3.5.2 Associations with Body Mass Index (BMI).

Previous studies have found BMI to be significantly associated with body dissatisfaction (Meltzer, et al., 2001) and disordered eating (Bryden, et al., 1999) among women with type 1 diabetes. According to the WHO report for adult women in the Asia Pacific region (including Australia), BMI has been classified as underweight BMI < 18.5, normal weight BMI = 18.5 – 24.9, overweight BMI = 25 – 29.9, and obese BMI > 30 (WHO/IASO/IOTF., 2000). In the current study BMI ranged from 16 to 39 for the diabetes group and 17 to 43 for the undergraduate group, indicating that both groups included underweight and obese participants. Preliminary analyses indicated that BMI scores were more positively skewed for the undergraduate group (skewness = 1.48) as compared to the diabetes group (skewness = .86). Bivariate correlations between

disordered eating, body dissatisfaction, maternal influence and BMI for the total sample, the diabetes group and the undergraduate group are shown in Table 8 below. BMI scores had significant associations with body dissatisfaction and disordered eating in the diabetes group, the undergraduate group and the total sample. BMI was also significantly correlated with maternal influence but only for the undergraduate group and the total sample.

Table 8.

Pearson r Correlation Coefficients for BMI in total group (n = 108), diabetes group (n = 42), and undergraduate group (n = 66).

Variable	Total group BMI	Diabetes group BMI	Undergraduate Group BMI
1. Disordered Eating	.43**	.45**	.43**
2. Body Dissatisfaction	.58**	.64**	.55**
3. Maternal Influence	.28**	.01ns	.39**

** $p < .01$. (2-tailed). ns = not significant.

A series of regression analysis conducted according to the method described by Baron and Kenny (1986) revealed that body dissatisfaction fully mediated the influence of BMI on disordered eating for both the diabetes (Figure 10) and undergraduate groups (Figure 11).

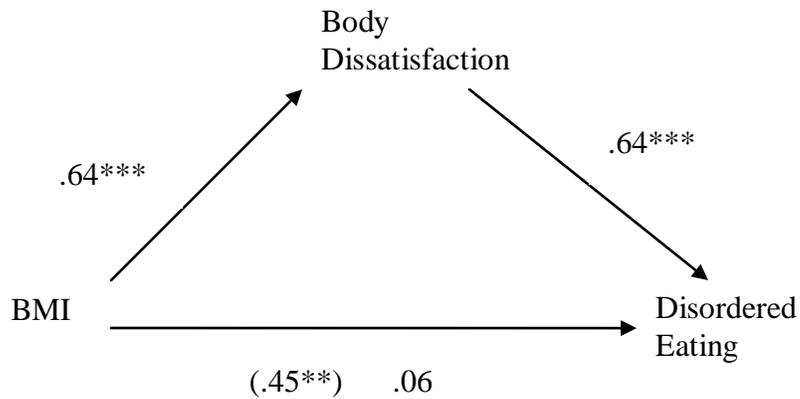


Figure 10. Body Dissatisfaction as a Mediator of the Relationship between BMI and Disordered Eating for the diabetes group. The number in parentheses is the standardized beta weight for the direct relationship between BMI and disordered eating.

*** $p < .001$. ** $p < .01$.

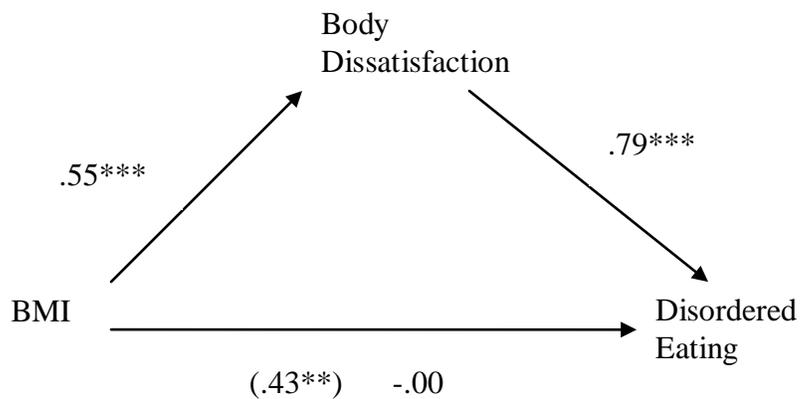


Figure 11. Body Dissatisfaction as a Mediator of the Relationship between BMI and Disordered Eating for the undergraduate group. The number in parentheses is the standardized beta weight for the direct relationship between the BMI and disordered eating.

*** $p < .001$. ** $p < .01$. * $p < .05$.

Hierarchical multiple regression analysis was conducted to assess the possible influence of BMI on disordered eating. The aim of this post-hoc analysis was to examine if BMI accounted for additional variance over the two direct pathways of depressive symptoms and body dissatisfaction confirmed in the previous analyses (Figure 8). The order of entry in the regression was as follows: Step 1, depressive symptoms; Step 2, body dissatisfaction; Step 3, BMI. Disordered eating was treated as the dependent variable in this equation. The sample was divided into diabetes and undergraduate groups due to the stronger associations with BMI in the diabetes group.

Table 9.

Hierarchical multiple regression results examining additional influence of BMI on disordered eating symptoms in diabetes sample.

Step	Variable	R^2	R^2 change	F	B	SE B	β
1	Depressive Symptoms	.14	.14*	6.45	.05	.02	.28*
2	Body Dissatisfaction	.49	.35***	25.79	.12	.03	.55**
3	BMI	.49	.00	.28	.03	.05	.08

*** $p < .001$. * $p < .05$.

Table 10.

Hierarchical multiple regression results examining additional influence of BMI on disordered eating symptoms in undergraduate sample.

Step	Variable	R^2	R^2 change	F	B	SE B	β
1	Depressive Symptoms	.11	.11*	6.70	.04	.02	.16
2	Body Dissatisfaction	.59	.49***	66.32	.17	.03	.68***
3	BMI	.59	.00	.31	.02	.04	.06

*** $p < .001$. * $p < .05$.

As presented in Table 9 and Table 10, the entry of BMI in Step 3 did not reliably improve prediction of the outcome variable disordered eating after controlling for the influence of depressive symptoms and body dissatisfaction. The results were similar for both the diabetes and undergraduate groups.

4 Discussion

4.1 Introduction

The current study examined the influence of risk factors on disordered eating and diabetes management through two models for a sample of women aged 18 to 25 years with and without type 1 diabetes in Australia. In regard to disordered eating the risk factors were body dissatisfaction, depressive symptoms, perceived maternal influence, attachment to peers, and perfectionism. The primary aim was to investigate whether having type 1 diabetes made any additional contribution to disordered eating after taking into account the contribution of the above mentioned risk factors. The results indicated that body dissatisfaction and depressive symptoms played a significant role in the disordered eating patterns of women with and without diabetes but the presence of type 1 diabetes did not add further to the influence of other risk factors. The second aim was to investigate the influence of disordered eating and other risk factors including body dissatisfaction, depressive symptoms, and diabetes onset age on diabetes management and metabolic control levels. The results suggest that for the current diabetes sample disordered eating did not contribute to overall diabetes management, but was linked to certain aspects of how young women manage their illness. In contrast depressive symptoms were a strong influence on how young women managed their diabetes.

4.2 Disordered Eating and Type 1 Diabetes

4.2.1 Disordered eating in current sample.

Eating disturbances that do not reach clinical levels have been described as the most important subtype of eating problems in female populations with type 1 diabetes (Nielsen, 2002). There has been conflicting evidence from overseas studies comparing women with and without diabetes, with some suggesting the levels of disordered eating were higher in the diabetes populations (Engstrom, et al., 1999; M. J. Jones, et al., 2000; Smith, et al., 2008) while others studies have reported no difference between the two groups (Fairburn, et al., 1991; Marcus, et al., 1992; Meltzer, et al., 2001; Peveler, et al., 1992; Robertson & Rosenvinge, 1990). In the current study, there were no differences in the reported disordered eating levels between young Australian women with type 1 diabetes and an undergraduate group without diabetes. These results indicate that having diabetes itself may not lead to young women being more vulnerable to developing disturbed eating patterns. It is noteworthy that the undergraduate sample used in this study reported higher scores of disordered eating compared to recent local Australian norms for women aged 18 – 22 years (Mond, et al., 2006). This difference in scores may be explained by the current study having recruited females who are specifically university students, and possibly high achievers, compared to the norm study (Mond, et al., 2006) which randomly selected women from the local electoral roll. Thus, it is possible that the higher levels of disordered eating in the undergraduate group may have cancelled out the expected difference between the two study groups. There is a need for additional research to include broader control samples in order to confirm the current results.

However, a substantial percentage of the diabetes sample reported not following recommended eating behaviors in terms of food portions they ate (61.9%) and time gap between their meals (50%). These reports might highlight possible undisclosed eating disturbances in the diabetes group. Women with disordered eating patterns are known to downplay or conceal their disturbed attitudes and behaviors (Rastam, et al., 2004). The current study did not directly ask about insulin omission and manipulation, but a small percentage of the diabetes participants reported not taking their insulin at recommended times (16.6%) or in recommended doses (4.8%). These findings indicate that there may be some association between aspects of type 1 diabetes management and reported levels of disordered eating, but that these pathways are not as straightforward as initially hypothesized in the current study. Alternatively, these findings could simply have been an indication of how young women in this age group accommodated diabetes regimen in their day-to-day lives. This possibility is supported by studies that have found youth with type 1 diabetes struggle to maintain their regimen in social situations, especially those involving friends or their peers (Greening, et al., 2006; Hains, et al., 2007).

4.2.2 Disordered eating and diabetes management.

A number of studies have emphasized the negative impact of disordered eating on metabolic control and aspects of diabetes management (Bryden, et al., 1999; Hillege, et al., 2008; M. J. Jones, et al., 2000; Kay, et al., 2009; Lawson, et al., 1994; Marcus, et al., 1992; Neumark-Sztainer, et al., 2002; Rydall, et al., 1997; Steel, et al., 1987; Ward, et al., 1995). Contrary to findings from previous research, in the current study there were no direct relationships between disordered eating and diabetes related self management or metabolic control among young women with type 1 diabetes. The current findings are

consistent with earlier studies with adults (Herpertz, et al., 1998) and adolescents (Colton, et al., 2004; Colton, Olmsted, Daneman, Rydall, & Rodin, 2007; Engstrom, et al., 1999) that did not find a significant association between metabolic control and eating issues. These findings might seem to challenge the much researched notion that having a chronic illness such as type 1 diabetes with high dietary focus can adversely affect eating patterns (Antisdel & Chrisler, 2000; Steel, et al., 1987). However, it is important to consider that recent studies have focused on adolescent populations or a combination of ages ranging from early adolescence to older adults and have not examined potential associations between disordered eating and diabetes management specifically in young women aged 18 to 25 years. Earlier studies of young women with type 1 diabetes in the same age group as the current study have described young women with disturbed eating patterns as proficient in their ability to manage insulin doses and avoid complications associated with poor metabolic control (Fairburn & Steel, 1980; Steel, et al., 1987). In general women aged 18 to 22 years have been found to demonstrate significantly better metabolic control than when they were adolescents aged between 11 to 16 years (Domargard, et al., 1999). More recently, in a longitudinal study that involved eight data collection points from adolescence (aged 14 to 17 years) to adulthood (aged 21 to 25 years) Luyckx and Seiffge-Krenke (2009) described three metabolic control trajectories of moderate control, optimal control, and deteriorating control that emerged during late adolescence and intensified during adulthood. The authors indicated that the group of participants on the deteriorating control trajectory had more females than males and that this group had lower scores on positive self concept and family interactions. It is notable that in the current study the mean metabolic control level for the diabetes sample was similar to that

reported for the moderate metabolic control trajectory. The above evidence suggests two possibilities: 1. female adolescents with or without eating disturbances are simply more likely to have poorer metabolic control than young women, 2. female adolescents with disturbed eating patterns are possibly not skilled enough to disguise their metabolic control levels as compared to young women with similar eating issues. Future studies focused on Australian young women might render a better understanding of whether the current findings are unique to this sample or can be generalized to this population.

Nonetheless, in the current study an interesting association was found between disordered eating and one of the important diabetes self care aspect that recommends carrying quick acting sugars to treat low glucose. It is possible that the quick acting sugar foods may be seen as empty calories or unnecessary and possibly are consciously avoided by young women with diabetes and disturbed eating attitudes. The absence of quick acting sugar foods might render young women vulnerable to medical complications in situations involving low blood glucose levels. A recent Australian study has quoted young women with type 1 diabetes and clinical eating disorders as feeling embarrassed and fearing people's judgments when they had to eat sugary food during a hypoglycaemia episode (Hillege, et al., 2008). Similar thoughts or fears might have existed for the current sample of young women with disordered eating patterns. The study by Hillege et al. (2008) also discusses the negative moods and interactions with family or partners reported by these women while experiencing hypoglycaemia episodes.

Poor diabetes management raises issues that extend beyond the social and interpersonal experiences.

4.2.3 Disordered eating and diabetes complications.

Numerous studies have emphasized the risk of diabetes related medical complications such as retinopathy, nephropathy, and neuropathy in women who report disturbed eating patterns (Bryden, et al., 1999; Daneman, 2002; Peveler, et al., 2005; Rydall, et al., 1997). Longitudinal studies have suggested links between persistent disordered eating patterns and consequent medical complications at follow up after 4 to 12 years (Bryden, et al., 1999; Helgeson, et al., 2009; Peveler, et al., 2005; Rydall, et al., 1997). Thus, even though the levels of disordered eating reported are not higher among the current diabetes sample as compared to the undergraduate group, the combination of type 1 diabetes and eating disturbances would pose higher risks for young women with this illness (e.g. Peveler, et al., 2005; Steel, et al., 1987). In the current study, a small percentage of diabetes participants had reported recent hospitalizations (16.7%) for diabetic ketoacidosis, hyperglycaemia, and hypoglycaemia as well as recent complications as a consequence of their diabetes (11.6%) that included weight gain, retinopathy, and microalbuminuria. An inspection of these participants' responses to study questionnaires revealed higher levels of disordered eating and the lower scores on diabetes management measure as compared to other diabetes participants who did not report hospitalizations or complications. The lack of a significant association between eating issues, metabolic control levels, and diabetes related complications in the current study may possibly be related to the small number of participants with these issues.

Diabetes participants who reported being hospitalized or having medical complications also had higher levels of body dissatisfaction as compared to their counterparts who did not report these issues.

4.3 The Influence of Body Dissatisfaction

4.3.1 Body dissatisfaction and disordered eating.

The association between body dissatisfaction and eating disturbances has been confirmed in studies of adolescents (Shroff & Thompson, 2006; Stice, 2001; Thompson, et al., 1995) and adults (Coomber & King, 2008; Lee & Lee, 1996; Stice & Shaw, 2002; Striegel-Moore, et al., 1989; Tylka & Subich, 2004; van den Berg, Thompson, et al., 2002; Yamamiya, et al., 2008; Zakin, 1989) from community samples. Two Australian studies of female adolescents also reported an association between body dissatisfaction and eating disturbances (Muir, Wertheim, & Paxton, 1999; van den Berg, Wertheim, et al., 2002). To a lesser degree this association has been confirmed in overseas samples of adolescents with type 1 diabetes (Engstrom, et al., 1999; Kichler, et al., 2008; Meltzer, et al., 2001; G. Rodin, et al., 2002) and in one study of females aged between 12 to 21 years (Neumark-Sztainer, et al., 2002). No previous Australian studies have investigated this association in females with a diagnosis of type 1 diabetes.

In the current sample of Australian young women body dissatisfaction emerged as the strongest risk factor for disordered eating symptoms in both the participants with diabetes and the undergraduate participants. In regard to participants with diabetes, the current findings for an Australian sample of young women with type 1 diabetes replicates the findings from overseas diabetes research conducted with younger age groups that report an association between body dissatisfaction and disordered eating.

Similar to the disordered eating scores, there was no significant difference between the body dissatisfaction scores of young women with and without diabetes. These findings extend the work of two earlier studies (Marcus, et al., 1992; Meltzer, et

al., 2001) that had compared their diabetes group with control samples from previous studies (Garner, et al., 1983; Rosen, et al., 1988 respectively) and found no difference in mean body dissatisfaction scores. Incidentally, the study by Meltzer et al. (2001) had found lower levels of disordered eating in the diabetes group compared to the comparison sample whereas the study by Marcus et al. (1992) had found no difference in the disordered eating scores from the two samples. In contrast, the study by Engstrom et al. (1999) that reported higher levels of disordered eating in their diabetes group had also found higher levels of body dissatisfaction in their diabetes group compared to a control sample recruited for the same study. These studies combined with the current study results suggest that body dissatisfaction may have a possible causal role in disordered eating symptoms such that an increase in body dissatisfaction results in more severe disordered eating symptoms. Further research using larger Australian samples and a longitudinal design would be required to test this causal link between body dissatisfaction and disordered eating.

4.3.2 Body dissatisfaction as a mechanism of influence.

In recent years studies have reported multifactorial risk models for eating disturbances that confirm body dissatisfaction as the mechanism through which other risk factors might influence disordered eating patterns (Keery, et al., 2004; Shroff & Thompson, 2006; Stice, 2001; Stice & Bearman, 2001; Stice & Shaw, 2002; Tylka & Subich, 2004; van den Berg, Thompson, et al., 2002; van den Berg, Wertheim, et al., 2002; Veron-Guidry, et al., 1997). These studies were based on the premise that known risk factors such as negative family influences, peer teasing, and perceived pressure to be thin could lead female adolescents or women to feel dissatisfied with their bodies and

consequently to develop restrictive eating, bulimia, or disturbed eating attitudes. Only one such study (van den Berg, Wertheim, et al., 2002) has been conducted in Australia using female adolescents aged 13 to 17 years and no studies have examined risk models of disordered eating with participants who have been diagnosed with diabetes. The current study has extended existing overseas research in this area by developing a model based on risk factors that are well-established as influencing disordered eating through body dissatisfaction and tested the model on young women with and without diabetes. The results from this study contribute further to the theoretical framework of eating disturbances among women with and without with type 1 diabetes.

In the current study body dissatisfaction worked as a mechanism through which perfectionism influenced disordered eating for young women with and without type 1 diabetes. This result confirms the study hypothesis that having a personality facet that is characterized by high self expectations may lead to young women feeling dissatisfied with their body and that eating disturbances may be a possible consequence of the experienced pressure to achieve these self-targets. The association of perfectionism with disordered eating has been found in earlier studies of young women with (Pollock-Barziv & Davis, 2005) and without diabetes (Davis, et al., 2000; Garner, et al., 1984; Joiner, Heatherton, & Keel, 1997; Joiner, Heatherton, Rudd, et al., 1997). However, the current study extends the work of a previous overseas study (van den Berg, Thompson, et al., 2002) and highlights the intermediary role of body dissatisfaction in the influence of perfectionism on disordered eating in young women.

Similarly, body dissatisfaction was the intermediating mechanism in the influence of perceived maternal influence on disordered eating for both the participants with and

without type 1 diabetes. Higher levels of perceived maternal influence were identified in terms of young women who indicated they had experienced direct and indirect encouragement from their mothers to lose weight and who reported that their mothers idealized being thin and struggled with their own weight issues. This pathway suggests that young women who experienced maternal encouragement to lose weight or modeled maternal eating and weight patterns were likely to develop a sense of dissatisfaction with their own bodies, which may influence their eating patterns. Previous risk model studies (Keery, et al., 2004; Stice, 2001; Tylka & Subich, 2004; van den Berg, Wertheim, et al., 2002) have only looked at negative family influences (i.e. weight teasing, pressure to be thin) despite the fact that maternal influence (direct encouragement and modeling) is a well researched risk factor particularly for adolescents. The current study replicates and extends the findings from previous Australian studies that reported a significant association between maternal eating pathology and eating disturbances in female adolescents (Benedikt, et al., 1998; Wertheim, et al., 2002; Wertheim, et al., 1999) to a group of young adult women.

However, some risk factors had both direct and/or indirect pathways to young women's disturbed eating patterns. One of these factors with both a direct and an indirect influence on disordered eating was depressive symptoms.

4.4 The Influence of Depressive Symptoms

4.4.1 Depressive symptoms and disordered eating.

Although the association between depressive symptoms and disordered eating is well established in community samples (Ackard, et al., 2002; Cooley, et al., 2007; VanBoven & Espelage, 2006), there is a need for studies to confirm this link in adult

women populations with type 1 diabetes. Diabetes studies have confirmed this link in women with clinical eating disorders (Hillege, et al., 2008; Takii, et al., 1999; Villa, et al., 1995; Ward, et al., 1995) as well as preadolescent (Colton, Olmsted, et al., 2007) and young adolescent females (Helgeson, et al., 2009; Littlefield, et al., 1992; van den Berg, Wertheim, et al., 2002) without clinical eating disorders. In the current study, depressive symptoms experienced by young women were positively associated with their eating patterns, especially for young women with type 1 diabetes. These results extend existing evidence to a sample of Australian young women with diabetes and confirm these associations in an Australian community sample of female undergraduate students.

Post-hoc analyses revealed that depressive symptoms had a stronger influence on disordered eating patterns of the current sample of young women with type 1 diabetes compared to undergraduate females. This is the first Australian study that has investigated the influence of depressive symptoms in the two groups and this finding might suggest that depressive symptoms as a risk factor might be more detrimental to young women with type 1 diabetes because of the implications of disordered eating being more serious. However, this finding needs to be treated with caution due to the different sample sizes for the two groups.

4.4.2 Depressive symptoms and body dissatisfaction.

There has been conflicting evidence identifying depressive symptoms as a cause (Ackard, et al., 2002; Durkin & Paxton, 2002; Franko & Omori, 1999; Franko, et al., 2005; Lee & Lee, 1996) or a consequence (Paxton, et al., 2006; Stice, 2001; Stice & Bearman, 2001; Thompson, et al., 1995) of body dissatisfaction in female populations. Findings from the current study confirm the initial hypothesis that depressive symptoms

would have a significant influence on young women's dissatisfaction with their body. These results also provide evidence that apart from the direct pathway between depressive symptoms and disordered eating; body dissatisfaction partially mediated the association between depressive symptoms and disordered eating thus creating an indirect pathway. These multiple pathway suggest that there is a more complex interaction between the three variables of depressive symptoms, body dissatisfaction, and disordered eating than originally hypothesized. Additional research examining depressive symptoms as both the cause and consequence of body image and eating pathology might increase understanding of the influence of depressive symptoms in young women.

In the current study, depressive symptoms in young women with diabetes were significantly associated with reported difficulty following recommended eating schedules. These findings draw attention to an aspect in the diabetes group that has not really been explored in previous research. It alludes to the possibility that when young women with type 1 diabetes experience depressed moods, it may affect their eating patterns and attitudes even though they are not dissatisfied with their bodies. A possible explanation could be that depressive symptoms in young women with diabetes are associated with dissatisfaction that is focused more specifically on their illness or its management routines rather than specific parts of their own physical body (e.g. hips or thighs). Thus, in the current sample depressive symptoms might have negatively impacted on young women's ability to maintain necessary dietary regimen. These results extend the work of recent local (Kyrios, et al., 2006; Tahbaz, et al., 2006) and overseas (Ciechanowski, Katon, Russo, & Hirsch, 2003) studies that also found an association between aspects of diabetes treatment adherence including diet and depressive symptoms.

4.4.3 Depressive symptoms and diabetes management.

In the current study, diabetes management was significantly negatively associated with only one of the hypothesized risk factors i.e. depressive symptoms. Further analyses of diabetes management aspects had revealed that depressive symptoms were significantly associated with young women not treating low blood glucose levels as recommended, and to a lesser extent young women not administering insulin at recommended times. These findings confirm the reports from overseas studies that when women experience higher levels of depressive symptoms; they may neglect necessary aspects of diabetes management such as blood glucose monitoring (McGrady, Lafel, Drotar, Repaske, & Hood, 2009) and be at risk for developing medical complications such as retinopathy or diabetes ketoacidosis (Lawrence, et al., 2006). As discussed earlier the association between depressive symptoms and diabetes management have not been examined in samples of Australian young women although similar results have been reported in recent overseas studies (Anderson, et al., 2001; Cote, et al., 2003; Lawrence, et al., 2006; Lustman & Clouse, 2002; McGrady, et al., 2009; Tercyak, et al., 2005).

In contrast to earlier studies (Daneman, 2002; Helgeson, et al., 2009; La Greca, Swales, et al., 1995; Lawrence, et al., 2006; Lustman & Clouse, 2002), the current study did not find an association between depressive symptoms and metabolic control. However, the longitudinal design used by Helgeson et al. (2009) revealed that the relation of depressive symptoms to poor metabolic control levels decreases as female adolescents become older. Domargard (1999) had reported a significant improvement in the metabolic control levels of females between the ages of 18 to 22 years as compared to when they are aged between 11 to 17 years. These studies might provide support for the

lack of association between depressive symptoms and metabolic control in the current sample. The current study did find an association between poor diabetes management and higher metabolic control levels. This pathway makes theoretical sense and demonstrates a possible indirect influence of depressive symptoms on metabolic control levels through reported poor diabetes management aspects. There was no support for this mediated pathway in the current study because of the lack of association between depressive symptoms and metabolic control. Nonetheless, the absence of an association between depressive symptoms and metabolic control might be unique to the current sample and this association needs to be tested in larger Australian diabetes samples.

While numerous studies have examined risk models assessing the impact of depressive symptoms or body dissatisfaction on disordered eating, there is limited research to show the influence of perceived maternal influence or peer attachment on disordered eating. These latter risk factors have mostly been observed in combination with other risks factors in studies that involved adolescent populations and have not been examined in Australian samples of young women.

4.5 The Role of Perceived Maternal Influence

In comparison to fathers, mothers have often been portrayed as more influential with daughters due to their role as the primary caregiver and the scope for higher levels of communication and intimacy in this dyad (Wertheim, et al., 1999). One of the formative risks singled out in the mother-daughter relationship has been mothers' capacity to impart eating and weight-related concerns to their daughter. A growing body of evidence has identified maternal influence as a risk factor for disordered eating in adolescent females (Benedikt, et al., 1998; Mukai, et al., 1994; Pike & Rodin, 1991;

Wertheim, et al., 2002; Wertheim, et al., 1999) and adult women (Hanna & Bond, 2006; Haudek, et al., 1999; Kichler & Crowther, 2001); of these only three studies (Benedikt, et al., 1998; Wertheim, et al., 2002; Wertheim, et al., 1999) had been conducted on adolescent females in Australia. The current findings confirm that the impact of perceived maternal encouragement for weight loss and preference for thin ideals remains a persistent risk for daughters' eating pathology even in adulthood. It further demonstrates that maternal influence on disordered eating is likely to be transmitted through a young woman's dissatisfaction with her own body.

Researchers have recently distinguished between the impact of family dysfunction and maternal eating and weight concerns on females with type 1 diabetes who presented with disturbed eating patterns (Daneman, 2002; G. Rodin, et al., 2002). At present, there is limited research from one group of Canadian researchers that has confirmed the impact of maternal influence on eating disturbances of daughters with type 1 diabetes (Maharaj, et al., 2003; Maharaj, et al., 2000; Maharaj, Rodin, Olmsted, & Daneman, 1998). The current study has replicated these results in an Australian group of young women with type 1 diabetes. These findings raise concerns regarding the significant role a mother might play in the harmful eating disturbances that may develop in young women with diabetes and the ensuing impact on their psychological and medical health. It is noted that in the current study both the undergraduate and diabetes groups were combined while assessing the impact of maternal influence in a risk model, and additional research is required to examine the impact of maternal influence as a part of the risk model in a larger diabetes samples.

The second risk factor that has not been examined in earlier eating pathology risk models is attachment to peers.

4.6 The Influence of Attachment to Peers

Earlier eating disturbance risk model studies have confirmed the negative contribution of peers to adolescent's eating patterns. In particular peer teasing, weight-related teasing, negative appearance feedback from peers, and peer pressure to be thin or to diet have been identified as influential risk factors (Stice & Bearman, 2001; van den Berg, Thompson, et al., 2002; van den Berg, Wertheim, et al., 2002). An overseas study that examined a risk model for adult women had reported that lower levels of perceived social support from friends contributed to an increase in disordered eating patterns (Tylka & Subich, 2004). However, the influence of peer attachment, a source of companionship and an intimate emotional bond, on eating disturbances has not been examined in earlier risk model studies or in Australian populations with or without diabetes.

In the current study the path from peer attachment to disordered eating was not significant after other sources of risk were included in the hypothesized model. This result may have been due to the stronger impact of body related aspects such as body dissatisfaction on disordered eating among young women as compared to the interpersonal aspect of peer attachment. However, peer attachment was significantly negatively associated with depressive symptoms. These findings suggest that difficulty developing or maintaining interpersonal connections with friends may result in depressive symptoms, and can consequently influence a young woman's eating pathology.

Alternatively, as reported in studies of clinically depressed women (e.g. Stice & Agras, 1999), depressive symptoms may influence young women's ability to maintain social connections and influence their eating pathology. This possibility is also supported by the earlier findings of Armsden and Greenberg (1987) that depressive symptoms in adolescents were related to less secure attachment to peers along with lower levels of trust, communication difficulties, and feelings of alienation in their peer relationships.

The associations described above may be considered more important for young women with diabetes, who according to research exhibit more difficulties with managing their diabetes regimen in social situations (Greening, et al., 2006), fear negative reactions from peers towards their illness (Hains, et al., 2007), and are more prone to depression (Grey, et al., 2002). A recent overseas study has described peer relations as a risk factor for metabolic control and a "source of problems in regards to diabetes health" (McGrady, et al., 2009). Given the risk associated with difficulty developing positive attachment to peers and the role of depressive symptoms along with the above mentioned added complexities for those with type 1 diabetes, peer attachment as a risk factor needs more research attention.

Apart from the previously described risk factors in post hoc analyses, one established risk factor i.e. BMI demonstrated associations with some of the study variables.

4.7 The Role of BMI

The influence of BMI on body and eating disturbances has been confirmed in community samples of female adolescents (Keery, et al., 2004; McCabe & Ricciardelli, 2003; Shisslak, et al., 1998; Stice & Whitenton, 2002; Wertheim, et al., 1999) and adult

women (Ackard, et al., 2002; van den Berg, Thompson, et al., 2002; Wilson, Tripp, & Boland, 2005). These studies suggest that higher BMI is a possible trigger for body dissatisfaction and consequent disordered eating patterns. The contribution of BMI to body dissatisfaction and disordered eating has been emphasized in studies of type 1 diabetes participants where higher BMI is a likely outcome of necessary insulin treatment (Bryden, et al., 2003; Colton, Olmsted, et al., 2007; Colton, Rydall, Olmsted, Rodin, & Daneman, 2007; Engstrom, et al., 1999; Grylli, et al., 2005; M. J. Jones, et al., 2000; Marcus, et al., 1992; Meltzer, et al., 2001). Similarly, in the current study BMI was more strongly associated with disordered eating and body dissatisfaction for the young women with diabetes compared to undergraduate participants even though mean BMI scores were not significantly different for the two study groups.

This study also found a strong association between perceived maternal influence and BMI but only in the undergraduate sample. These findings extend the work of an earlier Australian study (Wertheim, et al., 1999) that had reported associations of higher BMI in adolescent females who had received more encouragement to diet and weight related criticism from both their mothers and fathers. The lack of this association among young women with type 1 diabetes and higher BMI suggests that mothers may possibly be less critical of daughters who weigh more because they have a medical illness. A recent Australian study reported a two-way dependency dynamic between mothers and daughters with diabetes, suggesting that mothers might feel guilt for causing their daughter's diabetes and/or any consequent difficulties (Rasmussen, Dunning, Cox, & O'Connell, 2008). Alternatively, mothers of the young women in the current diabetes

sample may have been less concerned about their own eating or weight issues, and hence, were possibly more supportive of daughters with higher BMI.

However, there exists some contradictory research regarding the role of BMI in either body dissatisfaction or disordered eating patterns. Previous Australian studies have indicated that the girls who scored higher on body dissatisfaction measures were more likely to be in the normal BMI range instead of the higher BMI range (Benedikt, et al., 1998; Paxton, et al., 2006). Such counter-intuitive findings were also reported in overseas studies looking at diabetes participants (e.g. Neumark-Sztainer, et al., 2002). A recent overseas study reported no significant difference in the BMI scores for diabetes and control samples, although eating disturbances were more common in the diabetes group (Smith, et al., 2008). The contradictory evidence suggests that BMI may not be a set marker for body dissatisfaction or disordered eating patterns but rather that, women with average or low BMI may also engage in disturbed eating patterns. In a study of female adolescents with type 1 diabetes, Colton et al. (2004) suggested the possibility of higher BMI being a result of, rather than a risk factor for, eating disturbances. It is likely that prolonged periods of disordered eating patterns along with diabetes management issues might eventuate in young women weighing more than their peers who maintain healthy eating and diabetes regimen.

In the current study, the mean BMI scores were similar for both the diabetes and undergraduate groups and BMI did not add to the risk model after body dissatisfaction and depressive symptoms were included in the model. It seems likely that a young woman's sense of dissatisfaction with her body and depressive feelings are important regardless of her actual BMI. These results are also supported by an earlier longitudinal

study of young college women where actual weight was not related to the increased body dissatisfaction at follow up (Striegel-Moore, et al., 1989). However, the current study only provides evidence for the absence of a linear relationship between BMI and disordered eating in a regression model that includes the two influential risk factors of body dissatisfaction and depressive symptoms. Additional research is required to assess whether there exist a nonlinear association between BMI, eating pathology, and other risk factors in Australian young women.

4.8 *Limitations*

There were a number of limitations in the current study. Firstly, the current study has used a cross sectional design so no conclusions can be drawn about causality. Secondly, the relatively small size of the diabetes sample recruited may limit the reliability and generalisability of the results. Some of the hypothesized pathways in both risk models may have not reached statistical significance due to the small sample size and may need to be tested in larger diabetes samples.

Thirdly, the current sample may not be totally representative of Australian young women with and without type 1 diabetes. The use of university students as a comparison group for the sample of young women with type 1 diabetes may account in part for the failure to confirm some of the hypotheses in the current study. University students may be considered high achievers and may not be representative of the populations of young adult women as suggested by the current sample scoring higher on disordered eating compared to Australian norms (Mond, et al., 2006). In contrast, half of the diabetes sample was not studying at the time of recruitment. Future studies could aim to recruit outside universities in order to include a broader control group.

The sample of young women with diabetes may also not have been representative of the population of young women with type 1 diabetes as it had been predominantly recruited from a clinic specifically set up for young adults in a major metropolitan tertiary hospital that provides intensive specialist care. Young women that infrequently or never attend diabetes clinic appointments are more likely to have problems. There is evidence that attendance at diabetes clinic reduces markedly following the move from pediatric services to adult diabetes services and that those young people who had poorer metabolic control before the transition were more likely not to attend adult services two year post transfer (Kipps, et al., 2002). In contrast there is evidence to suggest that women who actively attend their diabetes clinic appointments may have an elevated interest in their well-being and a greater sense of control over their illness and its management (Surgenor, Horn, & Hudson, 2002). While for the current study practical limitations (including the current incomplete register and lack of access) limited the recruitment possibilities the benefit of recruitment from a state-wide diabetes register should be considered in future studies. Overseas studies (e.g. McGrady, et al., 2009) have used broader sample recruitment techniques to include different locations and larger sample pools. These aspects may further limit the generalisability of the results found in the current study.

Finally, there may have been some limitations on the basis of the measures used and the contexts in which the data was collected. As identified in earlier studies (van den Berg, Thompson, et al., 2002), possible similarities between measures of body dissatisfaction and weight and shape concern, which is an essential feature of disturbed eating thoughts and attitudes, make it difficult to conclude that the concepts are entirely distinct. Although the EDEQ has been identified as an appropriate measure for use in

diabetes populations (Crow, et al., 1998), there are limitations in that responses to some items (4,5, 6 and 12) may reflect the necessary dietary restrictions associated with diabetes management rather than disordered eating attitudes. Along with a strong emphasis in media and society regarding psychological issues such as eating disturbances or body image, there is an inclination in young women to either conceal or downplay their eating symptoms (E. A. Becker, et al., 2005; Rastam, et al., 2004). Thus, the scores from study measures based on self reports made by participants are susceptible to participant's biases or apprehension about revealing issues such as eating pathology. Some studies have used a two stage design with initial self report assessment followed by interviews for those who meet cut off criteria (e.g. M. J. Jones, et al., 2000) but these studies are based on the belief that the initial assessments would be answered accurately. There is a possibility of these limitations being amplified in the case of diabetes participants who, at the time of recruitment, were at the diabetes clinic awaiting routine medical assessments where the focus might be their diabetes management issues, dietary regimen, and emotional or psychological well-being. There has been evidence to show that these routine clinic visits may be seen by some young women with type 1 diabetes as an "exam" and they may fear rebuke from professionals for poor diabetes management (Hillege, et al., 2008).

4.9 Implications

4.9.1 Theoretical implications.

The current study makes positive contributions to the limited research on disordered eating and diabetes management risk issues for young Australian women aged 18 to 25 years, especially in regard to young women with type 1 diabetes. It goes further

than examining prevalence of risks in this age group by developing and testing the two models to try to explain how these risk factors might collectively influence a young woman's eating problems and her diabetes. The study was unique in terms of its inclusion of perceived maternal influence and peer attachment in the disordered eating risk model. Although the model specific to young women with diabetes was not supported it did highlight the impact of depressive symptoms on management issues and demonstrated to some degree the associations between risk factors in Australian young women with diabetes. However, there is a need for further studies to address some of the issues specific to young women with type 1 diabetes, using a larger sample and preferably a longitudinal design.

4.9.2 Practical implications.

In the current study, body dissatisfaction emerged as the primary risk factor for disordered eating symptoms. Health professionals may therefore need to give greater attention to young women's concerns or dissatisfaction with their bodies, especially those young women with type 1 diabetes. Although in the diabetes group higher BMI has been shown to be associated with body and eating issues (e.g. Meltzer, et al., 2001), there is evidence to suggest that dissatisfaction with one's body and eating disturbances can occur in women with normal BMI. In the case of young women with type 1 diabetes, there is a need for clinicians to regularly assess depressive symptoms, especially if women present with difficulty managing their diabetes regimen.

At present, there is growing evidence to suggest the existence of disordered eating in diabetes and community samples but there are no specific guidelines for the assessment of disordered eating or how risk factors might influence these patterns in

diabetes populations. A recent overseas study that interviewed hospital-based health-care professionals reported that the professionals demonstrated a lack of clarity regarding classification, detection, and treatment of disordered eating in individuals with type 1 diabetes suggesting a need for professionals to receive specialized training (Tierney, Deaton, & Whitehead, 2008). The current study was aimed at providing evidence to assist with understanding how certain risk factors might influence disordered eating in an Australian sample, especially young women with type 1 diabetes. Findings from this study suggest how these risk factors might function differently for young women with type 1 diabetes as compared to their peers without this illness.

4.10 Conclusion

In recent years there had been growing concerns about the impact of disordered eating in female populations and the harmful consequences of disordered eating in females with type 1 diabetes. However, the emphasis of diabetes research had been on studying eating issues and associated risk factors in adolescent populations or combined age ranges from young adolescents to older adults, while the young adulthood phase, a transitional period that involves becoming an independent adult, has been largely neglected. There is a gradual shift towards developing models based on multiple risk factors to explain eating pathology, but none of these had considered the possibility of additional risk associated with a chronic illness such as type 1 diabetes.

The current study contributes to the limited Australian research that has examined risk factors for disordered eating in young women, including those with type 1 diabetes. Body dissatisfaction and depressive symptoms emerged as influential risk factors for disordered eating patterns in this age group. Additionally, depressive symptoms

significantly influenced diabetes management aspects and demonstrated a complex relationship with eating and body issues in the diabetes group.

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Appendices

Appendix: 1
Background Questionnaire

This section asks personal information about you.

1) **Date of birth:**

2) **Today's date:**

3) **For each question, please circle one of the options.**

Highest education level reached:

Completed Primary School

Completed Secondary School

Tertiary Education – please specify _____

Year 7

Year 8

Year 9

Year 10

Year 11

Year 12

4) **Marital Status:**

a) **Single**

b) **Married**

c) **Divorced/Separated**

d) **De-Facto**

e) **Other** -please specify _____

5) **Living Arrangements:**

a) **With Parent (s)**

b) **With Housemate (s)**

c) **With Partner**

d) **Alone**

e) **Other** -please specify _____

6) **Current Employment Status, please circle and specify:**

a) **Unemployed**

b) **Part-time employment for** _____ **hours per week as**

c) **Full-time employment as**

d) **Student: Secondary** _____

Tertiary: Degree /

Course: _____

7) **In which country were you born?**

a) **Australia**

b) **Other** -please specify _____

8) Which of the following ethnic groups best describes you?

- a) Caucasian (Anglo-Saxon, European)
- b) Aboriginal/Torres Strait Islander
- b) African (non-Arabic)
- c) North African (Middle East region)
- d) East Asian (e.g. India, Pakistan, Bangladesh, Sri Lanka)
- e) Far East Asian and South East Asian
(e.g. China, Japan, Korea, Philippines, Indonesia)
- f) Polynesia
- g) Other -please specify _____

9) What is your order in the family:

- a) 1st Born b) 2nd born
- c) 3rd Born d) 4th born
- e) Other -please specify _____

10) Weight kg: _____ or pounds: _____

11) Height m/cm: _____ or feet/inches: _____

12) At what age were you diagnosed with Diabetes: _____

13) Current Treatment Regimen:

- a) Insulin Pump b) Insulin Injections

14) Frequency of diabetes clinic attendance:

- a) Once a week b) Once a fortnight
- c) Once a month d) Once every two months
- e) Once every six months f) Once a year
- g) Less than once a year

15) At what age did you begin managing your insulin medication? _____

16) At what age did you begin managing your diet? _____

17) Have you ever been hospitalised in relation to your diabetes in the last 3 years?

a) Yes **If yes, please specify the reason for your admission**_____

b) No

18) Have you ever experienced any complication as a result of your diabetes?

a) Yes **If yes, please specify** _____

b) No

Appendix: 2
Eating Disorder Examination – Questionnaire (EDE-Q)

Please read each statement and **circle a number 0, 1, 2, 3, 4, 5, or 6** which indicates **how much the statement applied to you** over the previous 28 days. There are **no right or wrong answers** so do not spend too much time on each statement. Green = restraint, blue = eating, pink = weight, orange = shape; red = extra diagnostic

The rating scale is as follows:

0 = Did not apply to me at all

2 = Applied to me to some degree, or some of the time

4 = Applied to me to a considerable degree, or a good part of the time

6 = Applied to me very much, or most of the time

	0	1	2	3	4	5	6
1. Over the past 4 weeks have you been consciously trying to restrict what you eat, whether or not you have succeeded?							
2. Over the past 4 weeks have you gone for periods of 8 or more waking hours without eating anything?							
3. Over the past 4 weeks have you wanted your stomach to be empty, to influence your shape or weight?							
4. Over the past 4 weeks have you tried to avoid eating any foods that you like, whether or not you have succeeded?							
5. Over the past 4 weeks have you tried to follow certain definite rules regarding your eating, for example, a calorie limit, preset quantities of food, or rules about what you should eat or when you should eat?							
6. Have there been occasions when you have been aware that you have broken a dietary rule that you have set for yourself?							
7. Over the past 4 weeks have you spent much time between meals thinking about food, eating, or calories?							
8. Has thinking about food, eating, or calorie interfered with your ability to concentrate e.g. on things that you are interested in, such as, reading, watching television, or following a conversation?							
9. Over the past 4 weeks have you been afraid of losing control over eating?							
10. Over the past 4 weeks have you been concerned about other people seeing you eat?							
11. Over the past 4 weeks have you eaten in secret?							

		0	1	2	3	4	5	6
12.	Over the past 4 weeks have you felt guilty after eating?							
13.	Over the past 4 weeks have you been dissatisfied with your weight?							
14.	Over the past 4 weeks have you wanted to lose weight?							
15.	How would you feel if you were asked to weigh yourself once each week for the next 4 weeks?							
16.	Over the past 4 weeks have you been dissatisfied with your shape?							
17.	Over the past 4 weeks have you spent much time thinking about your shape or weight?							
18.	Has thinking about your shape or weight interfered with your ability to concentrate e.g. on things that you are interested in, such as, reading, watching television, or following a conversation?							
19.	Over the past 4 weeks have you felt uncomfortable seeing your body, for example, in a mirror, in shop window reflections, while undressing, or while taking a bath or shower?							
20.	Over the past 4 weeks have you felt uncomfortable about others seeing your body, for example, in common changing rooms, when swimming or when wearing clothes that show your shape?							
21.	Over the past 4 weeks have you felt fat?							
22.	Over the past 4 weeks have you had a definite desire to have a flat stomach?							

Appendix: 3
Eating Disorder Inventory – Body Dissatisfaction subscale (EDI-BD)

The questions below ask about **your dissatisfaction with parts of your body**. Please answer the questions as honestly and accurately as you can. Your responses will be confidential.

	Never	Rarely	Sometimes	Often	Usually	Always
1. I think that my stomach is too big						
2. I think that my thighs are too large						
3. I think that my stomach is just the right size*						
4. I feel satisfied with the shape of my body*						
5. I like the shape of my buttocks*						
6. I think that my hips are too big						
7. I think that my thighs are just the right size*						
8. I think my buttocks are too large						
9. I think that my hips are just the right size*						

Appendix: 4
Eating Disorder Inventory – Perfectionism subscale (EDI-P)

The questions below ask about **your personal expectations for achievement**. Please answer the questions as honestly and accurately as you can. Your responses will be confidential.

	Never	Rarely	Sometimes	Often	Usually	Always
1. Only outstanding performance is good enough in my family						
2. As a child, I tried very hard to avoid disappointing my parents and teachers						
3. I hate being less than best at things						
4. My parents expected excellence of me						
5. I feel that I must do things perfectly or not do them at all						
6. I have extremely high goals						

Appendix: 5
Self-Care Inventory Revised – Type 1 Diabetes (SCIR)

The questions below ask about **your diabetes self-care activities** and **how often you have followed recommendations for self-care during the past month**. Please answer the questions as honestly and accurately as you can and **place a tick in the appropriate box**. Your responses will be confidential.

	Never do it	Almost never do it	Sometimes do it	Almost always do it	Always do this as recommended, without fail
How often do you:					
1. Exercise regularly					
2. Attend clinic appointments					
3. Eat recommended food portions					
4. Adjust insulin					
5. Keep food records					
6. Treat low blood glucose					
7. Carry quick acting sugar for lows					
8. Read food labels					
9. Wear medic alert					
10. Check blood glucose with monitor					
11. Eat meals/snacks on time					
12. Take insulin at the right time					
13. Record blood glucose results					
14. Check ketones					
15. Take correct dose of insulin					

Appendix: 6
Depression Anxiety Stress Scale – Depression Subscale (DASS-D)

Please read each statement and **circle a number 0, 1, 2, or 3** which indicates **how much the statement applied to you** over the past week. There are **no right or wrong answers** so do not spend too much time on each statement.

The rating scale is as follows:

0 = Did not apply to me at all

1 = Applied to me to some degree, or some of the time

2 = Applied to me to a considerable degree, or a good part of the time

3 = Applied to me very much, or most of the time

		Did not apply to me at all	Applied to me to some degree, or some of the time	Applied to me to a considerable degree, or a good part of the time	Applied to me very much, or most of the time
3.	I couldn't seem to experience any positive feeling at all	0	1	2	3
5.	I just couldn't seem to get going	0	1	2	3
10.	I felt that I had nothing to look forward to	0	1	2	3
13.	I felt sad and depressed	0	1	2	3
16.	I felt that I had lost interest in just about everything	0	1	2	3
17.	I felt I wasn't worth much as a person	0	1	2	3
21.	I felt that life wasn't worthwhile	0	1	2	3
24.	I couldn't seem to get any enjoyment out of the things I did	0	1	2	3
26.	I felt down-hearted and blue	0	1	2	3
31.	I was unable to become enthusiastic about anything	0	1	2	3
34.	I felt I was pretty worthless	0	1	2	3
37.	I could see nothing in the future to be hopeful about	0	1	2	3
38.	I felt that life was meaningless	0	1	2	3
42.	I found it difficult to work up the initiative to do things	0	1	2	3

Appendix: 7
Daughter's Perception of Maternal Influence (DPMI)

The questions below are about what **your mother thinks about weight and dieting**. Please answer the questions as honestly and accurately as you can. Your responses will be confidential.

	Never	Almost Never	Sometimes	Fairly Often	Very often
1. It is acceptable to my mother to be overweight*					
2. My mother is very watchful of her weight					
3. My mother is involved in a continuous struggle with weight and dieting					
4. My mother places a lot of importance on thinness					
5. My mother places a lot of importance on appearance					
6. My mother encourages me to lose weight					
7. My mother would like me to be thin					

Appendix: 8
Inventory of Parent and Peer Attachment – Peer Attachment (IPPA-Peer)

The questions below ask you about **your relationships with your closest friends**. Please **place a tick in the appropriate box**.

		Almost always or always true	Often true	Sometimes true	Seldom true	Almost never or never true
1.	I like to get friends' point of view on things I'm concerned about					
2.	My friends sense when I'm upset about something					
3.	When we discuss things, my friends consider my point of view					
4.	Talking over my problems with my friends makes me feel ashamed or foolish*					
5.	I wish I had different friends*					
6.	My friends understand me					
7.	My friends encourage me to talk about my difficulties					
8.	My friends accept me as I am					
9.	I feel the need to be in touch with my friends more often*					
10.	My friends don't understand what I'm going through these days*					
11.	I feel alone or apart when I am with my friends*					
12.	My friends listen to what I have to say					
13.	I feel my friends are good friends					
14.	My friends are fairly easy to talk to					
15.	When I am angry about something, my friends try to be understanding					
16.	My friends help me to understand myself better					

	Almost always or always true	Often true	Sometimes true	Seldom true	Almost never or never true
17. My friends are concerned about my well-being					
18. I feel angry with my friends*					
19. I can count on my friends when I need to get something off my chest					
20. I trust my friends					
21. My friends respect my feelings					
22. I get upset a lot more than my friends know about*					
23. It seems as if my friends are irritated with me for no reasons*					
24. I tell my friends about my problems and troubles					
25. If my friends know something is bothering me. They ask me about it					

Appendix: 9
Information Letter for Diabetes Clinics

Dear Participant,

We would like to invite you to participate in a research project that is being conducted at Western Hospital (Footscray). The research project is Adjustment in Young Women with and without Type 1 Diabetes and it is being conducted by Hege Andreassen and Sonal Sachdeva (as part of their Doctor of Psychology degree at Victoria University) under the supervision of Professor Sandra Lancaster and with the support of Associate Professor Shane Hamblin.

Participation in this project will involve completing a questionnaire booklet. Most questions will require you to tick or circle one of the possible responses. It will take approximately 45 minutes to answer all the questions.

This study has been approved by the Victoria University and Melbourne Health Ethics Committees (including Western Hospital).

Please refer to the enclosed participant information sheet for further details about the research. You can also contact one of the researchers for more information and/or queries about the study.

Contact Details of Researchers:

Hege Andreassen – Mobile: 0405 151 135

Email: hege.andreassen@research.vu.edu.au

Sonal Sachdeva – Mobile: 0423 776 195

Email: sonal.sachdeva@research.vu.edu.au

The research will be conducted at the Western Hospital Diabetes Clinic (Footscray). If you agree to take part, you will be asked to fill in a questionnaire booklet that takes approximately 45 mins to complete.

Please ask your diabetes educator regarding the location of the researcher on your next visit to the Diabetes Clinic.

We appreciate your support and look forward to your participation.

Thank you,

Hege Andreassen and Sonal Sachdeva
Victoria University

Appendix: 10
Research Poster for Diabetes Clinics

Appendix: 11
Research Poster for University Campuses

Appendix: 12
Participant Information and Consent Form for Undergraduate Sample

Participant Information and Consent Form
Version 2 Dated 13.06.2007
Site: Western Health / Victoria University

Full Project Title: Adjustment in Young Women with and without Type 1 Diabetes

Principal Researcher: Professor Sandra Lancaster
Associate Researcher(s): Associate Professor Shane Hamblin
Student Researcher(s): Hege K. Andreassen
Sonal Sachdeva

This Participant Information and Consent Form is **6** pages long. Please make sure you have all the pages.

1. Your Consent

You are invited to take part in this research project.

This Participant Information contains detailed information about the research project. Its purpose is to explain to you as openly and clearly as possible all the procedures involved in this project before you decide whether or not to take part in it.

Please read this Participant Information carefully. Feel free to ask questions about any information in the document. You may also wish to discuss the project with a relative or friend or your local health worker. Feel free to do this.

Once you understand what the project is about and if you agree to take part in it, you will be asked to sign the Consent Form. By signing the Consent Form, you indicate that you understand the information and that you give your consent to participate in the research project.

You will be given a copy of the Participant Information and Consent Form to keep as a record.

2. Purpose and Background

There are two purposes of this project:

- a) To examine how young women become more independent and autonomous and how this affects people with and without a chronic illness such as Type 1 diabetes.
- b) To understand more about how young women think about their bodies, how that might affect eating related behaviour and whether these issues create more difficulties for young women with Type 1 diabetes.

A total of 120 people will participate in this project.

Previous research has shown that during the time when young adults become more independent a number of factors such as their mood and their relationship with parents and their friends are important. There has been no research that has tried to

understand more about the experience of becoming more independent when you are a young

woman. Eating behaviour and how young women think about their bodies are also relevant issues in this period of life. Family influences, relationships with friends, personality and mood are important factors that influence our eating behaviour.

You are invited to participate in this research project because your experience of the issues described above will help us to get a better understanding of independence and eating related behaviour in young women.

This project will be done as a part of the above mentioned students' post-graduate research.

3. Procedures

Participation in this project will involve completing a questionnaire booklet. Questions will be about relationships with friends and family, your mood, independence, and eating behaviour and most questions will require you to tick or circle one of the possible responses. It will take approximately 45 minutes to answer all the questions.

4. Possible Benefits

Participating in this study will not benefit you directly; however, results of this study may offer benefits to young women in the future. Results of the study may contribute to greater understanding of independence and eating behaviour in young women and help professionals offer appropriate services to young women with and without diabetes.

5. Possible Risks

There are no expected risks associated with this study, however; it is possible that some people may find certain questions distressing. If you are upset by any of the questions let the researcher know and they will suggest ways that you could obtain help.

At any point you may withdraw your participation in this study.

6. Privacy, Confidentiality and Disclosure of Information

Any information obtained in connection with this project will remain confidential. It will only be disclosed with your permission, except as required by law (e.g. possible harm to self or others). Only the results from the group of participants will be written up and published. No individuals will be identified in the writing up of results. Information and data collected will be stored in locked filing cabinets in the psychology department of Victoria University. Only student researchers and the principal researcher will have access to the data.

7. Results of Project

If you would like to know the results of the study at the completion of the project we will send you a general summary of the results. To receive this summary you need to provide your contact details in the questionnaire booklet.

8. Further Information or Any Problems

If you require further information or if you have any problems concerning this project you can contact the principal researcher.

Principal researcher: Professor Sandra Lancaster Ph: (03) 9919 2397

Email: sandra.lancaster@u.edu.au

9. Other Issues

If you have any complaints about any aspect of the project, the way it is being conducted or any questions about your rights as a research participant, then you may contact

Name: **Dr Stacey Gabriel**

Position: **Manager, Mental Health Human Research Ethics Committee**

Telephone: **(03) 9342 7098**

You will need to tell **Dr Stacey Gabriel** the name of one of the researchers given in section 8 above.

Or

Name: **the Secretary**

Position: **Secretary, Victoria University Human Research Ethics Committee**

Telephone: **(03) 9919 4710**

10. Participation is Voluntary

Participation in any research project is voluntary. If you do not wish to take part you are not obliged to. If you decide to take part and later change your mind, you are free to withdraw from the project at any stage.

Your decision whether to take part or not to take part, or to take part and then withdraw, will not affect your relationship with Western Hospital or Victoria University.

Before you make your decision, a member of the research team will be available to answer any questions you have about the research project. You can ask for any information you want. Sign the Consent Form only after you have had a chance to ask your questions and have received satisfactory answers.

If you decide to withdraw from this project, please notify a member of the research team before you withdraw.

11. Ethical Guidelines

This project will be carried out according to the *National Statement on Ethical Conduct in Research Involving Humans* (June 1999) produced by the National Health and Medical Research Council of Australia. This statement has been developed to protect the interests of people who agree to participate in human research studies.

The ethical aspects of this research project have been approved by the Human Research Ethics Committees of Melbourne Health and Victoria University.

Consent Form

Version 2 Dated 13.06.2007

Site: Western Health / Victoria University

Full Project Title: Adjustment in Young Women with and without Type 1 Diabetes

I have read, and I understand the Participant Information version 2 dated 13/06/07.

Please tick box when signing the consent form:

I freely agree to participate in this project according to the conditions in the Participant Information, including completion of questionnaire booklet.

Yes No

I will be given a copy of the Participant Information and Consent Form to keep.

The researcher has agreed not to reveal my identity and personal details if information about this project is published or presented in any public form.

Participant's Name (printed)

Signature

Date

Name of Witness to Participant's Signature (printed)

Signature

Date

Declaration by researcher*: I have given a verbal explanation of the research project, its procedures and risks and I believe that the participant has understood that explanation.

Researcher's Name (printed)

Signature

Date

* A senior member of the research team must provide the explanation and provision of information concerning the research project.

Note: All parties signing the Consent Form must date their own signature.

CONSENT FORM

VERSION 2 DATED 13.06.2007

SITE: WESTERN HEALTH / VICTORIA UNIVERSITY

Full Project Title: Adjustment in Young Women with and without Type 1 Diabetes

I have read, and I understand the Participant Information version 2 dated 24/04/07.

Please tick box when signing the consent form:

I freely agree to participate in this project according to the conditions in the Participant Information, including completion of questionnaire booklet.

Yes No

I will be given a copy of the Participant Information and Consent Form to keep.

The researcher has agreed not to reveal my identity and personal details if information about this project is published or presented in any public form.

Participant's Name (printed)

Signature

Date

Name of Witness to Participant's Signature (printed)

Signature

Date

Declaration by researcher*: I have given a verbal explanation of the research project, its procedures and risks and I believe that the participant has understood that explanation.

Researcher's Name (printed)

Signature

Date

* A senior member of the research team must provide the explanation and provision of information concerning the research project.

Note: All parties signing the Consent Form must date their own signature.

Revocation of Consent Form

Full Project Title: Adjustment in Young Women with and without Type 1 Diabetes

I hereby wish to WITHDRAW my consent to participate in the research proposal described above and understand that such withdrawal WILL NOT jeopardize any treatment or my relationship with Western Hospital or Victoria University.

Participant's Name (printed)

Signature

Date

Appendix: 13
Participant Information and Consent Form for Diabetes Sample

Participant Information and Consent Form**Version 3 Dated 22.05.2008****Site: Western Health / Victoria University / Royal Melbourne Hospital****Full Project Title: Adjustment in Young Women with and without Type 1 Diabetes**

Principal Researcher: Professor Sandra Lancaster

Associate Researcher(s): Associate Professor Shane Hamblin
Cheryl Steele
Associate Professor Peter Colman

Student Researcher(s): Hege K. Andreassen
Sonal Sachdeva

This Participant Information and Consent Form is **6** pages long. Please make sure you have all the pages.

1. Your Consent

You are invited to take part in this research project.

This Participant Information contains detailed information about the research project. Its purpose is to explain to you as openly and clearly as possible all the procedures involved in this project before you decide whether or not to take part in it.

Please read this Participant Information carefully. Feel free to ask questions about any information in the document. You may also wish to discuss the project with a relative or friend or your local health worker. Feel free to do this.

Once you understand what the project is about and if you agree to take part in it, you will be asked to sign the Consent Form. By signing the Consent Form, you indicate that you understand the information and that you give your consent to participate in the research project.

You will be given a copy of the Participant Information and Consent Form to keep as a record.

2. Purpose and Background

There are two purposes of this project:

- a) To examine how young women become more independent and autonomous and how this affects people with and without a chronic illness such as Type 1 diabetes.
- b) To understand more about how young women think about their bodies, how that might affect eating related behaviour and whether these issues create more difficulties for young women with Type 1 diabetes

A total of 120 people will participate in this project.

Previous research has shown that during the time when young adults become more independent a number of factors such as their mood and their relationship with parents and their friends are important. There has been no research that has tried to understand more about the experience of becoming more independent when you are a young woman with a chronic illness such as Type 1 diabetes. Eating behaviour and how young women think about their bodies are also relevant issues in this period of life. Family influences, relationships with friends, personality and mood are important factors that influence our eating behaviour. Management of diabetes requires young women to pay particular attention to the food they eat and this may be a further pressure. It is possible that these factors may affect management and control of the diabetes.

You are invited to participate in this research project because your experience of the issues described above will help us to get a better understanding of independence and eating behaviour and the impact of having Type 1 diabetes over a period of time.

This project will be done as a part of the above mentioned students' post-graduate research.

3. Procedures

Participation in this project will involve completing a questionnaire booklet. Questions will be about relationships with friends and family, your mood, independence and eating behaviour. In addition to this there will also be questions about your experience and the management of diabetes. Most questions will require you to tick or circle one of the possible responses. It will take approximately 45 minutes to answer all the questions.

Participation in this research will also involve your consent for researchers to access your medical records. The only medical information necessary for our research will be your recent metabolic control as assessed by glycosylated hemoglobin (HbA1c).

4. Possible Benefits

Participating in this study will not benefit you directly; however, results of this study may offer benefits to young women in the future. Results of the study may contribute to greater understanding of independence and eating behaviour in young women and help professionals offer appropriate services to young women with diabetes.

5. Possible Risks

There are no expected risks associated with this study; however it is possible that some people may find certain questions distressing. If you are upset by any of the questions let the researchers know and they will suggest ways that you could obtain help.

At any point you may withdraw your participation in this study.

6. Privacy, Confidentiality and Disclosure of Information

Any information obtained in connection with this project will remain confidential. It will only be disclosed with your permission, except as required by law (e.g. possible

harm to self or others). Only the results from the group of participants will be written up and published. No individuals will be identified in the writing up of the results. Information and data collected will be stored in locked filing cabinets in the psychology department of Victoria University. Only student researchers and the principal researcher will have access to the data.

7. Results of Project

If you would like to know the results of the study at the completion of the project we will send you a general summary of the results. To receive this summary you need to provide your contact details in the questionnaire booklet.

8. Further Information or Any Problems

If you require further information or if you have any problems concerning this project you can contact the principal researcher.

Principal researcher: Professor Sandra Lancaster Ph: (03) 9919 2397

Email: sandra.lancaster@u.edu.au

9. Other Issues

If you have any complaints about any aspect of the project, the way it is being conducted or any questions about your rights as a research participant, then you may contact

Name: **Dr Stacey Gabriel**

Position: **Manager, Mental Health Human Research Ethics Committee**

Telephone: **(03) 9342 7098**

You will need to tell **Dr Stacey Gabriel** the name of one of the researchers given in section 8 above.

Or

Name: **the Secretary**

Position: **Secretary, Victoria University Human Research Ethics Committee**

Telephone: **(03) 9919 4710**

10. Participation is Voluntary

Participation in any research project is voluntary. If you do not wish to take part you are not obliged to. If you decide to take part and later change your mind, you are free to withdraw from the project at any stage.

Your decision whether to take part or not to take part, or to take part and then withdraw, will not affect your relationship with Western Hospital, Royal Melbourne Hospital or Victoria University.

Before you make your decision, a member of the research team will be available to answer any questions you have about the research project. You can ask for any

information you want. Sign the Consent Form only after you have had a chance to ask your questions and have received satisfactory answers.

If you decide to withdraw from this project, please notify a member of the research team before you withdraw.

11. Ethical Guidelines

This project will be carried out according to the *National Statement on Ethical Conduct in Research Involving Humans* (June 1999) produced by the National Health and Medical Research Council of Australia. This statement has been developed to protect the interests of people who agree to participate in human research studies.

The ethical aspects of this research project have been approved by the Human Research Ethics Committee of Melbourne Health and Victoria University.

Consent Form

Version 3 Dated 22.05.2008

Site Western Health / Victoria University / Royal Melbourne Hospital

Full Project Title: Adjustment in Young Women with and without Type 1 Diabetes

I have read, and I understand the Participant Information version **3** dated **22/05/08**.

Please tick boxes when signing the consent form:

I freely agree to participate in this project according to the conditions in the Participant Information, including completion of questionnaire booklet.

Yes No

I freely agree to the researchers obtaining information regarding my recent metabolic control (glycosylated hemoglobin) from my medical records.

Yes No

I will be given a copy of the Participant Information and Consent Form to keep

The researcher has agreed not to reveal my identity and personal details if information about this project is published or presented in any public form.

Participant's Name (printed)

Signature

Date

Name of Witness to Participant's Signature (printed)

Signature

Date

Declaration by researcher*: I have given a verbal explanation of the research project, its procedures and risks and I believe that the participant has understood that explanation.

Researcher's Name (printed)

Signature

Date

* A senior member of the research team must provide the explanation and provision of information concerning the research project.

Note: All parties signing the Consent Form must date their own signature.

Consent Form

Version 3 Dated 22.05.2008

Site Western Health / Victoria University / Royal Melbourne Hospital

Full Project Title: Adjustment in Young Women with and without Type 1 Diabetes

I have read, and I understand the Participant Information version **3** dated **22/05/08**.

Please tick boxes when signing the consent form:

I freely agree to participate in this project according to the conditions in the Participant Information, including completion of questionnaire booklet.

Yes No

I freely agree to the researchers obtaining information regarding my recent metabolic control (glycosylated hemoglobin) from my medical records.

Yes No

I will be given a copy of the Participant Information and Consent Form to keep

The researcher has agreed not to reveal my identity and personal details if information about this project is published or presented in any public form.

Participant's Name (printed)

Signature

Date

Name of Witness to Participant's Signature (printed)

Signature

Date

Declaration by researcher*: I have given a verbal explanation of the research project, its procedures and risks and I believe that the participant has understood that explanation.

Researcher's Name (printed)

Signature

Date

* A senior member of the research team must provide the explanation and provision of information concerning the research project.

Note: All parties signing the Consent Form must date their own signature.

Revocation of Consent Form

Full Project Title: Adjustment in Young Women with and without Type 1 Diabetes

I hereby wish to WITHDRAW my consent to participate in the research proposal described above and understand that such withdrawal WILL NOT jeopardize any treatment or my relationship with Western Hospital or Victoria University.

Participant's Name (printed)

Signature

Date