

**Understanding the Link Between Body Dissatisfaction and Binge Eating:
A Model Comparison Approach**

by

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Executive Summary

There is evidence within the literature to suggest that body dissatisfaction, that is, any discontent with one or more aspects of one's body shape or appearance (Cash, Morrow, Hrabosky, & Perry, 2004), is relevant to binge eating. In spite of this, the psychological bases of this association are not well understood. To date, several explanatory models – dual pathways, escape from awareness, and objectification theory - have been used to explain the unexpected phenomenon that individuals who are dissatisfied with their appearance are actually more likely to engage in binge eating behaviour. While each of these models has received support in the literature when tested separately, it is presently unclear: (i) which of the models best accounts for this phenomenon, and (ii) whether the models, in combination, fully explain the body dissatisfaction-binge eating association. To rectify these gaps, an empirical investigation was undertaken to test these models separately as well as in combination.

In Study I, 412 women aged between 18 and 40 years ($M=25.25$, $SD=5.25$) completed a survey designed to assess the relative and combined contributions of model implied mediators (dietary restraint and negative affect from the dual pathway model, self-distraction from the escape from awareness model, and interoceptive deficits from objectification theory) for explaining the relationship between body dissatisfaction and binge eating. This was undertaken to examine: (1) whether the three models (when combined) adequately account for the shared variance between the IV and DV, and (2) whether a hybrid model is most suitable for explaining the link between body dissatisfaction and binge eating. While mediation analyses revealed support for the dual pathway model and the objectification theory when tested separately, the dual pathway model was the strongest predictor of the body

dissatisfaction-binge eating relationship. Both dual pathway model-implied mediators (dietary restraint and negative affect) made significant unique contributions, and accounted for roughly one-quarter of the shared variance between body dissatisfaction and binge eating when tested separately from other models. Moreover, improvements in variance explained were negligible once the other proposed mediators were included in a test of models combined. Collectively, these findings suggest the superiority of the dual pathway model over objectification theory and the escape model, but the remaining unaccounted for covariance suggests need to consider alternative modeling approaches and/or mechanisms that may allow for a more accurate model of the way in which body dissatisfaction and binge eating relate to each other.

The purpose of Study II was then to extend on the findings from Study I by further examining the model/theory that most strongly explained the body dissatisfaction-binge eating relationship. Despite cross-sectional support for both pathways of the dual pathway model, few studies have examined these dynamic processes in real time. To address this gap, Study II utilised an experience sampling methodology (ESM) to determine whether elevated states of body dissatisfaction predicted dietary restraint and/or negative mood and, in turn, comfort eating or binge eating. By re-sampling across several time points, it was expected that estimates would better reflect daily experience than simple induction designs.

In Study II, 124 women aged 18 to 40 years ($M = 24.72$, $SD = 4.15$) completed an online survey (accessed via a mobile phone device with web access) for a 7-day period. The mobile phone device prompted participants at random intervals seven times daily to self-report their state body dissatisfaction, current mood experiences, and eating practices. Multi-level mediation modeling revealed

that negative mood, but not dietary restraint, significantly mediated the state body dissatisfaction-binge eating relationship. These mediation effects were consistent across participants, and strength of mediation could not be predicted by key trait-level measures of body image and eating behaviour. Collectively, these results highlight that the dual pathway model is robust, but raise the possibility that the dietary restraint path in the model is not well operationalized. In light of the non-significant mediating effect of dietary restraint, this led the researcher to identify various modeling alternatives to further understand the mediating influences of the pathways of negative affect and dietary restraint.

The limitations of the current research specify several directions for future research including the replication of these results in clinical populations.

Nonetheless, to the author's knowledge, the present study was the first ESM study to examine the full dual pathway model in real time. Further, it has been the first study to consider and analyse the variations in the conceptualisation and modeling of the state-based associations of the dual pathway model. Importantly, the present findings cast doubt on the possibility that the link between body dissatisfaction and binge eating is adequately explained by the mechanisms involved in the traditional (or usual) methods of modeling the dual pathway model.

CHAPTER 1

INTRODUCTION

Body image is a multi-faceted construct, comprising the perceptions, cognitions, feelings, and attitudes associated with one's appearance, and the behavioural processes employed in response to the subjective impression of one's appearance (Cash & Smolak, 2011). Because body image is multi-dimensional, it follows that there are several different forms of body image disturbance. One facet is dissatisfaction with overall appearance or with certain physical attributes (e.g., body weight or shape) (Thompson & van den Berg, 2002). A further component is the frequency of negative body image discontent spanning a range of contexts and activities (Melnik, Cash, & Janda, 2004). Psychological investment in one's physical appearance is an additional precursor to body image disturbance, and is the extent to which individuals engage in appearance-management behaviours or define and appraise their self-worth by their physical appearance (Forand, Gunthert, German, & Wenze, 2010; Tod & Edwards, 2013). Of these disturbances, body dissatisfaction is the most commonly researched because of its prevalence (as covered below), and also because it is the disturbance most strongly and consistently linked with a range of adverse psychosocial outcomes (e.g., low self-esteem, depression, social anxiety, dieting, and eating disorders (EDs); Neumark-Sztainer, Paxton, Hannan, Haines, & Story, 2006; Thompson & Stice, 2001).

In a recent study of over 50,000 Australian youth, body image was rated as being their greatest personal concern, above family conflict, coping with stress, and study issues (Mission Australia, 2010). Body dissatisfaction and preference

for a thinner body type are evident and widespread among non-clinical girls and women throughout Western cultures, with approximately 60% of 13-15 year old girls, 90% of 18-30 year old girls, and 80% of middle-aged women reporting dissatisfaction with their appearance (McLaren & Kuh, 2004; McLean, Paxton, & Wertheim, 2011; Swami et al., 2010). There is a spectrum of body change behaviours that exist among those individuals who wish to alter their appearance from relatively innocuous (or even beneficial) body change activities, such as exercise and eating a more well-rounded and healthy diet, to more serious and unhealthy body change practices, such as compulsive over-exercising, deliberately abusing laxatives or diuretics, or fasting for at least 24 hours (Bearman, Presnell, Martinez, & Stice, 2006; Brokhoff et al., 2012; Thompson & Stice, 2001).

Within the literature, body dissatisfaction has been linked to intentional weight management behaviours in women and adolescent girls (Donovan, Spence, & Sheffield, 2006; Dunkley, Wertheim, & Paxton, 2001; McCabe, Ricciardelli, & Holt, 2005), particularly for the onset of purging episodes (Stice & Agras, 1998; Thompson et al., 1995), and dietary restraint (Mooney, Farley, & Strugnell, 2010; Ouwens, van Strien, van Leeuwe, & van der Staak, 2009; van Strien, Engels, van Leeuwe, & Snoek, 2005).

It is also somewhat surprising that body dissatisfaction is also related to binge eating across several studies (Cooley & Toray, 2001; Gordon, Holm-Denoma, Troop-Gordon, & Sand, 2012; Stice & Shaw, 2002), and this relationship is not simply driven by shared association with other ED symptoms (Stice, Shaw, & Nemeroff, 1998b). Binge eating is characterized by 1) the consumption of a significantly large amount of food in a discrete period of time

(e.g., within 2 hours) compared to what others would consume under similar circumstances, and 2) the presence of a subjective sense of loss of control over eating (APA, 2013). The act of bingeing emerges amid an individual's venture to restrict food intake and obtain a more attractive appearance by achieving a slim figure. In this light, binge eating represents a self-defeating pattern of behaviour as it undermines the individual's intentions to lose weight. Because this relationship is perplexing, and also because body dissatisfaction and binge eating may perpetuate (and prolong) ED diagnosis, there is need to understand how and why body dissatisfaction leads to binge eating.

The aim of this review chapter is to evaluate extant models that attempt to explain the relationship between body dissatisfaction and binge eating. Section I will present an overview of three commonly cited theoretical explanations for the link between body dissatisfaction and binge eating: the dual pathway model, escape from awareness model, and objectification theory. Section II examines the empirical support for these models and, ultimately, shows that (a) each model/theory is insufficient by itself to fully explain the body dissatisfaction-binge eating link, and (b) there has been limited evaluation of the relative and/or combined contribution to explaining the body dissatisfaction-binge eating link. Based on limitations identified in this prior research, Section III details a series of studies, which will be conducted in this thesis to further develop theoretical understanding of the relationship between body dissatisfaction and binge eating. In particular, a more comprehensive model is proposed, which synthesizes the empirically supported pathways from each of the aforementioned models.

SECTION I:

THEORETICAL EXPLANATIONS FOR THE LINK BETWEEN BODY DISSATISFACTION AND BINGE EATING

Several explanations have been proposed to account for the relationship between body dissatisfaction and eating pathology. These explanations can be broadly applied to eating disordered behaviours across various groups as eating pathology is common both in clinical (i.e. individuals with anorexia nervosa (AN), bulimia nervosa (BN), and binge eating disorder (BED)) and non-clinical populations. This section will provide an overview of three frequently cited theories: the dual pathway model, escape from awareness model, and objectification theory.

Dual Pathway Model

The dual pathway model (Stice, 2001) attempts to explicate the mediating mechanisms between sociocultural standards of appearance and bulimic pathology (i.e., binge eating and purging). These standards comprise the thin-ideal body image advocated for women, the importance of appearance for societal success, and the focus of appearance in the female role (Stice, 1994). Women in Western cultures (and increasingly, in non-Western cultures) are frequently exposed to multiple influences (such as the media, family, and peers) that endorse the slender ideal, a standard that is unrealistic for most women to attain (Brennan, Lalonde, & Bain, 2010; Pope et al., 1999).

This model proposes that internalization of the thin ideal leads to body dissatisfaction, which then influences binge eating. As shown in Figure 1, one pathway from body dissatisfaction to binge eating is via dieting. Body

dissatisfaction may prompt an individual to employ weight reduction strategies, such as dietary restraint, to improve one's appearance and consequently, satisfaction with her body (Ouwens et al., 2009; van Strien et al., 2005). Dietary restraint is defined as a deliberate effort to attain or maintain a desired weight by means of decreased caloric intake (Herman & Mack, 1975; Williamson et al., 2007). Binge eating is believed to be the effect of restrained eating due to both physiological (carbohydrate cravings) and cognitive mechanisms (cognitively generated disinhibition- an increased attention to food and drive to eat) (Stice, 1994). While periods of caloric restraint may prevent weight gain, it also depletes necessary resources for the body to function, and increases hunger levels, food cravings, the reinforcing value of food, and appetite responsiveness to food (Cameron, Goldfield, Cyr, & Doucet, 2008; Moreno-Dominguez et al., 2012; Raynor & Epstein, 2003). Dieting encourages an eating style regulated by individuals' cognitions that causes them to be more prone to disinhibition of restrictive eating practices (Polivy & Herman, 1985; Stice, 1994). Chronic dieters restrain their food intake until a disrupting event or 'disinhibitor' creates a break in the diet regimen at which point overeating ensues. When dieters deem themselves to be "in control", with their diets abided by, they eat sparingly (Polivy, 1985). Once they consider that their diet has been breached, they overeat or even binge.

This restriction of food can be achieved via methods such as stringent avoidance of particular kinds of food, evasion of eating for a specified period of time, and complete restriction of food consumed (Lowe, Witt, & Grossman, 2013). Restrained eating is perceived as a means to promote weight loss and, in turn, decrease body dissatisfaction. Unfortunately for the restrained eater, dieting

is an unsuccessful method to long-term weight loss and may have the unintended consequences of initiating periods of binge eating to restore energy levels after a period of deprivation (Polivy & Herman, 1985, 1987). Although those who engage in diets are often able to achieve significant weight loss in the short term and whilst actively dieting, most regain the lost weight in the months and years to follow (Aphramor, 2010; Lowe, Davis, Lucks, Annunziato, & Butryn, 2006; Mann et al., 2007; Powell, Calvin, & Calvin, 2007). Moreover, efforts of restraint (on a daily basis) are often followed by increased meal consumption later in the day or in the 1-2 days following the commencement of the diet (Zunker et al., 2011).

A second proposed mediational pathway from body dissatisfaction to binge eating is via negative affect (as shown in Figure 1). According to the dual pathway model, dissatisfaction with a specific aspect of one's self (in this instance, one's appearance) may promote a general state of negative affect and, when this negative affect is sufficiently heightened, the individual may seek to reduce this dysphoric state by using a temporary distraction/source of comfort or relief, such as food (Beebe, 1994; Shepherd & Ricciardelli, 1998; Stice, 1994; Stice et al., 1998a).

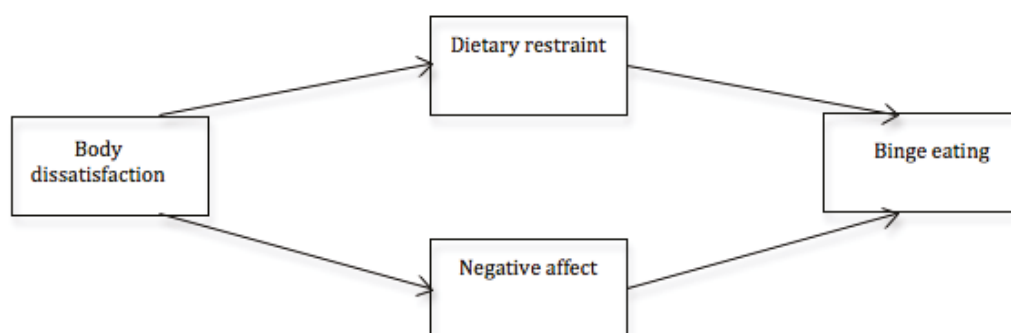


Figure 1. Stice's original dual pathway model.

While binge eaters are able to acknowledge positive aspects of food consumption (such as the taste and enjoyment of eating), they are more often concerned with the potential for weight gain. These negative aspects typically have a prohibitive effect on the food consumption of binge eaters and, hence, an adequate explanation of engagement in binge eating must account for this shift in attention from (or de-emphasis of) the negative aspects of food consumption. This identified gap in the dual pathway model can be accounted for by the escape from awareness model.

Escape from Awareness Model

While not an intrinsically aversive state, there are instances when self-awareness may be onerous, predominantly when one has perfectionist ideals, and realizes that s/he is falling short of self- or society-prescribed standards (Blackburn, 2006). For instance, if this awareness is focused on body image, failure to meet standards of appearance is likely to lead to body dissatisfaction and in turn, negative affect. In these circumstances, an individual is compelled to minimize levels of self-awareness in order to escape such negative experiences (Paxton & Diggins, 1997). The escape model (Heatherton & Baumeister, 1991), as shown in Figure 2, provides a cognitive model that serves to explain how an individual is able to: (1) forego aversive, self-directed thoughts about one's appearance, and (2) engage in a behaviour that would ordinarily be self-prohibited because of fear of increased weight gain and compounded body dissatisfaction.

Heatherton and Baumeister's (1991) model posits that binge eating is a consequence of, rather than means for, the individual's attempt to cognitively distract/disengage from negative emotions, aversive self-criticism, and/or other cognitions that an individual wishes to avoid. Despite their preoccupation with

food and appearance, individuals are able to temporarily evade their cognitions related to the appearance-threatening aspects of food in order to binge eat (Heatherton & Baumeister, 1991). This conflicting behaviour reflects disruptions to cognitive awareness and diminished behavioural self-control.

Fundamental to this escape model is the concept of various levels of meaning that are associated with various means of being aware of oneself and one's behaviour (Heatherton & Baumeister, 1991). Low levels of meaning entail specific, temporally restricted awareness of feeling and movement to the immediate physical environment (Heatherton, & Baumeister, 1991). For instance, at the lowest levels, individuals may focus on the taste, smell, or texture of food, and enjoy it for these sensory inputs. In contrast, high levels of meaning employ a broader duration of time, and may include consideration of the consequences and implications of one's actions and entail assessment of events (and the self) against broad standards (Duval & Wicklund, 1972). For example, at higher levels of awareness, individuals may consider whether they normally allow themselves to eat certain foods, taking into consideration the repercussions of consumption for their diet and weight loss goals.

It is argued that a by-product of escaping from awareness is that it allows individuals to ignore or de-emphasize feedback that typically facilitates the inhibition of unhealthy behavioural reactions to food, such as the impulse to overeat. This feedback includes knowledge of foods consumed, awareness of what is a suitable amount to consume, as well as internal cues about hunger and satiety (Fuller-Tyszkiewicz & Mussap, 2007; O'Connor, Jones, Conner, McMillan, & Ferguson, 2008). Thus, utilization of escape from awareness strategies in an attempt to alleviate negative affect may indirectly facilitate binge

eating by impeding high-level cognitive functions that would otherwise promote inhibition of food consumption.



Figure 2. Relationships among body dissatisfaction, negative affect, self-distraction and binge eating.

While the escape theory suggests that binge episodes arise as a result of an individual's deliberate endeavor to evade negative emotions and aversive self-criticism, the objectification theory (Fredrickson & Roberts, 1997) posits that placing such value on outward appearance increases individuals' risk for binge eating since they become less attuned to their inner states (such as hunger, satiety, and negative emotions), thereby allowing individuals to momentarily ignore these internal cues as a by product of being more outwardly aware of their physical appearance. Hence, it is not the negative emotions associated with falling short of the thin-ideal that facilitates a binge episode as such, rather it is the consequence of having fewer resources with which to attend to their own internal bodily states, that would otherwise prevent them from overeating.

Objectification Theory

Objectification theory (Fredrickson & Roberts, 1997) argues that women, particularly in Western cultures, are commonly viewed as appearance-based, sexual objects, with their bodies being viewed and appraised, and ultimately consumed by society (Myers & Crowther, 2008). It is a framework for

understanding a range of psychological and physical consequences women potentially suffer as a result of living in a world that sexually objectifies their bodies (Oehlhof, 2011). Objectification theory describes the process through which women internalize both the belief that appearance is a vital factor of women's worth as well as culture's standards of near physical perfection and subsequently ascertain their worth as an individual dependent on their ability to meet these standards (Crawford et al., 2009). Over time, many women learn via relational experiences and vicarious observation of the current culture that their and other women's physical appearance matters, that the thin-ideal standard is often associated with other desirable outcomes (e.g., success, wealth, romantic partner), and that other people's appraisal of their appearance can determine how they are treated (Aubrey, 2006; Oehlhof, 2011).

Internalization of an observer's perspective of one's own body manifests as persistent body surveillance in which women and girls engage in habitual body and appearance monitoring (Moradi, Dirks, & Matteson, 2005). Accordingly, self-objectification is hypothesized to precipitate higher levels of self-consciousness and contribute to feelings of body shame, body dissatisfaction, and social physique anxiety as women often compare their body with an unattainable cultural thin-ideal standard and base their self-evaluations and self-worth on how closely they can mimic the social ideal (Calogero, 2004; Muehlenkamp & Saris-Baglama, 2002; Oehlhof, 2011).

Theorists argue that body dissatisfaction prompts an individual to alter those aspects of the self that fall short of internalized ideals (Lewis, 1971; Lewis, 1992; Scheff, 1988). On this basis, objectification theory postulates that body dissatisfaction can prompt dieting and binge-purge cycles in an effort to lose

weight to appear uniform with this thin-ideal. In this respect, objectification theory is similar to the dietary restraint component of the dual pathway model yet the objectification theory offers a novel aspect in recognition of the potential role of diminished internal awareness. Valuing one's body more on the basis of outward appearance than performance, health, or function, is posited to result in women's increased risk for binge eating because they become less aware of, and have less means to focus on, their own internal bodily states, including hunger, satiety, and emotional cues (Augustus-Horvath & Tylka, 2009; Oehlhof, 2011). Whereas the dual pathway model supposes that negative affect is a predictor of binge eating, the objectification theory suggests that it is not a sufficient precursor since individuals become less attuned to emotional states (such as negative affect) and can ignore these internal cues if more aware of their outer physical appearance. This deficit in internal awareness, also referred to as *poor interoceptive awareness (IA)*, may be an antecedent to binge eating, as the individual is unaware of satiety cues that would otherwise prevent her from overeating (Augustus- Horvath & Tylka, 2009; Tylka & Subich, 2004).

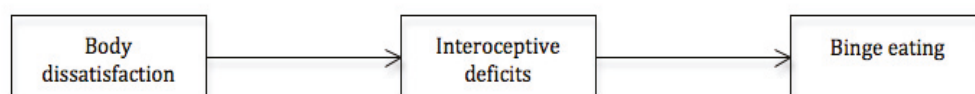


Figure 3. Relationships among body dissatisfaction, interoceptive deficits, and binge eating.

In summary, several main theories and models have been typically employed to explain the link between body dissatisfaction and binge eating. The

dual pathway model proposes that internalization of sociocultural pressure to be thin leads to body dissatisfaction and subsequently bulimic behaviours via negative affect and dietary restraint. On the other hand, the escape from awareness model posits that binge eating is a consequence of the individual's effort to distract from higher levels of awareness (i.e., negative emotions and cognitions) associated with body dissatisfaction. Finally, objectification theory provides an alternative mechanism to explain the body dissatisfaction-binge eating relationship and propounds that body dissatisfaction facilitates women to be more avidly aware of their outer physical appearance and, accordingly, become less attuned to their inner states (i.e., hunger, satiety, and emotional cues) that would otherwise preclude them from overeating. Each of the aforementioned theories implicates different mechanisms and variables that can and have been subject to empirical evaluation.

SECTION II

EMPIRICAL EVALUATION OF THE BODY DISSATISFACTION-BINGE EATING RELATIONSHIP

Attempts to empirically validate these theories have been made using several approaches, including cross-sectional designs, retrospective studies, experimental and longitudinal assessments and, more recently, naturalistic observations over extended timeframes. This section evaluates key claims from the aforementioned theories; namely that: (1) dietary restraint influences binge eating, (2) negative affect influences binge eating, (3) individuals who binge eat have a tendency to use avoidance/escape mechanisms, and (4) self-objectification produces poor interoceptive awareness and in turn influences binge eating.

Empirical Support for the Link Between Dietary Restraint and Binge Eating

There are several converging lines of evidence to suggest that dietary restraint is not only used as a method of weight loss, but that it also serves as a mediator of the relationship between body dissatisfaction and disordered eating (Stice, 1994, 2001; Stice et al., 1998b). Cross-sectional research has found that dietary restraint (variously operationalized as frequent caloric deprivation, dieting attitudes, and intention to diet) and eating pathology co-occur in individuals with a diagnosed ED, particularly BN and BED (Brody, Walsh, & Devlin, 1994; Gleaves, Williamson, & Barker, 1993; Jacobi, Hayward, de Zwaan, Kraemer, & Agras, 2004; Stice & Presnell, 2010). Individuals with an ED tend to show higher levels of dietary restraint and preoccupation with eating than non-clinical control groups (Lowe, Witt, & Grossman, 2013; Shah, Passi, Bryson, & Agras, 2005; Wilson, Fairburn, Agras, Walsh, & Kraemer, 2002). This latter finding has been

attributed to the severe dieting of AN patients as a significant proportion of initially restricting AN patients develop the symptoms of bingeing as their illness progresses (Vandereycken & Pierloot, 1983). However, it is important to point out that while dieting behaviours are used less frequently and/or with less severity in non-clinical populations, dietary restraint still accounts for a large portion of the variance in binge eating and bulimic behaviour in non-clinical samples (Ricciardelli & McCabe, 2001; Womble et al., 2001).

Retrospective studies have also consistently shown that bingeing coincides with tendencies to restrict food intake (Polivy & Herman, 1985). Individuals with BN report that a period of self-induced dieting and restrictive eating patterns typically preceded the onset of binge eating (Mussell et al., 1997; Thompson et al., 1995). These patterns also hold for individuals with BED who report that they commenced dieting at a younger age and spent more of their life span occupied by the endeavor to lose weight (Grilo & Masheb, 2000; Hagan et al., 2002), as well as non-clinical samples of adolescent girls (Stice, Presnell, & Spangler, 2002) and adult women (Hagan et al., 2002).

While cross-sectional data suggest that dietary restraint and binge eating co-occur, and case studies (with retrospective reports) suggest that dietary restraint contributes to binge eating, prospective studies, experimental designs, and naturalistic observations provide interesting insights into how and under what conditions this relationship may obtain. First, many of the instances of overeating would not qualify as a binge episode. While support has been found for the occurrence of a 'binge' following dietary restraint in both non-clinical and bulimic samples (Steiger, Lehoux, & Gauvin, 1999; Stice et al., 1998a; Stice et al., 2002), other studies of non-clinical samples have failed to find this effect

(Spoor et al., 2006; Stice, 1998). Of those studies that have documented 'binge episodes', many have utilized participant ratings and have not been verified by viewer ratings or food diaries that would have offered external corroboration of the incidence of a binge of clinical importance (Engelberg, Gauvin, & Steiger, 2005). However, this does not imply that individuals do not exhibit problematic eating behaviours, as there is evidence to suggest that overeating does occur in individuals who are dieting.

In a seminal study, a non-clinical sample of men were held under strictly controlled conditions for three months of standardization in which they were maintained on a healthy diet of 3,492 calories per day. After having their normal daily intake reduced by 50% for a period of six months, participants were then permitted to consume as much as they wanted for a three-month period. The quantity consumed in this period was considerably greater than their normal, pre-experiment diet (approximately six to seven thousand calories per day compared with their pre-experiment diet of three to four thousand calories per day) (Franklin, Schiele, Brozek, & Keys, 1948). This suggests that experiments involving longer-term manipulations find that reduced caloric intake positively affects subsequent overeating in non-clinical samples.

More recently, Wardle and Beales (1988) evaluated obese individuals assigned to one of three treatments: diet, exercise, or control. After one month of treatment, individuals participated in a taste trial as a laboratory analogue assessment of binge eating. Whilst tasting, individuals in the diet group ate twice as much ice cream as those in either the exercise or control groups. These findings endorse restraint theory and its proposition that dieting produces increases in restraint that can ultimately result in overeating in a laboratory taste test.

However, given the taste test was the only assessment of overeating in Wardle and Beale's (1998) study, and focused on obese binge eating individuals who are likely to be intemperate in the practice of binge eating, these studies lack external validity. Similarly, Franklin et al.'s (1948) study is an 'extreme' case since the authors made use of a stricter amount of restraint than individuals who engage in restraint would normally use. Thus, while these studies demonstrate that periods of restraint lead to overeating, it may only be in extreme cases that this overeating qualifies as a binge eating episode.

Experimental research has also shown that caloric deprivation positively affects other phenomena that are potentially relevant to binge eating such as food cravings (Pelchat, 1997), attentional bias towards food cues (Placanica, Faunce, & Job, 2002), and physiological reactivity to the presentation of food (Vögele & Florin, 1997).

Unfortunately, several of the aforementioned studies have failed to quantify the amount of dieting that occurred prior to binge (or overeating) episodes nor do they attempt to discriminate between dieting of full restriction versus restriction of specific types of food. Further, dieting has been defined differently across studies, making comparisons difficult. For example, some studies have defined *dieting* in terms of behavioural accomplishment and as such, exclude efforts at dieting that were unsuccessful (Mussell et al., 1997). Other studies have used the term *strict diet*, requiring that a subjective decision concerning strictness be made (Wilson, Nonas, & Rosenblum, 1993). The term *diet* is also prone to biased interpretation, as one individual's diet may be equivalent to another's usual eating plan (Howard, 1991). Accordingly, it is

difficult to assess the dietary factors that are most likely to lead to a binge, versus the factors that simply lead to overeating.

Research assessing the outcomes of restricting only certain foods has found this to be related to a subsequent increase in food intake. Various dieters may evade what they deem forbidden, fattening, or guilt-inducing foods, and the frustration of depriving oneself of something pleasurable may increase its appeal, and thus prompt over-consumption (Herman & Polivy, 2003; Polivy & Herman, 1993). Polivy, Coleman, and Herman (2005) investigated the relation between being deprived of a specific, well-liked food (i.e., chocolate) and intake of that food in restrained and unrestrained eaters over a period of a week. They found that chocolate-deprived restrained eaters consumed significantly more chocolate than did restrained eaters deprived of vanilla (a less preferred food) or of those not deprived at all. While the generalisability of this effect to other food types remains unclear, research on the effects of restricting a particular type of food demonstrates the existence of a rebound effect suggesting that eliminating “forbidden” foods may be counterproductive as an approach for managing food intake.

A different form of restraint used by dieters is the full restriction of food intake (reduced total calories). Despite some studies showing that full restriction of food intake is related to subsequent increases in consumption in humans and animals (e.g., Laessle, Platte, Schweiger, & Pirke, 1996), other studies provide divergent evidence. Gendall, Joyce, and Abbott (1999) provided calorically sufficient meals of protein, carbohydrates, or a combination of both and found that craving for carbohydrate-rich foods was raised subsequent to a protein-rich meal, however not after a carbohydrate or mixed meal. Participants’ first *ad*

libitum eating episodes after the protein meal comprised a higher quantity of total carbohydrate and had a higher probability of being identified as a binge than were those after the carbohydrate or mixed meals. As such, the complete restriction of calories may not be a necessary precondition for the occurrence of problematic eating behaviour as it is when particular, preferred foods are omitted.

Dietary restriction has also been found to reduce binge eating in some experimental studies (Klem, Wing, Simkin-Silverman, & Kuller, 1997; Presnell & Stice, 2003), signifying the presence of apparent “successful dieters” (see also Brownell & Rodin, 1994; Lowe & Kleifield, 1988; van Strien, 1997). For example, randomised trials with overweight and obese women show that adherence to 5-6-month energy-deficit weight loss or weight maintenance diets (e.g., 1,200 calories a day) results in greater decreases in binge eating than observed in waitlist control conditions (Goodrick, Poston, Kimball, Reeves, & Foreyt, 1998; Reeves et al., 2001; Stice, Presnell, Groesz, & Shaw, 2005). These effects have been replicated in samples of women with BN (Burton & Stice, 2006) and in normal weight adolescent girls and young women (Groesz & Stice, 2007; Presnell & Stice, 2003). These findings are contrary to the dietary restraint model and are at odds with the findings from the aforementioned studies that assert that dietary restraint promotes binge eating.

Possible explanations exist for the conflicting findings, wherein some studies report that elevated dietary restraint scores predicts onset of binge eating symptoms but experimental findings report that being assigned to an energy-deficit diet reduces symptoms of binge eating. Perhaps the dietary restraint measures utilised in a number of studies do not detect individuals on energy-deficit diets or, alternatively, the measures may be insensitive to the exact manner

in which individuals diet. This is a reasonable supposition as studies have found that individuals with high scores on self-report measures of dietary restraint, consume comparable amounts of calories during single and multiple eating episodes (Jansen et al., 2003; Stice, Sysko, Roberto, & Allison, 2010; Sysko, Walsh, & Wilson, 2007) as well as over longer time intervals (2-12 week periods) (Martin et al., 2005; Stice, Cooper, Schoeller, Tappe, & Lowe, 2007; Stice et al., 2010). Similarly, several prospective studies have shown that particular unhealthy weight control behaviours such as fasting, use of food replacements, and meal skipping, reveal stronger associations to future binge eating episodes comparative to self-reported dieting measures five years later (Neumark-Sztainer et al., 2006; Stice Davis, Miller, & Marti, 2008).

The relationships between dietary restraint and binge eating appear to function both in individuals with EDs (i.e., BN and BED) as well as in non-clinical samples of restrained eaters. For example, in a naturalistic study, Davis, Freeman, and Garner (1998) found that bulimics not only reported consuming considerably less meals per day than weight-matched controls, but they tended to be more calorie-deprived in the hour preceding binge episodes compared with controls at the comparable time of day. Numerous prospective studies have also established that normal-weight adolescent girls with elevated scores on dietary restraint scales have greater probability for future onset of binge eating (Stice et al., 2002), bulimic symptoms (Johnson & Wardle, 2005; Wertheim, Koerner, & Paxton, 2001), and threshold or sub-threshold BN (Stice & Agras, 1998).

Despite evidence for a link between restraint and binge eating, not all findings support this association. Several correlational studies have found that individuals with more severe binge eating behaviour in fact reported less dietary

restraint compared to those with moderate binge eating problems (Lawson et al., 1995; Masheb & Grilo, 2000; Wardle, Waller, & Rapoport, 2001). Further, despite the apparent role of hunger in binge eating, not all binge episodes result from periods of food deprivation: individuals with BED are just as prone to binge eat on days when food intake is restricted as when it is not (Yanovski, Gormally, Leser, Gwirtsman, & Yanovski, 1994), and bulimics may also binge on days when they do not exert dietary control (Steiger et al., 1999). Thus, it seems likely that binge episodes can occur in the absence of dietary restraint.

It may be that individuals do not have to be restricting food intake, but the consumption of a prohibited or “forbidden” food may lead to subsequently eating considerably more. For example, using adaptations of the ‘preload’ paradigm, experimental studies have demonstrated that restrained eaters consistently exhibit counter-regulation, a method in which they consume small amounts *ad libitum* food (hence preserving their diets) subsequent to no preload or a small mandatory preload, however consume vast quantities of food *ad libitum* subsequent to being mandated to eat large, high-calorie preloads (Herman, Polivy, & Silver, 1979; Ruderman & Christensen, 1983). In comparison, unrestrained eaters demonstrate normal regulation whereby they consume much more *ad libitum* food following no preload or a small forced preload than after a large forced preload.

In an adapted version of the preload experiment, Knight and Boland (1989) investigated whether the type of preload food affected subsequent overeating in both restrained and unrestrained eaters. In a preliminary study, they asked restrained eaters to rate items of food on a 5-point Likert scale from extremely permitted food (1) to extremely forbidden food (5). In a subsequent study, they used a forbidden preload (milkshake) and a permitted preload (cottage

cheese) with equivalent caloric contents. Restrained eaters consumed more food than unrestrained eaters after the forbidden food preload but not after the permitted food preload. In a separate study, Spencer and Fremouw (1979) gave participants a milkshake preload with the associated caloric content information. In one condition, the information indicated that the milkshake had low calorie content, and in the other condition the information indicated that the milkshake had high calorie content. Yet again, restrained eaters who believed that they had consumed the high calorie milkshake ate consistently more than the other groups.

Taken together, findings from these preload studies suggest that it is not merely the physiological effects of restraint that initiate overeating among restrained individuals but that psychological factors are also at play. Individuals with EDs assess their diet regime in dichotomous terms, as either maintained or violated for a given period of time and they think in a rigid, all-or-nothing fashion (Yanovski et al., 1994). This is likely to be reflected in the disinhibitive effect of consumption of forbidden foods with high calorie content upon subsequent eating for restrained eaters found by Knight and Boland (1989) and Spencer and Fremouw (1979). The display of preload-induced disinhibition in the above laboratory studies offers insight into real-world occurrences, whereby dieters give up prolonged efforts to restrict food following a relatively minor diet transgression (Polivy & Herman, 1985). This leaves us to question whether the relationship between chronic or repeat dieting and binge eating reflects a psychological deprivation rather than true caloric restriction (Polivy, Coleman, & Herman, 2005).

Despite the possibility that many dieters are not subject to engaging in binge eating behaviours, dieting may be sufficient, but not a necessary

precondition, for overeating. While there is some evidence from longitudinal and experimental studies that dieting increases the likelihood of unusual eating patterns, other evidence suggests that binge eating can also occur in the absence of dieting. This suggests that other pathways than restraint (such as negative affect) may also precede binge eating.

Empirical Support for the Link Between Negative Affect and Binge Eating

Researchers have used several variables as indicators of negative affect, including depression (Ouwens et al., 2009), anxiety (Shepherd & Ricciardelli, 1998), stress (Ricciardelli & McCabe, 2001), sadness (Stice, 1998), fear (Watson & Clark, 1992), anger/frustration (Corstorphine, Waller, Ohanian, & Baker, 2006; Waller et al., 2003), guilt (Berg et al., 2013), and shame (Stice, Ziemba, Margolis, & Flick, 1996). Regardless of how negative affect is defined, cross-sectional research is generally supportive of the link between aversive mood states and binge eating.

Prevalence rates of depression in female high school students with an ED are as high as 84% (Lewinshon, Striegel-Moore, & Seeley, 2000). Approximately 20% of individuals with BN have current major depression and 50% may develop depression at some point concurrent with their ED (Crow & Brandenburg, 2009). Co-morbid depression rates appear highest among individuals with BED, with 40-50% of individuals also having had major depression (Bodell, Brown, & Keel, 2012; Williamson, Thaw, & Varnado-Sullivan, 2001).

Several cross-sectional studies indicate that depressive symptoms (trait), acute negative mood (state), and binge eating behaviour are correlated (Grilo, Masheb, & Wilson, 2001; Stice et al., 2001). Higher levels of self-reported depression, anxiety, and guilt have been found in individuals with BED and BN as

compared to non-clinical controls (Mischoulon et al., 2011; Swanson, Crow, Le Grange, Swendsen, & Merikangas, 2011). Similarly, in cross-sectional studies in non-clinical samples, positive correlations have been found between measures of depression and binge eating (Tomori & Rus-Makovec, 2000), and disordered eating attitudes (Wichstrom, 1995). Further, in samples of female high school and college students, the pathway of negative affect was found to mediate the relationship between body dissatisfaction and binge eating (Ricciardelli & McCabe, 2001; van Strien et al., 2005).

While some cross-sectional and retrospective studies explicate that binge eating is a way of coping with negative affect and that individuals report a perceived decrease in negative affect following a binge episode, findings from prospective, experimental and naturalistic examinations (with repeated measurements) provide further insight into this relationship. In studies using a standard, mood induction paradigm (e.g., Agras & Telch, 1998; Chua, Touyz, & Hill, 2004; Telch & Agras, 1996), participants with BED who were allocated to the negative mood condition consumed significantly more food during the subsequent taste test (Chua et al., 2004) and experienced more binge episodes (40%) compared to those individuals with BED who were in the neutral condition (17%; Agras & Telch, 1998; Telch & Agras, 1996). In one experimental study (Agras & Telch, 1998), individuals with BED in the negative mood induction condition reported a significant decrease in negative affect following food consumption. However, negative affect decreased for both participants who did and did not binge eat, with no association between binge eating and mood changes within the negative mood induction condition. Thus, binge eating did not

seem to “cause” the reduction in negative affect. Rather, decreases in negative mood may simply be the consequence of the transient nature of mood states.

Data from naturalistic observation-based studies suggest that mood-induced eating generalizes beyond the laboratory setting. Haedt-Matt and Keel (2011) conducted a meta-analysis of studies using ecological momentary assessment on the link between mood and binge eating. Elevated negative affect prior to binge eating compared to average levels of negative affect was common for individuals with BN and BED (Crosby et al., 2009; Greeno, Wing, & Shiffman, 2000) as was negative affect prior to consuming regular meals or snacks (Engelberg, Steiger, Gauvin, & Wonderlich, 2007; Steiger et al., 2005, Stein et al., 2007). Further, negative affect *increased* after binge episodes in both BN and BED samples. These findings contradict retrospective reports that have suggested that binge eating reduces negative emotions (Hawkins & Clement, 1984; Stickney, Miltenberger, & Wolff, 1999). However as most naturalistic studies evaluated the consequences of binge eating through immediate post-binge reports, it is difficult to determine how long negative mood persists for following a binge. While the findings from naturalistic and laboratory studies raise uncertainty as to whether binge eating effectively reduces negative affect, the results clearly support the proposition that negative affect prompts periods of binge eating.

Dietary restraint may also contribute to negative affect, and thus contribute to bulimic symptoms such as binge eating. Dysphoria may result from failures associated with dietary efforts, or may be a function of caloric deprivation (Stice et al., 1998b). Greeno and Wing (1994) found that the negative affect-binge eating relationship was strongest when individuals had restricted food intake.

Furthermore, experiments have documented that caloric deprivation produces depression and anxiety, and this results in subsequent overeating (Frost, Goolkasian, Ely, & Blanchard, 1982; Schotte, Cools, & McNally, 1990).

While it seems clear from experimental studies that negative mood leads to increased eating, it seems unlikely or rare that negative mood elicitation leads to sufficient overeating to be defined as a binge episode. It could be that the elicitation is not strong enough (an issue with validity of the study) or that the link is more appropriately viewed as a relationship between negative affect and eating more than usual (a weaker claim than negative affect leads to binge eating). A further possibility is that the negative affect and binge eating relationship only obtains in extreme cases, or in instances where negative mood states have been extended for longer periods than normal. Moreover, the relationship between mood and binge eating is typically modeled in terms of concurrent mood and eating ratings or simple lags of one time point in a multiple time point design (such as experience sampling approaches) (Engelberg et al., 2007; Stein et al., 2007). Such approaches are insensitive to the possibility that sustained negative mood, more so than one intense yet temporary state of negative mood, is the better predictor of binge eating. Thus, while strong support is found for the link between negative affect and eating behaviours, the link between negative affect and *binge eating* is less well supported, either because the way the relationship is modeled is inaccurate or the operationalization for the over eating phenomenon is too restrictive and rarely linked to negative mood.

Empirical Support for the claims of Escape From Awareness Theory

Various forms of evidence support the notion that “escape” processes facilitate binge eating. Clinical case reports demonstrate that cognitive narrowing

or deconstruction occurs among individuals with an ED during a binge. For example, Johnson and Larson (1982) found that bulimics report experience of a pleasurable sense of loss of control, describing a binge as a means of “letting go” and “temporarily be[ing] out of control” (p. 261). Similarly, individuals with BN have reported low self-awareness and “spacing out” (Schupak-Neuberg & Nemeroff, 1993) or feeling “numb” (APA, 2000) and “dazed” (Torem, 1986) during binge episodes. Individuals with an ED also have difficulty recalling how much they consume during a binge episode (Polivy, 1976), and seem insensitive to satiety cues during this time, eating more than they need to (Heilbrun & Worobow, 1991). Further, binge eaters are more vulnerable to prominent external cues (i.e., food related stimuli) than internal cues (i.e., hunger and satiety), eat unusual and unpleasant foods throughout a binge episode, and regularly describe experiences of numbness for the duration of a binge episode (Paxton & Diggins, 1997), all of which represent a model of eating that may be suggestive of a mental state whereby meaningful thought has been impeded (Katsounari & Zeeni, 2012).

These “escape” processes and resultant binge eating episodes are not merely limited to those with diagnosed eating disorders and have been frequently documented in non-clinical samples of female adolescents and young women (Blackburn, Johnston, Blampied, Popp, & Kallen, 2006; Paxton & Diggins, 1997). For example, in their non-clinical sample of women, Blackburn et al. (2006) found that individuals who experienced higher levels of aversive self-awareness were more likely to experience higher negative affect, which in turn lead to greater cognitive narrowing, and resulted in higher levels of binge eating. It is noteworthy that Blackburn et al.’s (2006) study assessed aversive self-awareness via measures of public and private self-consciousness. In doing so,

these measures may have placed too much emphasis on the self-awareness component of negative self-awareness, either via awareness of individuals' own feelings (private self-consciousness) or the responses of those surrounding the individual (public self-consciousness), as opposed to the appraisal of that awareness. Blackburn et al (2006) raised the question of whether incorporating a measure of the degree to which the individuals' self-awareness is unpleasant for them would generate a more robust assessment of aversive self-awareness, and potentially contribute even stronger support for the escape theory in non-clinical samples.

Some authors have likened the shift in awareness explained in escape theory with the notion of dissociation, proposing that binge eating takes place in dissociative states (Lyubomirsky, Casper, & Sousa, 2001; McManus & Waller, 1995; Meyer, Waller, & Waters, 1998). Dissociation has been conceived as varying from everyday experiences such as immersion and imaginative involvement (e.g., daydreaming), amnesiac dissociation (e.g., memory loss), and depersonalization-derealization (e.g., identity confusion) (Lyubomirsky et al., 2001) to more pathological deficits in assimilating affect, perception, cognition, and behaviour (e.g., Kihlstrom, Glisky, & Angiulo, 1994; Putnam, 1989; Waller, Putnam, & Carlson, 1996). Although dissociation is considered to be a defensive means to evade uncomfortable or states, it has the potential to be maladaptive if it is employed recurrently (Everill, Waller, & MacDonald, 1995; Lyubomirsky, Casper, & Sousa, 2001). As a number of researchers have equated dissociation with escape/avoidance coping strategies, evidence for the relationship between dissociation and binge eating will be incorporated in this subsection.

Individuals with heightened levels of body dissatisfaction (i.e., those with BN, AN, or who diet, etc.) are more likely to respond to difficult encounters with friends and family, emotional distress, and being teased about being fat, with escapist responses (Heatherton, 1991; Lacey, Coker, & Birtchnell, 1986; Neckowitz & Morrison, 1991). Individuals with BN tend to use more escape-avoidance coping strategies (such as withdrawal) than controls, rather than using problem-solving or other, more constructive methods (Ball & Lee, 2002). These findings are consistent in samples of non-clinical, female college students (Koff & Sangani, 1997; Mayhew & Edelman, 1989). Mayhew and Edelmann (1989) found that individuals with elevated levels of disordered eating symptoms were more likely than low scorers to report using avoidant coping strategies and that such avoidant coping strategies were directly related to body dissatisfaction.

Several correlational studies have underlined the relevance of dissociative states in body dissatisfaction (Beato, Rodriguez, & Belmonte, 2003; Valdiserri & Kihlstrom, 1995; although see Gleaves & Eberenz, 1995) and eating pathology (Everill et al., 1995; Katz & Gleaves, 1996; although see Waller et al., 2003 and Covino, Jimerson, Wolfe, Franko, & Frankel, 1994). For example, bulimic individuals consistently report more dissociative experiences than non-clinical controls (Everill et al., 1995; La Mela, Maglietta, Castellini, Amoroso, & Lucarelli, 2010), with the frequency of dissociative experiences being positively related to frequency and severity of binge episodes (Everill et al., 1995; Gleaves & Eberenz, 1995; La Mela et al., 2010; Lyubomirsky, Casper, & Sousa, 2001; Swirsky & Mitchell, 1996). Relations have also been established among dissociation and unhealthy eating attitudes in non-clinical populations (Meyer & Waller, 1998; Rosen & Petty, 1994; Valdiserri & Kihlstrom, 1995). Additionally,

research has found that dissociation mediates the relationship between negative experiences (e.g., shame, stress, anxiety, and helplessness) and abnormal eating in clinical and non-clinical samples (Everill et al., 1995; Kent, Waller, & Dagnan, 1999).

Findings from experimental studies support the notion that reducing self-awareness by distraction can lead to disinhibited eating. Schotte, Cools, and McNally (1990) found that individuals who restrained their eating were more prone to become disinhibited in their eating whilst watching an intensely captivating (and upsetting) film in contrast to when they viewed a more neutral film. Similarly, Heatherton, Polivy, Herman, and Baumeister (1993) found that circumstances that endorse low self-awareness (i.e., viewing a distracting movie) were more likely to prompt disinhibited eating as opposed to conditions that endorse high self-awareness (i.e., viewing a movie of one's performance on a problem-solving task). Disinhibition of eating is not a general effect of (or association with) movie watching, as the content of the movie appears important; movies that draw attention to the self are more likely to prompt periods of disinhibited eating.

Experimental studies have also demonstrated that disordered eating can be prevented or delayed by increasing level of self-attention. Paying attention to one's eating seems to preclude disinhibition and preserve eating restraints, both among dieters (Pecsok & Fremouw, 1988; Polivy, Herman, Hackett, & Kuleshnyk, 1986) and obese binge eaters (Pliner & Iuppa, 1978). For instance, individuals who were observed (by the experimenter) while eating resulted in their behaviour corresponding with societal standards of self-restraint (Heatherton, 1991; Herman et al., 1979). Likewise, if dieters are advised to

observe their eating (by counting frequency of bites), their restraint becomes more intense and they develop a certain level of immunity to disinhibited eating for the period they engage in self-monitoring (Pecsok & Fremouw, 1988).

Other experimental studies have used the Stroop paradigm (Stroop, 1935), as a way of testing the various tenets of escape theory. The Stroop paradigm is considered to reflect interference in cognitive processing and requires the colour-naming of the ink in which a word is printed rather than the naming of the word itself. Attention to information is manifest through a delay in colour-naming. Studies using Stroop tasks have involved general threats (e.g., ego (self-esteem) threats) (Waller & Meyer, 1997; Waller, Quinton, & Watson, 1995) and threats considered salient to unhealthy eating (e.g. food, weight, and shape related information) in both clinical and non-clinical female samples. Compared to non-eating-disordered controls, AN and BN women show an initial attentional bias towards the threat and significant slowing of the processing of threat information in contrast to neutral information (McManus, Waller, & Chadwick, 1996; Waller, Watkins, Shuck, & McManus, 1996). Furthermore, these biases are not exclusive to eating disordered women, and also occur in non-clinical dieters (Huon & Brown, 1996; Meyer, Waller, & Watson, 2000).

In another experimental study, Hallings-Pott, Waller, Watson, and Scragg (2005) studied the possibility that dissociation is not only a broad attribute of the individual, evident across all contexts (i.e., a trait), but also a time-restricted response to a particular setting (i.e., a state). Hallings-Pott et al (2005) examined individuals with BN as well as non-clinical women, each of who was exposed to subliminal, neutral, and threat cues prior to completing measures of dissociation, anxiety and mood. The findings indicated that the subliminal threat cue

substantially increased state dissociation (particularly derealization levels) in the individuals with BN however had little influence on the non-clinical sample.

Whilst most of the aforementioned studies involve the assessment of rapid, automatic responses, Meyer et al. (2005) conducted their study on women with AN and BN using a strategic/purposive processing task (i.e., involving the solution of neutral, food-related, and threat-related anagrams). They evaluated whether individuals demonstrated cognitive avoidance of ego threats and assessed the relationship of such avoidance with bulimic psychopathology. They found that cognitive avoidance of threat related information was only demonstrated amongst those individuals with bulimic characteristics. The existence of bulimic behaviours (i.e., bingeing and vomiting) was the most apparent factor linked with such avoidance. These results have also been replicated in two experimental studies of nonclinical women (Waller et al., 1995; Waller & Meyer, 1997).

The abovementioned studies suggest that it is when the individual is asked to actively process and detect threat cues (e.g., solving anagrams), that there is a slowing of cognitive processing (cognitive avoidance). In comparison, when the individual has a reasonably brief period of time to process the threatening stimulus and where active identification is not a task demand (e.g., Stroop tasks), there is an initial attentional bias towards the threat (Meyer, Waller, & Watson, 2000). Beck and Clark (1997) raised the possibility that threat is processed in distinctive ways over time, that is, automatically and then strategically. There may be an initial attentional bias and orientation towards threat and afterward the use of intra-psyche mechanisms that allow reduced awareness of that threat (i.e., dissociation/cognitive avoidance). Taken together, these results indicate that threatening stimulus result in enhanced state dissociation among this clinical

group. It is this state dissociation that is the immediate response to both subliminal threat- and food/shape-related cues and it is such behaviours that can serve the useful and adaptive function of “blocking” awareness of threatening cognitions and emotions (Baumeister, Heatherton, & Stice, 1994).

Empirical Support for the claims of Objectification Theory

Self-objectification has been linked with several negative outcomes in women, comprising body shame and body dissatisfaction (Calogero, 2004; Stice, 1994) as well as ED symptomatology (e.g., Calogero, Davis, & Thompson, 2005; Calogero, 2009; Szymanski & Henning, 2007). The theorized associations between self-objectification, body shame, and body dissatisfaction, and disordered eating, have also been supported in cross-sectional studies (Augustus-Horvath & Tylka, 2009; Greenleaf, 2005; Grippo & Hill, 2008; Moradi et al., 2005). Cross-sectional studies also show that body dissatisfaction either partially or fully mediates the relationship between self-objectification and disordered eating in non-clinical populations (Noll & Fredrickson, 1998; Tiggemann & Slater, 2001). However, a longitudinal investigation in a non-clinical sample of undergraduate women indicated that body dissatisfaction and body shame failed to mediate the relationship between self-objectification and eating disorder symptoms (Rolnik, Engeln-Maddox, & Miller, 2010).

The role of interoceptive awareness (IA).

Extant literature provides evidence for a link between self-objectification and IA, with lack of IA being correlated with greater ED symptoms (Muehlenkamp & Saris-Baglama, 2002; Sim & Zeman, 2004). Although the role of IA appears important to the understanding of objectification theory and eating pathology (Lilenfeld et al., 2006; Matsumoto et al., 2006), the specific nature of

the deficits and their association with disordered eating remains uncertain.

Further, as research has yielded inconsistent support, it is difficult to ascertain how/where IA fits in the model.

The eating disorder literature has centered its work on two areas of deficiency, jointly referred to as poor interoceptive awareness; uncertainty about what somatic and affective state one is experiencing, and fear or guilt regarding affective experience (Merwin et al., 2010). Research from longitudinal studies has shown that poor IA is predictive of ED symptomatology, subsequent to treatment and at long-term follow-up. For example, a prospective study of patients treated for AN found that poor IA at baseline predicted disorder severity 5-10 years later (Bizeul, Sadowsky, & Rigaud, 2001). It is worth noting that the treatment did not specifically target IA and thus improvements of IA and subsequently eating pathology may emerge regardless of the type of treatment provided. Furthermore, Gustafsson, Edlund, Kjellin, and Norring (2009) conducted a study to examine longitudinally potential predictors that may represent risk and protective factors in the development of disordered eating in a non-clinical sample of adolescent girls. They found that high levels of IA were protective against emergent disordered eating four to five years later.

Several studies have also found significantly higher levels of alexithymia (a personality trait characterised by the failure to experience and convey emotions) among patients with AN, BN, and EDNOS compared with control subjects (Beales & Dolton, 2000; Berthoz, Perdereau, Godart, Corcoz, & Haviland, 2007). However, alexithymia has not been reliably associated with specific symptoms of EDs (Bourke et al., 1992; Cochrane, Brewerton, Wilson, & Hodge, 1993; Schmidt, Jiwany, & Treasure, 1993). As these measures assess

inability to express emotions, other forms of IA such as deficits in physiological cues and internal states specific to eating (i.e., hunger and satiety cues) may be more relevant to the incidence of binge/overeating. Extant research support the assertion that body shame and body dissatisfaction are related to the inability to identify hunger and satiety signals (Muehlenkamp & Saris-Baglama, 2002) and that poor IA of hunger and satiety predicts disordered eating among non-clinical samples of women (Pike, 1995; Tylka & Hill, 2004).

The literature is inconclusive about the extent to which IA mediates the relationship between self-objectification and ED symptoms, particularly in non-clinical samples. While Muehlenkamp and Saris-Baglama (2002) found an association between self-objectification and IA in non-clinical college women, IA did not mediate the association between self-objectification and eating pathology. In Tiggemann and Slater's (2001) study, they also demonstrated no significant associations between self-objectification and awareness of internal bodily states, and disordered eating. Similarly, Tiggemann and Kuring (2004) found that awareness of internal bodily states did not mediate the relationship between self-objectification and disordered eating. Contrary to these findings, Leon and his colleagues found both in cross-sectional (Leon, Fulkerson, Perry, & Cudeck, 1993) and prospective studies (Leon, Fulkerson, Perry, & Early-Zald, 1995) that poor IA was one of the main indicators of disordered eating. More recently, Myers and Crowther (2008) investigated the associations between self-objectification, IA, and disordered eating attitudes using a broad measure of IA that captured both awareness of emotions and feelings of hunger and satiety. Their findings have been the only research to corroborate Fredrickson and Robert's

(1997) supposition that IA mediates the association between self-objectification and disordered eating.

As has been previously noted in the literature, discrepancies in these findings are likely to be the result of the assessment instruments used to measure IA (Myers & Crowther, 2008). Leon and his colleagues (1993, 1995) and Myers and Crowther (2008) used the Interoceptive Awareness subscale from the Eating Disorders Inventory (EDI-IA; Garner et al., 1983), which assesses the ability to discriminate between emotional and visceral (feelings of hunger and satiety) states. Tiggermann and Slater (2001), on the other hand, utilised the Private Body Consciousness subscale of the Body Consciousness Questionnaire (Miller, Murphy, & Buss, 1981), which is a measurement of internal bodily sensations. In contrast, Muehlenkamp and Saris-Baglama (2002) created their own Alexithymia measure, which assesses problems recognising and expressing emotions, and they developed a latent variable using this measure and the Difficulty Identifying Feelings subscale from the Toronto Alexithymia Scale (TAS; Bagby, Parker, & Taylor, 1994).

These differences in assessment highlight the potential importance of the amalgamation of lack of awareness of hunger, satiety and of emotions is to ED symptoms. As discussed earlier, Stice's dual pathway model (1994; see Figure 1) has hypothesized that the development of disordered eating takes place via two pathways; one through dietary restraint, whereby cognitive mechanisms may exceed the physiological cues of hunger and satiety (Heatherton, Polivy, & Herman, 1989), and the other via negative affect, in which binge eating symptoms may result in an effort to alleviate negative aversive states (Stice, 1994). It has been well documented within the literature that individuals with disordered eating

behaviours encounter problems identifying awareness of hunger and satiety (Bruch, 1962) as well as emotional states (Bydlowski et al., 2005). It is for this reason that researchers have raised the possibility for the construct of IA to be encapsulated by a scale that features items appropriate to both of these aspects of awareness of one's internal states (Myers & Crowther, 2008). Further, it may be worthwhile to separate these two aspects, as it is important to distinguish the emotional aspect from hunger aspects of IA. At present, it appears hunger and satiety aspects are often measured with emotions, whereas emotions are measured separately.

Despite it seeming reasonable to believe that individuals who feel disconnected from their internal experiences will report higher rates of bulimic pathology and ED symptoms, the findings are varied. This is at least partially attributable to cross-study differences in operationalization of IA. Further, as research has predominantly used a cluster of symptoms in the assessment of disordered eating, it is difficult to ascertain to what degree the relations of self-objectification and IA relate solely to binge eating.

SECTION III

SUMMARY AND RECOMMENDATIONS

In summary, this literature review has critically examined evidence suggestive of a relationship between body dissatisfaction and binge eating. Three models have been discussed: the dual pathway model (consisting of dietary restraint and negative affect pathways), escape from awareness model, and objectification theory. Despite empirical support for each of these models, no one model or theory in isolation appears adequate for the explanation of the relationship between body dissatisfaction and binge eating. Moreover, the novel aspects of each of these models appears complementary, more so than competing, suggesting the plausibility of a hybrid model which synthesizes the mediation pathways from each model into a more complete understanding of the link between body dissatisfaction and food consumption.

The literature was examined for evidence that a relationship between body dissatisfaction and binge eating exists. The dual pathway model provides strong evidence that dietary restraint may be sufficient for the development of unhealthy eating practices; however, it is clear that dieting does not always lead to binge eating. Further, as many studies have failed to distinguish between the different forms of dietary restraint and have utilised varying definitions of dieting, it is unclear which forms of dietary restraint are most likely to lead to a binge.

Additionally, extant research on the negative affect pathway suggests that while strong support is found for the link between negative affect and eating behaviours, the link between negative affect and *binge eating* is less well supported. Section II (above) raised the concern that overeating or even comfort eating may be more appropriate outcome measures as these are more common, both in the general

population and in ED populations, and more strongly linked to the proposed mediators.

The escape theory offers consistent support that individuals with body dissatisfaction have tendencies to be highly aware of themselves and that binge eating/overeating serves as a means of escaping the negative aversive emotions and cognitions associated with body dissatisfaction. The findings for the objectification theory on the other hand are varied. This is the result of the research being unclear as to how best to measure the construct of IA. Further, it is difficult to ascertain to what degree the relations of self-objectification and IA relate solely to binge eating as the majority of research has utilised a combination of symptoms in the assessment of disordered eating. In light of the inconsistent findings and methodological limitations it remains unclear whether IA mediates the relationship between body dissatisfaction and binge eating behaviours.

This review has identified fundamental deficiencies in our understanding of the relative importance of the supported relationships between body dissatisfaction and binge eating. The gaps in the extant literature serve to highlight that no one models/theory appears satisfactory on its own; that the models appear complementary; and that there is a need to combine each theory into a single model in order to: (1) investigate the combined influence of these mediation pathways, as well as (2) determine which pathway explains the most variance in the relationship between body dissatisfaction and binge eating.

In Study I, a survey design will be employed to explore the possible relationships proposed by the aforementioned theories/models. In doing so, we will measure the relative importance of each model by establishing the extent to which each model/theory explains the link between body dissatisfaction and binge

eating. This study is necessary as research has often assessed each of these models individually and thus a comparative analysis of these models is required. The general approach will be to compare dietary restraint, negative affect, escape from awareness, and interoceptive deficits for their ability to explain variance in ED symptoms, including body dissatisfaction and binge eating. In doing so, a refined mediation model will be proposed which takes the components of these models that significantly mediate the body dissatisfaction-binge eating relationship.

Study II will then be informed by the findings of Study I with the aim of exploring this refined model further utilizing the experience sampling methodology (ESM; Csikszentmihalyi & Larson, 1987) that allows for dynamic assessments of model-implied relationships. This refined model will be assessed over a period of 7 days through the use of a mobile phone device with access to the internet. The ESM approach will allow for a more detailed insight into the context-dependent nature of body dissatisfaction and its relationship with binge/comfort eating. By sampling these variables *in situ* and on multiple occasions over an extended period, the author will be able to (1) test the associations in real time, (2) establish the temporal precedence, (3) evaluate how the relationship becomes stronger or decays as the lag between IV, mediator(s) and DV increases, and (4) determine whether the model is more appropriate for some individuals than others by evaluating random effects.

CHAPTER TWO

A MODEL COMPARISON OF THE BODY DISSATISFACTION-BINGE EATING RELATIONSHIP

Given the potential treatment implications of understanding the mechanisms by which body dissatisfaction promotes binge eating, further testing of these models is required. To date, several prominent explanations have been proposed to account for the link between body dissatisfaction and binge eating: the dual pathway model (Stice, 2001) (comprising dietary restraint and negative affect pathways), escape from awareness model (Heatherton & Baumeister, 1991), and objectification theory (Noll & Fredrickson, 1998).

The aforementioned review of the literature suggests that despite ample empirical support for each of these models/theories when tested individually, there are instances where body dissatisfaction leads to binge eating (or simply that overeating/binge eating occurs) in the absence of these mediators, suggesting that the mediator is not a *necessary* precondition. Taken together, this suggests the possibility of multiple pathways through which body dissatisfaction leads to binge eating. Study I will therefore adopt this view, and examine: (1) whether the three models (when combined) adequately account for the shared variance between the IV and DV, and (2) whether a hybrid model is most suitable for explaining the link between body dissatisfaction and binge eating. To the authors' knowledge, the relative contributions of these proposed mediators have not been evaluated, nor has it been evaluated whether these models (when considered jointly) fully mediate the relationship between body dissatisfaction and binge eating. Examining the relative significance of each of these mediators/models is valuable as it allows for recognition of the different mechanisms at play within each

model/theory and underscores and values the notion that there are varying means via which body dissatisfaction leads to binge eating. Given the complexities in the body dissatisfaction-binge eating link and the potential treatment implications of understanding the mechanisms by which body dissatisfaction promotes binge eating, further testing of these models is required. Moreover, as each of these models proposes markedly different mechanisms to account for the association between body dissatisfaction and binge eating, it is plausible to suggest that each may uniquely contribute to explanation of this main relationship. This relative exploration of the models/theories explicating this relationship is timely and presents a necessary precondition for further evaluation of the perplexing relationship between body dissatisfaction and binge eating behaviours.

The present study rectifies these gaps by assessing the individual and combined predictive value of the dual pathway, escape from awareness and objectification theory modeling of the relationship between body dissatisfaction and binge eating. Based on past research (Everill et al., 1995; Myers & Crowther, 2008; van Strien et al., 2005), it is hypothesized that each model will significantly mediate the direct path when tested separately, and that a combined (hybrid) model of these three models will provide more accurate modeling of the relationship between body dissatisfaction and binge eating.

Method

Participants

A convenience sample of 412 adult women, aged between 18 and 40 years ($M=25.25$, $SD=5.25$), participated in the study. Demographic data including age, height, and weight were assessed in a demographic questionnaire. Body mass

index (BMI) was calculated as weight in kg/height in metres². National Institute of Health (NIH, 1998) guidelines were employed to interpret body mass index (BMI) scores: 4% of this sample were “underweight” (BMI<18.5), 69% were “normal weight” (BMI 18.5-24.9), 17% were “overweight” (BMI 25.0-29.9), and 10% were “obese” (BMI≥30.0). For the overall sample, average BMI was 24.01 ($SD=5.25$). Participants were limited to being English speaking and having access to a computer in order to complete the survey.

Materials

Demographics.

Demographic data including age, height, and weight were assessed in a demographic questionnaire.

Eating disorder symptomatology. The Eating Disorder Examination-Questionnaire version 6 (EDE-Q 6.0; Fairburn & Beglin, 1994, 2008) is a self-report questionnaire version of the Eating Disorders Examination (EDE; Fairburn & Cooper, 1993). The questionnaire consists of 28 Likert-style items that assess the number of days out of the past 28 that attitudinal, emotional, and behavioural symptoms of disordered eating were present. Each item is answered using a 7-point scale ranging from 0 (*no days*) to 7 (*every day*). Symptom severity was measured for each of the following characteristics of eating disorders: (1) Dietary restraint (“Have you been deliberately trying to limit the amount of food you eat to influence your shape and weight?”); (2) Concern with body weight (“Has your weight influenced how you think about (judge) yourself as a person?”); and (3) Concern with body shape (“How uncomfortable have you felt seeing your body (e.g. in the mirror, in shop window reflections, while undressing or taking a

bath)?”). Given that the present study explored the effects of overall body dissatisfaction (as opposed to the specific aspects of dissatisfaction), and since the measures of weight and shape concerns were highly correlated ($r = .93$), the two subscales were averaged together to produce a single measure of body dissatisfaction. Other authors (e.g., Fuller-Tyszkiewicz & Mussap, 2008) have also performed this step on the same grounds.

The EDE-Q subscales have demonstrated good test-retest reliability (following a 10-month interval) (Grilo, Masheb, Lozano-Blanco, & Barry, 2003; Mond, Hay, Rodgers, Owen & Beumont, 2004) and acceptable internal consistency (Peterson et al., 2007). Additionally, concurrent and discriminant validity support the use of the EDE-Q as a screening tool in clinical practice (Binford, LeGrange & Jellar, 2005) and a high level of agreement between EDE-Q subscale scores and EDE subscale scores has been established in community samples with both measures demonstrating the ability to distinguish between eating disorder and non-eating disorder cases (Berg, Peterson, Frazier, & Crow, 2011; Mond et al., 2004; Mond et al., 2008). Further, the subscale scores of these instruments have correlated with scores on measures of similar constructs, such as the dietary restraint measures of the Three-Factor Eating Questionnaire (Bardone-Cone & Agras, 2007; Bardone-Cone & Boyd, 2007).

Binge eating symptoms. Given the focus on binge eating in the current study, it was considered important to assess the various symptoms (i.e., the evaluative, emotional, and behavioural) of binge eating. In light of this, question 4 of the Questionnaire of Eating and Weight Patterns- Revised (QEWPR; Spitzer et al., 1992) was included. This question measures the occurrence of 6 symptoms of bingeing: rapid consumption of food, eating until uncomfortably full, eating

despite not being hungry, eating large quantities of food throughout the day, eating alone, and feeling guilt and shame about a binge episode. In the current study, the responses to these 6 sub-questions were computed to produce a tally of symptoms of binge eating, ranging from 0 to all 6 symptoms, with higher scores reflecting more probable cases of binge eating.

Psychometric studies comparing the QEWP with clinical interviews based on the criteria for binge eating disorder in the Diagnostic and Statistical Manual of Mental Disorders (DSM; APA, 2013) have demonstrated adequate test-retest reliability of the QEWP over a 3-week period (Celio, Wilfley, Crow, Mitchell, & Walsh, 2004; Nangle, Johnson, Carr-Nangle, & Engler, 1994; Spitzer, Yanovski, & Marcus, 1993). Further, the QEWP has shown good predictive validity for its ability to identify episodes of overeating and binge eating in BED participants at one week and three weeks (Nangle et al., 1994; Steinberg et al., 2004).

Interoceptive deficits. The Interoceptive Deficits (ID) subscale of the Eating Disorders Inventory version 3 (EDI-3; Garner, 2004) was used to measure the extent to which an individual experiences difficulty recognising and accurately identifying internal emotional states (“When I am upset, I don’t know if I am sad, frightened, or angry”) and physiological states of hunger and satiety (“I get confused as to whether or not I’m hungry”). Participants indicate their agreement with a series of 9 statements on a 6-point Likert scale ranging from 1 (*never*) to 6 (*always*), with the most maladaptive response receiving the highest score. The majority of previous research relating deficits in interoceptive awareness to eating pathology uses this scale (Clausen, Rosenvinge, Friborg, Rokkedal, 2011; Merwin, Zucker, Lacy, & Elliot, 2010). This subscale has good internal consistency, and yields adequate convergent and discriminant validity

amongst both eating disorder patients and non-clinical samples (Clausen et al., 2011; Cumella, 2006).

Emotional lability. The two emotional lability items of the Ten Item Personality Inventory (TIPI; Gosling, Rentfrow, & Swann, 2003) were used to measure propensity for negative mood states. Only the items measuring neuroticism (“I see myself as calm, emotionally stable”) (reverse scored as emotional stability) were incorporated as prior research has shown that of the five personality factors, the neuroticism dimension is most strongly associated with emotional stability (Davern, 2004; DeNeve & Cooper, 1998). Respondents are asked to rate their level of agreement with each statement using a 7-point Likert scale ranging from 1 (*disagree strongly*) to 7 (*agree strongly*), with a neutral midpoint. The emotional lability subscale of the TIPI has demonstrated acceptable test-retest reliability estimates across a 6-week time period (Gosling et al. 2003). In addition, the convergent and discriminant validity has been illustrated between measures of emotional lability subscale of the TIPI and well-established tools of personality such as the Big Five (Jonason, Teicher, & Schmitt, 2011; Livosky, Stevens, Hoff, & Surawski, 2012).

Escape from awareness. The self-distraction subscale of the Brief COPE Inventory (COPE; Carver, 1997) was used to assess participant’s tendency to escape from awareness when experiencing negative thoughts and feelings (“I turn to work or other substitute activities to take my mind off things”). All items are rated on a 4-point Likert scale ranging from 1 (*I usually don’t do this at all*) to 4 (*I usually do this a lot*). Carver (1997) performed a factor analysis of the Brief COPE and found it to be consistent with the full COPE. The subscales of the Brief COPE have also been found to have good internal consistency and acceptable

test-retest reliability estimates over an 8-week interval (Carver, 1997; Carver et al., 1989).

Table 2.1

Summary of Models, Relevant Variables, Questionnaires, and Subscales

Model	Relevant Variables	Questionnaires	Subscales
<i>Dual Pathway</i>	Dietary Restraint	Eating Disorder Examination-Questionnaire	Dietary Restraint
	Emotional Stability	Ten Item Personality Inventory	Neuroticism
<i>Escape from Awareness</i>	Self-distraction	Brief COPE Inventory	Self-distraction
<i>Objectification Theory</i>	Interoceptive Deficits	Eating Disorders Inventory	Interoceptive Deficits

Procedure

Ethics approval for the study was provided by the University's Human Research Ethics Committee (2010-006). Participants were invited to take part in the study via announcements at the beginning of tutorials and lectures in numerous classes (sampled across varying disciplines) at Deakin University's Melbourne campus. In addition, the relevant Unit Chairs of the various disciplines were contacted and announcements were made on Deakin University's student online learning management system, Desire to Learn (D2L). Participants were also recruited via the internet and social networking sites including Facebook, a web-based networking system that allowed the researcher to post a link of the study that can be seen by hundreds of individuals simultaneously. An interest group was created that allowed the general public to access this link. The link was

also posted on the researcher's personal page as well as on women's body image and health research interest groups.

Participation was voluntary and anonymous, and no monetary compensation or academic incentives were available. Prior to completing the questionnaires, the participants were informed of the purpose of the research. Interested participants followed a weblink provided in the announcement or included on the relevant webpage, which requested them to read a Plain Language Statement. Individuals who wished to participate pressed a button to indicate that they agreed with the conditions of participation, and upon clicking 'Agree' were directed to the online questionnaire. Participants completed the anonymous online questionnaire in their own time. The questionnaire was advertised to take approximately 20 minutes to complete. Participants were given the opportunity at the end of the survey to register their interest in receiving a summary of the results of the project by keying in their contact email. These contact details were not time-stamped, and were linked to a separate data file from the file containing all survey responses so that the researcher could not link email (and hence participant details) to survey responses. A summary of the correspondence between chosen measures and mediation models is provided in Table 2.1.

Power and sample size estimations.

The minimum sample size requirements for intended analyses were calculated using Green's (1991) formula for regression analyses:

$$N \geq (8/f^2) + (m - 1)$$

where m represents the number of predictors in the model, and f^2 is the metric for effect size. f^2 values of .02 are considered a small effect, .15 is considered moderate, and .35 is interpreted as a large effect (Tabachnick & Fidell, 2007).

The current study utilised Green's (1991) formula in reverse (i.e., solving for effect size based on knowledge of sample size) to determine the minimum detectable effect size based on the current study's sample of 408 cases. Calculations determined that this smallest effect was $f^2 < .02$, based on the assumptions that: (1) number of predictors was set at 5 (to include the IV and four proposed mediators), and (2) desired power would be .8, and (3) alpha was set at .05. Calculations determined that this smallest effect corresponds with a trivially small effect size.

Data Analytic Strategy

The results of the following analyses are divided into three sub-sections: (1) data screening procedures, (2) evaluation of descriptive statistics and correlations, and (3) mediation analyses.

Bivariate correlations were undertaken to explore the relationships between body dissatisfaction, proposed mediators (negative affect, dietary restraint, interoceptive deficits, and self-distraction), and the intended outcome variable (binge eating symptoms). The current study will utilise Cohen's (1988, 1992) criteria for interpreting effect size of correlations (e.g., r of .1-.3 = small effect, r of .3-.5 = moderate effect, and r of $>.5$ = large effect).

Mediation analyses were conducted to test the proposed influences of negative affect, dietary restraint, interoceptive deficits, and self-distraction for the relationship between body dissatisfaction and binge eating. These potential mediational pathways were tested if the following conditions, as specified by Baron and Kenny (1986), were met: (1) body dissatisfaction significantly correlates with binge eating, (2) body dissatisfaction significantly correlates with the assumed mediator, and (3) the assumed mediator significantly correlates with

binge eating. A decrease in the size of the body dissatisfaction regression coefficients following the addition of the mediator indicates the presence of mediation: if the IV's regression coefficient reduces to non-significance this suggests full mediation; if the regression coefficient is reduced yet still remains significant, this indicates partial mediation (Baron & Kenny, 1986; MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002).

For relationships that met these preconditions, mediation effects were tested for significance using a bias-corrected bootstrapping resampling method (Preacher & Hayes, 2008) to more accurately estimate confidence intervals for the mediation effect. In these mediation models, age and BMI were added as covariates given their known association with body dissatisfaction and binge eating (Grilo, 1998; Jackson, Grilo, & Masheb, 2002).

While there is a tendency for researchers to perform mediation analyses via multiple regression and to employ Sobel's (1982) test of coefficients to evaluate the significance of the change in the unstandardized regression coefficient (Mallinckrodt, Abraham, Wei, & Russell, 2006), there are several important reasons as to why this method was not implemented in the current study. Sobel's test converts the mediation effect into a z-score, which assumes a normal distribution. However, it has been shown that the outcome of two normally distributed variables tends to be asymmetric and highly kurtotic (MacKinnon, Warsi, & Dwyer, 1995), and that the confidence intervals resulting from a skewed sampling distribution is typically too wide in the direction of the null hypothesis and too narrow in the direction of the alternative hypothesis (MacKinnon & Dwyer, 1993; Mallinckrodt et al., 2006; Stone & Sobel, 1990). Accordingly, the confidence intervals around the calculated effect are imprecise

and unduly favour non-significant mediation effects (MacKinnon, Lockwood, & Williams, 2004). This absence of statistical power is most evident when the sample size is small and/or the effect size is modest.

Thus, as a solution to overcome the problems associated with the use of the Sobel's test, the current study will employ a bias-corrected bootstrap re-sampling method (Shrout & Bolger, 2002), with the use of SPSS. Bootstrapping was used in the present study as it is considered within the literature as the most powerful and practical method of acquiring confidence limits for specific indirect effects (Briggs, 2006; Williams & MacKinnon, 2008). The hypothesized mediator models were assessed with the SPSS Macro for bootstrapped estimates developed by Preacher and Hayes (2008). Bootstrapping involves continually re-estimating the mediation effect (i.e., $a \times b$), every instance excluding one or more cases from the study's sample. The process of omitting cases is random and independent to ensure that elimination of a case for trial one does not affect whether or not it will be removed in subsequent trials. This technique provides a distribution of estimates from which the confidence intervals (2.5th and 97.5th percentiles, when assessing for two-tailed significance with $\alpha = .05$) are determined. Since this distribution is created on the foundation of random sampling as opposed to a pre-identified normal distribution, the ensuing confidence intervals estimates correct for biases due to non-normally distributed data and, accordingly, offer a more accurate assessment of the significance of a particular mediation effect. Given the current study is also researching the effects of multiple mediators, an additional advantage of the Macro is that it provides output informing the combined and unique contributions of mediators.

Proportion reduction in variance (PRV) was calculated to determine the proportion of the total IV-DV relationship attributable to a given mediator. The PRV was calculated using the following formula:

$$PRV = ((c - c')/c) * 100$$

where c is the total effect of body dissatisfaction on binge eating, and c' is the direct effect of body dissatisfaction on binge eating, controlling for the indirect effect via the mediator(s). PRV values range from 0 to 100, with 0 indicating that the mediator failed to account for any of the shared variance between body dissatisfaction and binge eating, whereas 100 indicates that the mediator(s) accounted for all shared variance in this primary relationship.

Each of the proposed mediation models (dual pathway, escape from awareness, and objectification theory) was first tested separately to evaluate their total impact on the body dissatisfaction-binge eating relationship. Then, a full model containing all mediators was run to evaluate the relative contributions of each of the models.

Results

Data screening

Preliminary data screening revealed missing values (less than 2% overall), spread at random across the items and participants. If participants omitted responses to diagnostic symptoms, it was assumed by the researcher that these symptoms were absent. Therefore, missing values for items that comprise the EDE-Q subscales were replaced with a score of 0 ('No days') and missing values for the QEWP items (i.e., BINGE) were replaced with a 'No' response (for the presence of a symptom). For Age and BMI, missing values were replaced with

median values. For all other variables, missing values were replaced using expectation maximization.

All scales were examined for violations from normality, using Curran, West, and Finch's (1996) guidelines of absolute skew between -2 and +2, and absolute kurtosis values between -7 and +7 as acceptable. Ten univariate outliers (absolute value >3.29 or < -3.29 standard deviations from the mean) were identified and substituted with the value that coincides with 3.29 standard deviations. Four multivariate outliers were identified and deleted. The results of the subsequent analyses are for the 408 remaining cases.

Bivariate correlations

Table 2.2 displays the means, standard deviations, Cronbach's α , and inter-relationships for the measures of dietary restraint, body dissatisfaction, number of binge eating symptoms, interoceptive deficits, emotional stability, and self-distraction used in the present study. Cronbach's α is not reported for binge symptoms (BINGE) because as this variable represents a tally of symptoms, Cronbach's α is unsuitable. Cronbach's α values range from .71 to .88 and are all within the acceptable to excellent range.

Bivariate correlations showed that body dissatisfaction had moderate positive association with binge eating symptoms. Body dissatisfaction was significantly related to all proposed mediators, with magnitude of effect ranging from small ($r = .18$ with self-distraction) to moderate-to-large ($r = .48$ with dietary restraint). All proposed mediators were significantly related to binge eating symptoms.

Table 2.2

Bivariate Correlations (Pearson's r Values are Reported)

	1	2	3	4	5	6
1. Body dissatisfaction	.88					
2. Binge symptoms	.39**	n/a				
3. Dietary restraint	.48**	.26**	.82			
4. Interoceptive deficits	.34**	.25**	.32**	.84		
5. Emotional stability	.28**	-.20**	-.27**	-.59**	.76	
6. Self-distraction	.18**	.19**	.19**	.35**	-.16*	.71
Mean	33.78	1.60	9.73	15.26	4.28	9.62
SD	19.22	2.16	6.93	7.65	1.52	2.98

Note: * $p < .01$, ** $p < .001$

n/a = not applicable. The numbers presented in bold along the main diagonal represent internal consistency values (i.e., Cronbach's α) for these variables.

Mediation analyses

The three pre-conditions for mediation models were obtained for all models. Mediation effects proceeded first individually for each model (Table 2.3), and then together in a full model with all proposed mediators (Table 2.4). When considered separately, the dual pathway model best accounted for the body dissatisfaction-binge eating relationship, with both dietary restraint ($a*b = -.01$, $p < .05$, 95% CI: -.024, -.00) and emotional stability ($a*b = -.01$, $p < .05$, 95% CI: -.013, -.00) making significant unique contributions to the model, and jointly accounting for a 23.83% reduction in variance in the IV-DV relationship. The objectification theory also reliably explained some variance in the IV-DV relationship ($a*b = -.01$, $p < .05$, 95% CI: -.018, -.00), although the proportion reduction in variance was small (PRV = 3.85). Self-distraction failed to mediate

the body dissatisfaction-binge eating relationship ($a*b = -.00, p > .05$, 95% CI: $-.007, .00$; PRV = 3.85). When considered jointly, only dietary restraint made a significant unique contribution to the IV-DV relationship ($a*b = -.01, p < .05$, 95% CI: $-.021, -.00$). Moreover, the PRV for the combined model was only marginally better than for the dual pathway model by itself (PRV complete model = 26.23 versus PRV dual pathways model = 23.83). The direct path (IV-DV) remained significant, even after accounting for the combined contributions of the IVs.

Table 2.3

Testing the Mediation Models Individually

	a*b	c	c'	PRV
Dual pathway model				
Dietary restraint	-.01*	-.08	-.06	23.83
Emotional stability	-.01*			
Escape from awareness				
Self-distraction	-.00	-.08	-.08	3.85
Objectification theory				
Interoceptive deficits	-.01*	-.08	-.07	12.27

Note: * $p < .05$

Table 2.4

Testing the Mediation Models Together

	a*b	c	c'	PRV
Dietary restraint	-.01*	-.08	-.06	26.23
Emotional stability	-.00			
Self-distraction	-.00			
Interoceptive deficits	-.00			

Note: * $p < .05$

Discussion

The primary aim of Study I was to test the effectiveness of the dual pathway, objectification theory, and escape from awareness models of potential mediators of the relationship between body dissatisfaction and binge eating. The study sought to determine which potential mediators (dietary restraint, emotional stability, self-distraction, and interoceptive deficits) explained the most variance in the body dissatisfaction-binge eating relationship. These models were tested individually and in combination to determine their relative contribution towards, and ability to fully mediate, the body dissatisfaction- binge eating relationship.

The present findings offered support for these models when tested separately. Both proposed mediators of the dual pathways model (dietary restraint and emotional lability) were significant unique contributors, and accounted for approximately one-quarter of the shared variance between body dissatisfaction and binge eating. These findings are consistent with previous research that has shown support for both pathways of dietary restraint and negative affect (Ricciardelli & McCabe, 2001; Stice & Agras, 1998; Stice, 2001; Stice, Nemeroff, & Shaw, 1996; Stice, Presnell, & Sprangler, 2002; Shepherd &

Ricciardelli, 1998; Stice, Ziemba, Margolis, & Flick, 1996). Interoceptive awareness – as proposed by objectification theory – also significantly mediated the IV-DV relationship when tested individually, although the impact of this mediator on the model was considerably smaller than the dual pathway mediators. The extant literature has been inconclusive about the extent to which interoceptive awareness mediates the body dissatisfaction-binge eating relationship. Of the studies that have successfully demonstrated this mediational effect, all have utilised an aggregate of eating disorder symptoms in their assessment of the body dissatisfaction and disordered eating relationship (Leon et al., 1993; Leon et al., 1995). Thus, this is the first study to evaluate the mediating influence of interoceptive awareness on the body dissatisfaction-binge eating relationship utilising binge eating as a distinct outcome measure. Interestingly, the present study found an effect with binge eating as the outcome, whereas the aforementioned studies failed to find an effect with a more generic, aggregate of ED symptoms. The discrepancy between past and current findings may be attributable to design differences. The significant effect of binge eating in the present study appears small at best, raising the possibility that prior studies failed to detect this effect. While interoceptive awareness was found to mediate the body dissatisfaction-binge eating relationship in the present study, interoceptive awareness may not be related to (all of) the other aggregated ED symptoms, hence further dampening an already small relationship, and making it even more difficult to obtain a significant effect in prior studies. Further, it may be that some eating disorder symptoms used in these prior studies are unlikely to be related to interoceptive awareness. For example, the relationship between interoceptive awareness and binge eating makes sense when one considers the impact that poor

interoceptive awareness has for undermining internal satiety cues, however it is questionable whether interoceptive awareness is also relevant to other eating disorder symptoms used in previous research such as internalisation of appearance standards, perfectionism, or maturity fears.

Surprisingly, self-distraction – a mediator derived from the escape from awareness model – failed to reliably account for variance shared between body dissatisfaction and binge eating. In light of the adequacy of sample size and the small effect size obtained for this mediation effect, explanations for this null effect based on insufficient power may be ruled out. However, a more plausible explanation for the null finding is the difficulty in measuring the mechanism of distraction that is central to the escape model. The present study measured these attitudes and behaviours “in general” to determine whether the tendency towards body dissatisfaction co-occurs with the tendencies to binge eat and engage in self-distraction. It is possible that the self-distraction effect on the body dissatisfaction-binge eating relationship is only potentiated in certain contexts (e.g., in extreme stress and/or perceived inability to cope directly with a threat). In such a case, the frequency with which individuals engage in self-distraction (as measured here) is less relevant than the context(s) in which the defense mechanism is enacted. Consistent with this view, several recent studies have demonstrated that binge episodes are more likely after a prolonged build-up of stress (Cartwright et al., 2003; Smyth et al., 2007), and this effect is most pronounced for those with poor coping skills (Freeman & Gil, 2004; MacNeil, Esposito-Smythers, Mehlenbeck, & Weismoore, 2012).

Present findings also suggest the superiority of the dual pathway model in accounting for the body dissatisfaction-binge eating relationship. In addition to

the larger proportion reduction in variance (PRV) values of this model than other tested models when evaluated separately, only dietary restraint (a dual pathway proposed mediator) significantly contributed to the IV-DV relationship in the full model with all mediators tested simultaneously. Thus, the findings from the current study showed that (1) the dual pathway was the model that was most strongly supported, and (2) minimal (and negligible) support was found for the escape theory and objectification model.

The present findings should be considered jointly with design limitations. First and foremost, the cross-sectional design indicates that the proposed mediation pathways of dietary restraint and negative affect could equally work in a re-arranged order and be of reciprocal causality. For instance, it is possible that binge eating may also lead to body dissatisfaction and, in turn, negative mood and dietary restraint. Longitudinal designs, in particular approaches such as the experience sampling method (ESM; Csikszentmihalyi & Larson, 1987) (e.g., Colautti et al., 2011; Lattimore & Hutchinson, 2010; Stein & Corte, 2003; Zunker et al., 2011), which assess momentary changes in state-like constructs, may be usefully employed to capture the dynamic nature of the relationships between body dissatisfaction, binge eating, and proposed mediators. The use of ESM designs would also allow researchers to distinguish between different arrangements of these variables by establishing temporal precedence of IVs and mediators before the DV event occurs. As detailed in the next chapter, there is some evidence from ESM studies to support the dual pathway model, but the model has yet to be tested in its entirety. Although the intention (and expectation) of Study I was to find a hybrid model which best predicted the body dissatisfaction-binge eating relationship, the current findings suggest that the dual

pathway is sufficient. Hence, the aim of Study II is to further assess the suitability of the dual pathway model for explaining the link between body dissatisfaction and binge eating in order to evaluate short-term prospective relationships between monitored variables, and to establish temporal precedence of suspected predictor variables in real time.

CHAPTER THREE

AN EXPERIENCE SAMPLING METHOD-BASED ASSESSMENT OF THE DUAL PATHWAY MODEL OF BINGE EATING

The literature review (see Section 1, Chapter 1) proposed several mediators for explicating the paradoxical relationship between body dissatisfaction and binge eating behaviours. Study I identified the dual pathway model as the best explanation for this link. However, it was noted that the cross-sectional nature of the study does not allow one to rule out other possible configurations of this association between key variables. Thus, Study II was designed with the purpose to further assess the dual pathway model, in real time using ESM.

Within the literature, there is clear evidence for aspects of the dual pathway model using experimental or ESM approaches. To date, ESM studies have confirmed the influence of: (1) negative affect and dietary restraint on binge eating episodes (Engelberg, Gauvin, & Steiger, 2005; Hilbert & Tuschen-Caffier, 2007; Stein et al., 2007; Zunker et al., 2011), and (2) body dissatisfaction on negative affect and dietary restraint (Colautti et al., 2011; Lattimore & Hutchinson, 2010).

However, to the author's knowledge, no research has tracked the full sequence from body dissatisfaction to binge eating in real time and in naturalistic settings. Experimental studies typically examine the relationship between mediator and outcome, for instance, manipulating mood or dietary restraint and then examining impact on overeating (Herman & Polivy, 1980; Howard & Porzelius, 1999; Mills & Palandra, 2008). As such, attempts to measure the mediation model proceed in a piece-meal, and possibly inaccurate, fashion.

Furthermore, the time constraints and questionable ecological validity of laboratory settings may not allow for monitoring of the whole process, as it would unfold in one's natural environment.

More recently, researchers have begun to utilise the experience sampling method as a way to monitor body dissatisfaction, overeating, dietary restraint, and mood over time, in less contrived settings. Participants complete brief surveys about these target variables at random intervals throughout the testing period, typically 5-10 times per day for a period of 1-2 weeks (Engelberg, Steiger, Gauvin, & Wonderlich, 2007; Heron, 2011; Rudiger, Cash, Roehrig, & Thompson, 2007). Proponents of ESM argue that it is better suited than cross-sectional and laboratory-based experimental studies to monitor dynamic, state-based relationships as they unfold, in naturalistic rather than artificial settings. Furthermore, the intensive longitudinal design allows researchers to evaluate short-term prospective relationships between monitored variables, and to confirm temporal precedence of suspected predictor variables, allowing for more sophisticated and multivariate models of inter-relation between variables over time (Beal & Weiss, 2003; Wichers et al., 2011).

Despite these advantages, ESM also poses challenges in terms of how best to operationalize state-based variables and model their inter-relationships. The paragraphs below summarise some key areas of contention, showing potential tensions between current and optimal methods of modeling these associations. Discussion of these differences helps inform the research design decisions made for Study II.

Standard ESM Designs

In typical ESM studies, researchers have modeled the ability of mood or dietary restraint to predict concurrently assessed binge episodes or episodes reported at the next time point (e.g., Heron, 2011; Zunker et al., 2011). Depending on how many time points of data are collected per day, the next assessment may be several hours after the first (e.g., Barker & Galambos, 2009; Barker, Williams, & Galambos, 2006; Newman, O'Connor, & Conner, 2007; Redlin et al., 2002; Sherry & Hall, 2009), or may fall on the next day (e.g., Freeman & Gill, 2004). In some instances, where multiple assessments are made per day rather than a single assessment point each evening, researchers have aggregated the multiple mood assessments into a single index of mood for that day and recorded whether the person engaged in an episode of restraint or binge eating (e.g., Anestis et al., 2010; Engelberg et al., 2005). These daily estimates are then either assessed concurrently or the daily reports of the predictors on one day are used to assess outcomes on the following day (e.g., Barker et al., 2006; Crosby et al., 2009).

Concern #1 - Explicitly Modeling Time as a Covariate

The random intervals of assessment that feature in Study II cause the lag between any two time points to be potentially different (by up to 1-1.5 hours) from the lag between any other pair of time points. Accordingly, this may result in increased hunger levels and food cravings when the interval is long than when it is short. For this reason there is a need to co-vary time to control for error variance and confounding variables produced by the differences that arise when longer or shorter time lags are used. A further issue, which is allied to the first, is the aspect of optimising the time lag between assessment points to accurately measure the influence of one variable on another. While previous research has

typically assessed predictors concurrently or on the following day, there are additional – and perhaps better – ways of conceptualising the lagged association than correlating the predictor with the outcome score at the subsequent time point. Unfortunately, the optimal time lag in ESM research has not been systematically evaluated in prior research and is therefore largely unknown. This necessitates further empirical testing, and experimentation with different time lags to assess impact on strength of association between predictor and outcome.

Theoretically at least, it is probable that longer intervals may have the potential to increase duration of the predictor (e.g., dietary restraint) and therefore, the period of deprivation from food may increase the chances of a binge episode. On the other hand, it may be that increasing the time lag between other predictors (such as mood) and binge eating outcomes may actually extinguish the association, as the association may need to occur closer in time. This has been noted in previous research that has shown effects of mood to be stronger when the IV and DV are assessed closer together in time (Alpers & Tuschen-Caffer, 2001; Sherwood, Crowther, Wills, & Ben-Porath, 2000; Wegner et al., 2002). Hence, in addition to co-varying time, it is essential to investigate different time lags to examine the impact that this has on strength of the association between IV and DV.

Concern #2 - Optimising Modeling of Dietary Restraint

A further consideration that has been overlooked within the literature is the extent to which duration or chronicity of dietary restraint increases likelihood of a binge episode. While most ESM studies have modelled the association between dietary restraint and binge eating in real time using a single time-lag occurrence (i.e., either one assessment per day, or at separate time points across

the course of the day), another possible method of formulating the dietary restraint-binge eating link is to operationalize dietary restriction in terms of consecutive attempts at restraint. Since dietary restraint typically involves a sustained attempt to reduce type and/or amount of food consumed (de Witt Huberts, Evers, & de Ridder, 2012; Herman & Mack, 1975; Wadden, Brownell, & Foster, 2002), it is different to other antecedents for binge eating (such as negative affect) that have an immediate or quick onset. Intervals in diary methods and ESM research should complement the processes that are being investigated (Reis & Gable, 2000) and as such, the duration, chronicity, or persistence in the dieting behaviour is potentially a better indicator of the eating outcome. Hence, consecutive dietary restraint efforts are likely to be a more accurate and therefore stronger predictor of binge eating outcomes than single instances of restraint.

Concern #3 - Optimising Modeling of Negative Mood States

In ESM research, negative mood has typically been modelled in terms of group-mean centered deviations from participants' mean level of negative mood. While this approach intends to address the question of whether self-reported mood state (above one's own usual mood state) increases the probability of a binge or comfort eating episode, in some instances even when the individual has exceeded her/his average negative mood, this may be at a contented level that does not distress the individual to the point at which s/he engages in binge or comfort eating. Hence, a threshold approach may need to be adopted whereby individuals report instances of heightened negative mood that are potentially more uncomfortable and thus sufficient to elicit a response (i.e., prompt binge eating or comfort eating episodes).

Concern #4 - Choice of Appropriate Outcome Measures

Binge eating is a relatively rare event both in clinical and non-clinical populations (Hay, 2003; Hudson, Hiripi, Pope, & Kessler, 2007; Jones, Bennett, Olmsted, Lawson, & Rodin, 2001; Racine, Burt, Iacono, McGue, & Klump, 2011). Experimental manipulations and naturalistic explorations of mood and dietary restraint have rarely resulted in sufficient food consumption to qualify as a binge episode (Dingemans, Martijn, van Furth, & Jansen, 2009; Walsh & Boudreau, 2003). Using such a stringent and narrow outcome may overlook important dysfunctional eating behaviour that fails to qualify as a binge episode. It is likely that there are other aspects of eating behaviour that warrant consideration, such as temptation to overeat, and engaging in comfort eating (a less restrictive outcome than binge eating). Engelberg et al. (2005) showed that dietary restraint was more strongly predictive of temptation or urge to overeat than to binge eating, and on that basis argued that dietary restraint may potentiate binge eating episodes by promoting temptation to overeat rather than directly impacting food consumption, *per se*. Further, in cross-sectional (van Strien et al., 2005) and experimental studies (Ouwens et al., 2009), researchers have examined an extended model whereby they have included an intermediate step of comfort (or emotional) eating prior to binge/overeating. These studies have found negative affect to be related to overeating only via emotional eating. The pathway of restrained eating was not found to relate to comfort or overeating in either study.

Concern #5 - Potential Individual Differences in State-Based Associations

Finally, it is probable that the strength of the above mentioned mediation effects depend on trait level differences across individuals. For instance, it may be that for an individual with a healthy body image in general, or one who typically

does not endorse sociocultural standards of appearance, an instance of body dissatisfaction may not be catastrophic, and as such, s/he may be less inclined to engage in avoidance-focused behaviours (such as binge or comfort eating) as a means of resolving a dysphoric state (Heatherton & Baumeister, 1991).

The Present Study

To the author's knowledge, no study has tested all components of the dual pathway model in its entirety. The overall aim of Study II was to rectify this, utilising the ESM to determine whether dietary restraint and/or negative mood could explain the relationship between body dissatisfaction and subsequent binge/comfort eating in real time. However, in order to do this effectively, and in light of the aforementioned methodological challenges and omissions in prior experimental and ESM research, several alternate modeling approaches were used to develop the most accurate model of the way in which these variables relate to each other. As mentioned above, there are a variety of ways to model this relationship, and in order to test the dual pathway in real time, there was a need for these different approaches to be considered and evaluated in the same study.

The present study first used the traditional approach of one time point lag between IV, MVs, and DV when modelling the dual pathway model with ESM data. The mediation effect was tested as a random effect and regressed onto key trait-level variables that were expected to make the mediation effect more probable: Internalisation of appearance standards, trait body dissatisfaction, and eating pathology. Incorporating trait measures as predictors of the mediation effect allowed for examination of the robustness of the dual pathway mechanisms and its generalizability across different subgroups of individuals (i.e., individuals of varying degrees of eating and body image pathology).

This traditional approach was augmented with alternative conceptualizations and modelling strategies. Specifically, the models were re-run with: (1) alternate outcome measures of comfort eating and temptation to overeat, as well as the traditional outcome of binge eating; (2) varied time lags between predictor and outcome event, ranging from 1 to 5 time points' gap between the two; (3) a cumulative model, whereby number of consecutive instances of dietary restraint or negative mood were used to predict likelihood of the outcome; and (4) a threshold model, whereby negative mood scores at or above 7 (Yes v No) were used to predict likelihood of the eating outcome. The threshold of 7 was chosen as it is sufficiently high on the scale to be deemed a severe negative mood state, however not at a heightened level at which it would be considered a rare event (and hence impractical cut-off).

Method

Participants

A total of 124 women volunteered to participate in the current study, and had an age range of 18 to 40 years ($M = 24.72$, $SD = 4.15$). Nine percent of participants had completed some high school education but had not graduated, 6.3% had graduated from high school, 24.5% were in the process of undertaking a Bachelor's degree, just over one-third of participants had obtained a Bachelor's degree (37.3%), 21.8% of participants were undertaking a postgraduate degree, and 9% of participants had obtained a Masters, PhD, law or medical degree. Most were working either full or part time in addition to studying (75.0%). Just under one-third (29.1%) of participants were single and approximately half (49.1%) of participants were in a relationship, with 10% of participants being married.

Body mass index (BMI) was calculated as weight in kg/height in metres². National Institute of Health (NIH, 1998) guidelines were applied to interpret body mass index (BMI) scores: 3.7% of this sample were “underweight” (BMI<18.5), 58.4% were “normal weight” (BMI 18.5-24.9), 33.3% were “overweight” (BMI 25.0-29.9), and 4.6% were “obese” (BMI≥30.0). For the overall sample, average BMI was 23.97 (*SD*=4.25). Participants were limited to being English speaking and having access to a computer in order to complete the survey and daily diary components.

Materials

Trait Measures (Phase 1: Pre-daily diary)

Demographics. The survey asked participants to provide information regarding their age, height, weight, education level, and relationship and employment status.

Internalization of appearance standards. The 9-item Internalization-General subscale of the Sociocultural Attitudes Towards Appearance Questionnaire-Version 3 (SATAQ-3; Thompson, van den Berg, Roehrig, Guarda, & Heinberg, 2004) was administered to measure the degree to which participants endorse and accept cultural ideals of physical appearance (e.g., “I would like my body to look like the models who appear in magazines”). Items were rated on a 5-point Likert scale from 1 (*definitely disagree*) to 5 (*definitely agree*). The SATAQ-3 has demonstrated content and convergent validity with regard to measures of body image and disordered eating, and they possess adequate internal consistency (Thompson et al., 2004). Cronbach’s alpha in the current study for internalization-general scores was .89.

Trait body dissatisfaction. The Body Image Satisfaction subscale of the Body Change Inventory (BCI; Ricciardelli & McCabe, 2002) is a 10-item measure used to assess trait body satisfaction. Respondents indicated on a 5-point Likert scale how satisfied they were with their chest, abdominal region, shoulders, arms, hips, thighs, stomach, weight, shape, and muscles. Response choices ranged from 0 (*very unhappy*) to 4 (*very happy*). Item responses were summed and subtracted from 40 so that higher total scores indicated greater body dissatisfaction. Scores on the body satisfaction subscale have been subjected to both exploratory and confirmatory factor analysis, have demonstrated high levels of internal consistency, satisfactory test-retest reliability, and concurrent and discriminant validity with other key measures of body concerns, such as the Stunkard's Figure Body Drawings and the Body Dissatisfaction subscale of the Eating Disorders Inventory (Ricciardelli & McCabe, 2002). Cronbach's alpha in the present study was .89.

Dietary restraint. The restrained eating behavior subscale of the Dutch Eating Behaviour Questionnaire (DEBQ; van Strien, Frijters, Bergers, & Defares, 1986) was used to evaluate how often participants utilise different dietary restraint behaviours ("Do you try to eat less at meal times than you would like to eat?"). Items were rated on a 5-point Likert scale, ranging from 1 (*never*) to 5 (*very often*), and averaged to form a single index of dietary restraint. The restrained eating subscale of the DEBQ has been shown to have good internal reliability and factorial validity (van Strien, 1996; van Strien et al., 1986), high predictive validity for actual restriction of food intake (van Strien, 2005), and high convergent and discriminative validity (Allison, 1995; van Strien, 2002; Wardle, 1987). Cronbach's alpha for the current sample was .92.

State-based measures (Phase 2: Daily diary)

State-based body dissatisfaction. The Body Image States Scale (BISS; Cash, Fleming, Alindogan, Steadman, & Whitehead, 2002) consists of six items designed to measure participant's momentary evaluative body image experiences at a given point in time. Participants rated their degree of satisfaction "right now at this very moment" in regards to the following domains of current body experience (1) physical appearance, (2) body size and shape, (3) weight, and (4) physical attractiveness. Furthermore, participants were asked to rate their current feelings regarding their looks relative to (5) how they typically felt, and (6) how the average person looks. Items were rated on a 9-point Likert scale ranging from 1 (*extremely dissatisfied*) to 9 (*extremely satisfied*). Scores for individual items were reverse coded and then summed together so that higher scores reflected greater state body dissatisfaction. The BISS has demonstrated high reliability and internal consistency scores across a range of contexts (i.e., neutral, negative- day at the beach, and positive- party compliments) (Rudiger et al., 2007). The BISS has also demonstrated good test-retest reliabilities over 2- to 3-week periods, as well as good predictive and convergent validity with selected trait-based measures of body image evaluation and investment such as Body Areas Satisfaction Scale (BASS; Giovannelli, Cash, Henson, & Engle, 2008) (Cash et al., 2002). Using Geldhof, Preacher, and Zyphur's (2013) method for calculating internal consistency of state-based scales in a multi-level framework, the maximal reliability for the BISS in the present study was estimated as .87.

Negative mood. The two negative mood items from the Trait Affect Scale (TAS; Blore, 2008; Colautti et al., 2011) were used to measure negative state affect. The two items of the TAS were modified so that participants were required

to indicate how they felt “right now” instead of “in general”. Items were rated on an 11-point Likert scale ranging from 0 (*not at all*) to 10 (*extremely*). Previous research has shown this measure to be sensitive to moment-by-moment fluctuations in mood (Blore, 2008; Davern, 2004; Yik, Russell & Feldman Barrett, 1999), and to correlate with other state-based constructs such as the Positive and Negative Affect Schedule (PANAS: Watson et al., 1988) (e.g., Blore, 2008; Colautti et al., 2011). In the present study, the maximal reliability was estimated as .92.

Eating practices. Participants were asked whether they had consumed food, engaged in dietary restraint (deliberately restricting food intake), and/or experienced an urge to eat unhealthy foods that they otherwise wouldn’t since last assessment. Follow-up questions were given to participants who answered Yes to any of these questions. The food consumption question was followed up with items to determine whether they engaged in comfort eating (*Did you eat to feel better?*) and/or showed symptoms consistent with a binge episode. Consistent with Fuller-Tyszkiewicz and Mussap (2008), the likelihood that the food consumption was a binge episode increased proportionally for the number of the following symptoms to which the participant answered Yes: (a) rapid consumption of food, (b) eating until uncomfortably full, (c) eating despite not being hungry, (d) eating large quantities of food (relative to your usual meal size), (e) eating alone, or (f) feeling guilt and shame after eating. Participants who answered Yes to the dietary restraint option were asked which of the following strategies they used to restrict food intake: (a) eat nothing, (b) eat only healthy foods, or (c) eat less than required to satisfy their hunger. Finally, participants who answered Yes to the urge to eat unhealthy foods option were asked to rate

their degree of temptation using a 7-point Likert scale ranging from 1 (*not at all*) to 7 (*extremely*).

Procedure

Ethics approval for the study was provided by the university's Human Research Ethics Committee. Participants were recruited via announcements at the beginning of tutorials and lectures in numerous classes (sampled across varying disciplines) at a large metropolitan university in Melbourne, Australia. Interested participants followed a link provided in the announcement, which requested them to complete the Plain Language Statement. Individuals who wished to participate were then directed to a web link to complete the questionnaire consisting of trait measures and demographics.

At the completion of the trait-based measures (Phase 1), participants were required to provide their mobile phone number and email address to enable the researcher to contact participants to arrange a 7-day period in which to complete the state-based measures of the study. Once participants nominated a range of dates they were available for the assessment period, they were scheduled to receive seven text messages per day over the course of seven days (Phase 2), via the use of the bulk SMS website, Red Oxygen. The text messages were scheduled at random intervals each day between the hours of 10am and 8pm, with a minimum of one hour between each text message to allow for sampling across the entire day. Each text message contained a web link that prompted participants to complete the state-based measures; this made it necessary for participants to own a mobile phone that had access to the internet. The hour and date was automatically recorded for all samplings. Once participants completed both trait- and state-based measures, they were mailed a \$20 gift voucher as an honorarium.

Data Analytic Strategy

Overview. Data analysis proceeded in four distinct stages. First, data were screened for missingness and potential violations pertinent to the intended analytic approach, multilevel modeling. While missing data do not necessarily need to be imputed prior to conducting multi-level modeling, the nature of the missingness must be determined as this has implications for interpretability of findings (Hox, 2002; Tabachnick & Fidell, 2007). Four participants were excluded from the study as they each failed to meet the 50% cut-off for completion of Phase 2 data (as per Colautti et al., 2011). No other participant missed more than 50% of the surveys and, given the model results were almost identical when these individuals were included versus excluded, the decision was made to retain all participants who met this 50% cut off. Second, descriptive analyses were undertaken to evaluate frequency of occurrence of the various eating-related variables (binge eating, comfort eating, dietary restraint, and temptation to overeat) in order to guide analytic decisions. Third, the primary analysis used the moment-by-moment data to test the dual pathway model in a manner consistent with past research (i.e., with a simple lag of one time point between variables, and with measures of body dissatisfaction, binge eating, dietary restraint, and negative mood). This step included consideration of individual differences in strength of the mediation processes proposed by the dual pathway model. Fourth, primary analyses were augmented with alternate ways of modeling this relationship, with particular emphasis on ways to model lagged effects, and consequences for results of using alternate operationalisations of the binge eating outcome.

As participants completed state-based measures on multiple occasions over the testing period, the data were hierarchical in nature, with responses to state-based surveys (Level 1 data) nested within individuals (Level 2). Accordingly, analyses conducted at stages three and four used multilevel modeling (MLM), a method that controls possible violations of the assumptions of independence that can arise when data are clustered within groups (Jackson, 2010). MLM considers each participant as a separate group and accordingly offers estimates of intra-individual and inter-individual variability in the relationships between state body dissatisfaction, mood, dietary restraint attempts, and eating episodes.

Continuous Level 1 predictors were group-mean centred so that scores on these variables could be interpreted as deviations from an individual participant's mean score over the testing period rather than as deviations from the grand mean (Hoffman & Gavin, 1998; Hox, 2010). Each individual's mean score on these predictors was entered at Level 2 in order to distinguish between- and within-individual variability the effects of these Level 1 predictors on the outcome variable. Given that time intervals were variable due to the random assessment schedule, time interval between assessment points was added as a covariate at Level 1 to control for relative weakening of longitudinal effects for longer gaps between assessment points. All analyses were conducted in Mplus Version 7.1, and used full-information maximum likelihood (FIML) estimation with robust standard errors to ensure estimates were unbiased by potential non-normality in the data (Muthén & Muthén, 1998-2011). Further details of these analyses are provided below.

Primary analyses. A lower level mediation model (1-1-1 model; Bauer, Preacher, & Gil, 2006) was conducted to test the dual pathway model, as the IV (body dissatisfaction), mediators (negative mood and dietary restraint) and outcomes (binge or comfort eating) were all state-based measures represented at Level 1 in a two-level MLM. Equations for the mediation model shown in Figure 1 are:

Level-1 equation for mediators:

$$\text{Mood}_{ij} = \beta_{m1i} + a_{1i} * \text{bd}_{ij} + d_{1i} * \text{time lag} + e_{ij} \quad [\text{Equation 1}]$$

$$\text{Diet}_{ij} = \beta_{m2i} + a_{2i} * \text{bd}_{ij} + d_{2i} * \text{time lag} + e_{ij} \quad [\text{Equation 2}]$$

Level-1 equation for outcomes:

$$\text{Binge}_{ij} = \beta_{oi} + b_{1i} * \text{mood}_{ij} + b_{2i} * \text{diet}_{ij} + c'_{i} * \text{bd}_{ij} + d_{3i} * \text{time lag} + e_{ij} \quad [\text{Equation 3}]$$

where i represents individual i and j represents the j th assessment point; a_{1i} and a_{2i} represent the relationship between the IV (state body dissatisfaction) and the two mediators (negative mood state and dietary restraint attempt), respectively; β_{oi} represents the intercept for the Level 1 outcome equation; β_{m1i} and β_{m2i} represent the intercepts for the two mediation equations; b_{1i} and b_{2i} represent the relationships between the DV (binge symptoms) and the mediators, controlling for each other and for the IV; c'_{i} represents the direct effect of the IV on the DV, and e_{ij} is the error term. Time lag is a Level 1 covariate, and $d_{1i} - d_{3i}$ are the coefficients representing its relationship with the outcome variable in the various models tested above.

Given the low frequency and count variable nature of binge symptoms for the sample as a whole, binge symptoms were recorded into a dichotomous

variable with 0 symptoms versus 1+ symptoms. This is consistent with prior studies, such as Barker et al (2006), who also dichotomized in this way. A Bernoulli distribution was used for instances in which the outcome was dichotomous (i.e., binge eating and dietary restraint), and a normal distribution was applied for continuous outcomes (negative mood). To establish temporal precedence of mediation effects, the mediator and outcome values were based on the data collected at one and two assessment points after the body dissatisfaction rating, respectively.

As per standard single level analyses, a significant mediation effect is obtained when the $a*b$ interaction (in this case, $a_{1i}*b_{1i}$ and $a_{2i}*b_{2i}$) are significant at $p < .05$ (Bauer et al., 2006). The key difference, however, is that each participant contributes multiple time points of data to the Level 1 mediation model, thus violating the assumption of independence of errors. The MLM approach effectively controls for this problem, by identifying and separating variability in the model due to within-subject fluctuations (across the testing period) and between-subject fluctuations in the strength of the model. As a consequence, this approach also allows for examination of whether trait-based measures (Level 2) can account for between-subject variability in the strength of the mediation model. This is effectively a moderated mediation model. In the present study, theoretically relevant trait-level variables (trait body dissatisfaction, eating restraint, and internalization of appearance standards) were included to predict inter-individual differences in the strength of the mediation pathways proposed by the dual pathway model.

Level 2 equations:

$$a_{1i} * b_{1i} = \gamma_{00} + \gamma_{01}(\text{BD}) + \gamma_{02}(\text{INTERN}) + \gamma_{03}(\text{REST}) + u_{0j} \quad [\text{Equation 4}]$$

$$a_{2i} * b_{2i} = \gamma_{00} + \gamma_{01}(\text{BD}) + \gamma_{02}(\text{INTERN}) + \gamma_{03}(\text{REST}) + u_{0j} \quad [\text{Equation 5}]$$

where γ_{00} is the Level 2 intercept, γ_{01} , γ_{02} and γ_{03} are the coefficients for the Level 2 predictors of inter-individual differences in the mediation effects, and u_{0j} is the error variance for the Level 2 equation.

Supplementary analyses. In light of identified difficulties in modeling ESM data, several alternate approaches were taken to further explore the dual pathway model. First, the traditional approach of regressing eating outcomes onto the IVs as they are originally scaled (dietary restraint = Yes v No, negative mood = 1-10) was compared against several different operationalizations of these predictors. Negative mood was modelled as: (1) group-mean centered deviations from the participant's mean level of negative mood (the *traditional approach*), (2) whether an individual reports an instance of heightened negative mood (Negative mood ≥ 7 ; *threshold approach*), and (3) consecutive assessments in which the participant rates negative mood above their mean (consecutive $> \text{Mean}$) or greater than or equal to 7 (consecutive ≥ 7).

Second, as the time lag between assessment points varies both within and across ESM studies, the lag time between the predictor variables and eating-related outcomes was varied in order to identify the optimal time interval for modeling the effects of dietary restraint and negative mood on the eating-related variables (Starr & Davila, 2009). This was explored by varying the time interval between the IV and DV from a minimum of one time point (as tested in Equations

2 and 3) to a maximum of five-time points' separation. The minimum of one was chosen to retain the longitudinal aspect of the study design (a time lag of zero would render concurrent assessments of the mediator and dependent variables), whereas the maximum of five was chosen to ensure enough data points to resample the relationship multiple times per participant:

$$\text{Binge}_{ij} = \beta_{oi} + b_{ki} * \text{diet}_{ij} + d_{li} * \text{time lag} + e_{ij} \quad [\text{Equation 6}]$$

where b represents the coefficient for the time lag between dietary restraint and binge symptoms, and k represents the actual time lag ($k = 1, 2, 3, 4$, or 5). Equations 2-5 were re-run for instances in which b_{ki} was significant as either a fixed effect (indicating a significant relationship between the two variables for the sample as a whole) or a random effect (indicating inter-individual differences in the strength of this Level 1 relationship), substituting the initial version of dietary restraint (i.e., lag = 1 time point) with the significant time lagged version of dietary restraint as derived from Equation 6.

A third modeling approach was to evaluate whether likelihood of a binge episode was better predicted by multiple successive dietary restraint attempts (the consecutive approach) than a single instance of dietary restraint (Yes vs No; the traditional approach):

$$\text{Binge}_{ij} = \beta_{oi} + b_{li} * \text{diet1}_{ij} + b_{2i} * \text{diet2}_{ij} + d_{li} * \text{time lag} + e_{ij} \quad [\text{Equation 7}]$$

where b_{1i} and b_{2i} represent the coefficients for the binge eating-single episode of restraint (b_{1i}) and binge eating-consecutive episode of restraint (b_{2i}) relationships.

Finally, the outcome variable of binge eating symptoms was replaced with suitable alternatives also related to unhealthy food consumption: (1) comfort eating, and (2) temptation to overeat. Equations 3-5 were re-run with these alternative eating variables as outcomes. A more fine-grained analysis of types of dietary restraint was also intended, but as shown in the Results section below, there was low frequency of each of the three dietary restraint techniques (eating only healthy foods, eating nothing, and/or eating less than required to satisfy hunger), rendering difficult attempts to analyse these separately.

Results

Prior to the main analysis, data were screened to ensure that they met the assumptions of multivariate analysis (Tabachnick & Fidell, 2007). Less than 2% missing data was found for Phase 1, and dealt with using expectation maximization. On average participants completed approximately 82% of the daily dairy assessment points ($M = 40.02$, $SD = 7.44$, range 19-49). This rate was generally consistent throughout and across the course of the testing period. Compliance with this protocol is representative of ESM studies with similarly demanding protocols (see Heron, 2011; Smyth & Stone, 2003; Stone & Shiffman, 1994). Individual differences in the number of Phase 2 random assessments completed were not reliably associated with any of the trait measures ($p > .05$). Moreover, results of the main analyses (below) changed trivially when four participants who completed approximately 40% of their assessments were

excluded. Thus, the decision was made to retain these participants to enhance statistical power. There were no outliers or evidence of non-normality in any variables.

Table 3.1 presents the means, standard deviations, and possible range of scores for the Level 1 and Level 2 variables in the current study. As may be expected given that ESM samples randomly several times per day, the prevalence of dietary restraint attempts and episodes of comfort eating, temptation to overeat, and binge eating were relatively infrequent comparative to the total number of assessments, occurring in 14%, 9%, 13%, and 8% of assessments, respectively. Further exploration of the various forms of dietary restraint showed that eating only healthy foods was the most commonly used method of dietary restraint (occurring in 6% of all assessment points), followed by eating nothing (5%), and then eating less than required to satisfy hunger (3%). Given the low frequency of these various forms of dietary restraint, the type of restraint strategy was ignored in subsequent analysis, which instead used whether participants had engaged in restraint as a predictor variable. The average negative mood rating across participants was $M = 3.12$ ($SD = 2.07$). Sixty-five participants (53%) had a mean negative mood score of 0-3 across the testing period, 53 (43%) had a mean of 4-6, and 6 (5%) had a mean in the range of 7-10. The mean for binge symptoms was low, warranting a zero-inflated Poisson approach for the multilevel analyses involving binge eating as the outcome variable. Nevertheless, scores on state-level predictors were sufficiently variable to meaningfully test the proposition that elevated body dissatisfaction and proposed mediators constitute risk factors for eating pathology.

Table 3.1

Means, Standard Deviations, and Possible Score Ranges for Level 1 and 2 Variables

Level	Variable	Mean	SD	Possible Range	ICCs
1	Negative mood	3.12	2.07	0 – 10	.66
	State Body dissatisfaction	4.00	0.73	1 – 9	.66
	Binge symptoms	0.17	0.72	0 – 6	.13
	Dietary restraint	0.12	0.33	0 – 1	.31
	Comfort eating	0.08	0.27	0 – 1	.09
	Temptation to overeat	1.76	2.92	0 – 7	.16
2	Internalization	31.86	7.00	9 – 45	n/a
	Trait Body dissatisfaction	21.96	9.17	0 – 40	n/a
	Dietary restraint	2.82	0.90	1 – 5	n/a

Note: The level 1 variables are state measures, whereas the level 2 variables are trait-based measures. ICC = intra-class correlation. Dietary restraint and comfort eating are dichotomous variables and thus the mean value for these variables represents the proportion of times that individuals engaged in the particular behaviour.

Primary analyses

Table 3.2 presents the fixed coefficients for variables in the lower level MLM mediation model. In combination, the two mediators accounted for 28% of the total effect of body dissatisfaction on binge eating, 63% of the total effect of body dissatisfaction on comfort eating, and 24% of the total effect of body dissatisfaction on temptation to overeat. Negative mood was found to be a significant mediator of the relationships between body dissatisfaction and binge eating ($a*b = .02$, 95% CI: .01 to .03, $p < .001$), body dissatisfaction and comfort eating ($a*b = .06$, 95% CI: .03 to .09, $p < .001$), and body dissatisfaction and

temptation to overeat ($a*b = .04$, 95% CI: .02 to .06, $p < .05$). Dietary restraint failed to mediate the relationships between body dissatisfaction and binge eating ($a*b = .00$, 95% CI: -.01 to .01, $p = .207$), body dissatisfaction and comfort eating ($a*b = -.01$, 95% CI: -.03 to .01, $p = .200$), and body dissatisfaction and temptation to overeat ($a*b = -.01$, 95% CI: -.01 to .03, $p = .356$).

Table 3.2

Regression Coefficients for the Mediation Models

Mediator	Outcome	a	b	c	c'	PRV
Mood	Binge eating	.34***	.06***	.04*	.03	28.25
Restraint		.02	-.26**			
Mood	Comfort eating	.34***	.17***	.16*	.06	63.13
Restraint		.02	-.70***			
Mood	Temptation to overeat	.30***	.12**	.08	.06	23.46
Restraint		.02	-.32*			

Note: * $p < .05$, ** $p < .01$, *** $p < .001$.

a path = IV \rightarrow MV, b path = MV \rightarrow DV (controlling for direct influence of IV and influence of other MV on the DV), c path = total relationship between IV and DV (that is, direct + indirect effects of IV on DV), c' path = direct effect of IV on DV (controlling for indirect effects via the mediators).

These indirect effects were followed up to better understand the generalizability of the dual pathway model. Planned moderated mediation analyses were conducted to evaluate whether the indirect effects were stronger for individuals with more pathological eating and appearance-related behaviours and concerns. As shown in Table 3.3, individual differences in key trait variables (trait body dissatisfaction, internalization of the thin ideal, and dietary restraint) failed

to account for inter-individual variability in the mediation effects when entered individually or in combination. Mediation analyses were not conducted for models involving temptation to overeat, as the size of these lower level mediation effects did not significantly vary across individuals.

Table 3.3

Predicting Variability in the Mediation Effects

Predictor	Mood→ Binge	Mood→ Comfort	Restraint→ Binge	Restraint→ Comfort
Body dissatisfaction	.16 (.01)	.05 (-.10)	-.19 (-.03)	-.11 (-.07)
Internalisation of appearance	-.03 (-.08)	-.10 (-.13)	.08 (.05)	.01 (-.02)
Restraint	-.17 (-.12)	-.07 (-.12)	-.04 (-.03)	-.03 (-.06)

Note: univariate effects are reported in brackets. Unbracketed effects are standardized coefficients in the context of other IVs in the model.

Supplementary analyses

Several alternate approaches were taken to further explore the inter-relationship between the predictor variables (negative mood state and dietary restraint) and eating-related outcomes (binge eating, comfort eating, and temptation to overeat). First, as shown in Table 3.4, the relationship between negative mood and eating-related outcomes was strongest when negative mood was operationalized in terms of symptom severity (i.e., the threshold approach). Individuals were over three times more likely to engage in either a binge or comfort eating episode when their negative mood rating was 7 or above, whereas they were only marginally more likely (than not) to report either outcome when negative mood was operationalized as single or consecutive scores above one's

own average mood state across the testing period (traditional and consecutive > M, respectively). Interestingly, consecutive negative mood ratings at or above 7 (consec ≥ 7) did not reliably predict either eating outcome, although it did predict temptation to overeat. However, the coefficient presenting the relationship between negative mood and temptation to overeat was clearly largest when negative mood severity (i.e., the threshold approach) was used in the model. None of the random effects for these relationships were significant and, as such, moderation of these moment-by-moment associations by trait level variables were not assessed.

Table 3.4

Effect Sizes (Odds Ratios) for the Relationship Between Negative Mood and Eating Related Outcomes

Outcome	Traditional	Severity	Consec ≥ 7	Consec > M
Binge eating	1.09*	3.19***	1.02	1.05
Comfort eating	1.08*	3.20***	1.03	1.06*
Temptation [^]	0.01	0.34*	-.01*	0.02

Note: * $p < .05$, ** $p < .01$, *** $p < .001$. Consec ≥ 7 = consecutive negative mood ratings at or above 7 Consec > M = consecutive scores above one's own average mood state

[^]Effects for this variable are reported as B weights in this instance as temptation is a continuous outcome.

Second, it was evaluated whether the non-significant mediation effects for dietary restraint were due to the limited time interval between commencement of dietary restriction and measurement of presence of binge or comfort eating symptoms. Accordingly, we altered the time interval to $t + 1$, $t + 2$, $t + 3$, and $t + 4$ (representing 60-75 minute, 76-150 minute, 151-225 minute, and 226-300 minute

gaps, respectively, between assessment of dietary restraint and unhealthy eating), following Starr and Davila's (2009) procedure for determining optimal time lag between target events. As outlined in Table 3.5, retesting the association between dietary restraint and eating (binge eating, comfort eating, and temptation to overeat) showed that the relationship between dietary restraint and binge eating was strongest at lags of 1 ($OR = 1.41$ $p < .05$) and 5 time points ($OR = 1.53$, $p < .01$), whereas the relationship between dietary restraint and comfort eating was only significant at lag of 5 time points ($OR = 1.56$, $p < .01$). Re-running single mediator models with these optimal time lags between dietary restraint and the eating pathology variables failed to improve the strength of the indirect effect of dietary restraint on the relationships between body dissatisfaction and binge eating, and body dissatisfaction and both comfort eating and temptation to overeat as the mediation effect remained non-significant in all instances.

The strength of association between negative mood state and eating outcome consistently declined as the time lag between the predictor and outcome measures increased. The pattern was somewhat different when severity scores were used instead of the traditional modeling approach for negative mood states: although the strength of association between mood and eating outcomes was strongest when measured concurrently, the strength of association exhibited a U shape over time, with effect sizes lowest at a lag of three time points, before increasing again at lags 4 and 5. The relationship between dietary restraint and eating behaviours also exhibited a quadratic shape, such that the relationship was strongest at the most recent and distant time points tested.

Table 3.5

Effect Sizes (Odds Ratios) for the Relationship Between Negative mood and Eating Related Outcomes

Predictor	Time lag	Binge	Comfort	Tempt [^]
Dietary restraint	1	1.41*	1.36	0.04
	2	1.20	1.30	0.06
	3	0.87	0.91	-0.04
	4	1.35	1.34	0.16
	5	1.53**	1.56**	0.04
Negative mood (traditional)	0	1.29***	1.30***	0.08**
	1	1.13**	1.13**	0.02
	2	1.08*	1.08*	-0.01
	3	1.06	1.07*	0.00
	4	1.10*	1.10**	0.03
	5	1.03	1.02	0.00
Negative mood (severity)	0	3.19***	3.20***	0.34*
	1	1.78**	1.81**	0.04
	2	1.31	1.33	0.09
	3	1.17	1.20	0.04
	4	1.72**	1.75**	0.28*
	5	1.44	1.49	0.39**

Note: * $p < .05$, ** $p < .01$, *** $p < .001$. Binge = binge eating episode, comfort = comfort eating episode, and tempt = temptation to overeat.

[^]Effects for this variable are reported as B weights in this instance as temptation is a continuous outcome.

Finally, consecutive attempts to restrict food intake was a better predictor of eating outcomes than a single instance of restraint (see Table 3.6). In the case of comfort eating, the relationship was non-significant using the traditional method but significant when the predictor was consecutive instances of restraint. Temptation to overeat was not reliably predicted by dietary restraint, regardless of operationalization. None of these effects varied significantly across participants.

Table 3.6

Dietary Restraint Predicting Key Eating Related Outcomes

Outcome	Traditional	Consecutive
Binge eating	1.41*	1.70*
Comfort eating	1.36	1.65*
Temptation [^]	0.04	0.06

Note: [^]Effects for this variable are reported as B weights in this instance as temptation is a continuous outcome.

Discussion

The purpose of this study was to expand upon the cross-sectional findings from Study I, using a novel momentary assessment approach to assess the plausibility of the dual pathway model in accounting for the association between body dissatisfaction and eating pathology. While key components of the dual pathway model have received considerable focus in prospective and cross-sectional designs, and components of the model have been tested in naturalistic settings, no study has tested the full model in real time. Nor have the challenges of modeling these associations with ESM data been comprehensively and conclusively addressed, to the extent that best practice guidelines for modeling these associations are available. Thus, Study II aimed to test the full dual pathway model in real time, to evaluate whether these effects differed across individuals, whether any existing differences can be explained by trait measures, and to assess how different operationalisations and modeling approaches influence results. This final aim was an important consideration as it is intended to provide recommendation for how best to model these associations.

Traditional analyses

The findings from the current study provide several lines of evidence to support the assertion that negative affect is a stronger mediator than dietary restraint of the body dissatisfaction-binge/comfort eating relationship. Firstly, negative affect was found to be a significant mediator irrespective of whether binge eating, comfort eating, or temptation to overeat was used as the outcome measure. Furthermore, body dissatisfaction was not reliably associated with dietary restraint (a fundamental obstacle in obtaining a significant mediation effect). Thus, for the present sample at least, negative affect appears to be the more common outcome (than dietary restraint) of body dissatisfaction.

These findings are consistent with earlier studies that also showed a stronger mediation effect for negative mood (Byrne & McLean, 2002; Johnson, Schlundt, Barclay, Carr-Nangle, & Engler, 1995; Stickney et al., 1999) and, in some instances, found that dietary restraint did not significantly mediate the body dissatisfaction-binge/overeating relationship in female adolescents and female eating disorder patients (van Strien, Engels, van Leeuwe, & Snoek, 2005) as well as in obese women (Wardle, Waller & Rapoport, 2001). These null findings for dietary restraint, both in the present study and in past literature, may be partially attributable to the way dietary restraint is measured (see supplementary analyses below for an extended discussion of this point).

Another important finding of the present study is that the mediation effects did not depend on key trait-level variables (i.e., trait body dissatisfaction, internalization of appearance standards, and dietary restraint behaviours). Although this could ordinarily reflect poor choice of predictors, in the present study the null findings for these predictors were driven by the consistency of the

mediation effect across participants. This finding of negligible between-subject variance in the mediation pathways is particularly noteworthy given that the present study recruited from a university population who would be more likely to exhibit variance in body dissatisfaction and binge/comfort eating than specific target groups for whom these behaviours are elevated and defining characteristics (e.g., individuals with an eating disorder). This then suggests that the dual pathway model is robust and invariant with respect to a range of individual difference factors. Nevertheless, the generalizability of these findings to clinical populations (such as eating disordered groups) is an empirical question and, accordingly, warrants further studies to investigate this.

Supplementary analyses

Despite the increasing popularity of ESM for evaluating dynamic, state-based associations between psychological constructs, insufficient research attention has been given to best practice for conceptualizing and modeling these state-based associations. While these and similar findings have clear implications for theory and clinical intervention, by pinpointing both individual-level and contextual risk factors for binge episodes, the findings from the present study highlighted several deficiencies in our understanding of the manner in which the relationships in the dual pathway model are - and have been - conceptualised in the literature to date. Accordingly, the present study performed additional analyses to evaluate various modeling approaches for their influence on the strength of the association between dietary restraint and negative affect on eating variables (binge eating, comfort eating, and temptation to overeat). The nature of the additional analyses were to: (1) modify the outcome variable (using binge, comfort eating, and temptation to overeat), (2) alter the time lag between

predictors and DV, and (3) operationalize the IVs in several different ways (traditional versus threshold versus consecutive instances).

Interestingly, these additional analyses revealed that the optimal modeling approach (as determined by strength of effect size) differed for dietary restraint and negative mood states. Effect sizes for the dietary restraint-eating outcomes relationships were stronger when the predictor variable was modeled in terms of consecutive attempts rather than a single instance of dietary restraint. In contrast, effect sizes for the negative mood state-eating outcomes relationships were strongest when mood state was measured in terms of symptom severity.

Typically, negative mood states have been modeled in disordered eating studies as group-mean centred predictors (e.g., Anestis et al., 2010), meaning that the substantive research question is whether a self-reported mood state above one's own usual mood state increases the likelihood of a binge or comfort eating episode. However, this approach depends on: (1) the average mood state of the individual over the testing period, (2) the frequency to which s/he fluctuates around the mean, and (3) how far s/he deviates from the mean. In the present study, 52% of participants had an average negative mood score of 3 or below. Such a low average score would mean that many instances in which the individual exceeds their average negative mood would still be comfortable levels of negative mood that may be unlikely to distress the individual or prompt coping strategies, such as comfort eating or binge eating. The cut-off applied in the present study in the severity approach was far more successful - effect sizes were approximately three times larger when the mood variable was modeled as scores at or above 7, indicating subjective feelings of heightened negative mood.

Consistent with the notion that negative mood is a temporary psychological state, it was also observed in the present study that the strength of association between negative mood state and eating outcomes deteriorated as the lag between IV and DV increased. This finding is consistent with the observation that the relationship between negative mood and binge eating has been more commonly supported in studies where the association has been tested concurrently or within a couple of hours (Sherwood, Crowther, Wills, & Ben-Porath, 2000; Wegner et al., 2002) than next day observations (Smyth et al., 2007).

Interestingly, consecutive instances of negative mood above one's mean or at or above 7 also failed to improve upon effect sizes, relative to the traditional approach. This seemingly contradicts an earlier finding in which Crosby et al. (2009) observed distinct trajectories of negative mood throughout the day that differentially predicted next day binge episodes. In particular, they found that binge episodes were more likely for those who exhibited increasing negative mood throughout the day. They argued that it is probable that after a day of extended, or escalating negative mood, a threshold is crossed at which point an individual's chances of engaging in binge eating increases. The variation in results between the present study and Crosby et al.'s may be explained by the differences in methodology. If the threshold hypothesis in Crosby et al.'s study is correct, then the trajectory of negative affect is actually irrelevant, and may instead be reflecting time to onset of binge episode. The more important determinant is whether individuals crossed the threshold and, in many instances, with a steep positive trajectory, the participant would be likely to cross the threshold. Alternatively, the consecutive approach used in the current study may be in error since it does not include awareness of whether two consecutive time

points are: (1) above the threshold (this is told), and (2) whether the second time point is more elevated than the last (not captured in the present modeling approach).

Although the differences in effect size were less pronounced than for negative mood, present findings suggest that restraint is better modeled in terms of consecutive attempts at restraint than single occurrences. This makes sense when one considers that, by definition, restraint is a sustained and effortful behaviour. Foregoing food, or limiting intake, within a 1.5-2 hour interval (as the present study design captured) is unlikely to induce sufficient levels of hunger to initiate a binge episode, particularly if one has just eaten prior to the instance of dietary restraint. In contrast, the accumulation of successive instances of dietary restraint indicates a longer period of food abstinence or restriction, hence making it a better predictor of likelihood of binge eating, comfort eating, and temptation to overeat. The researcher argues that the U shaped pattern of effect sizes when modeling the influence of time lag on the restraint-eating relationship also reflects this accumulation effect. It was observed that dietary restraint was strongest as a predictor at a lag of 5 time points, with lower effect sizes between these two points when closer together. One would expect hunger levels and desire for food to increase the further the instance of dietary restraint became, provided the individual did not eat in the intervening period. Unfortunately, the present study did not include a measure of normal eating that would allow for tests of moderation of subsequent food consumption on the size of association between time lagged restraint and unhealthy eating outcomes. The results from the current study were, however, consistent with a cross-sectional study undertaken by Shepherd and Ricciardelli (1998) who demonstrated that the mediation effect of

dietary restraint on the body dissatisfaction and bulimic behaviour relationship was stronger when restraint was measured in terms of chronicity and accumulation of failed attempts at restraint than another restraint measure that evaluated current and successful restraint attempts. Thus, the mediating influence of restraint likely depends on success of dieting efforts and length of time spent in restraint mode.

While the testing of dietary restraint and negative affect in the main analyses of the current study presents meaningful examination of the data, and is consistent with present formulations of the dual pathway model within the literature, it appeared necessary to undertake more sophisticated tests of whether chronicity of these mediators increased the likelihood of either binge or comfort eating. These revisions to the model have the potential to further establish the model's utility for understanding eating pathology in clinical populations and, therefore, provide potential treatment implications. For instance, understanding that dietary restraint and/or negative mood influences eating pathology via build-up may lend itself to intervention strategies that seek to disrupt the accumulation of negative mood states and/or sustained dieting efforts (Heron & Smyth, 2010).

It is important, however, to place present findings within the context of design limitations. One potential limitation of the ESM approach taken in this study is that recurrent questions about mood and body dissatisfaction may have caused changes in the behaviours being measured, a phenomenon described elsewhere as reactivity (Shiffman et al., 2008). Reactivity may produce unwanted changes in target behaviors (e.g., influencing the frequency of dietary restraint and binge eating) as well as impacting psychological variables of state body dissatisfaction and negative mood. However, there are several reasons to suggest

that reactivity effects may have been negligible in the present study. First, the frequency of reported comfort eating and binge eating symptoms is broadly consistent with previous studies of non-clinical populations (e.g., Barker, Williams, & Galambos, 2006). Second, existing literature has shown limited evidence of reactivity in ESM-based studies of body dissatisfaction and eating behaviours (Fuller-Tyszkiewicz, et al., 2013; Heron & Smyth, 2013; Leahey et al., 2007; LeGrange et al., 2001; Munsch et al., 2009).

It may also be that the self-reported nature of the study challenges the validity of the data obtained since it relies upon accurate reporting by participants and may be limited by subjective perceptions. While the ESM approach is intended to overcome the possibility of recall bias evident in surveys of behaviours ‘in general’, unfortunately it does not address the potential for under-reporting of socially undesirable eating disordered behaviours such as binge eating and comfort eating. These issues may be overcome by the use of more innovative and objective measures to quantify food intake, such as biological indicators (e.g., the Nutritional Data System; see Engel et al., 2009) that allows for the caloric intake calculation of foods eaten during the testing period. However, these approaches also create additional dilemmas since these methods are still reliant on participants providing data in a self-report format. As such, monitoring may lead to intentional underreporting or reduced food intake if participants are sensitive about the quantity of food eaten. Alternatively, devices that feature a set of inputs and outputs of sensory information, such as camera devices on cell phones, microphones, Bluetooth (for wireless networking of devices over short distance), accelerometer, and global positioning system (GPS), allow researchers the capacity to collect collateral information with the potential

to obtain more objective measures of eating disordered behaviours (Froehlich, Chen, Consolvo, Harrison & Landay, 2007; Rachuri et al., 2010). At this stage, however, these technological advances have been acknowledged in theory, but are yet to be implemented in the body image and eating behaviours literature.

Finally, a binge episode or objective bulimic episode is defined in the DSM-5 (American Psychiatric Association, 2013) as the consumption of an unusually large amount of food accompanied with a sense of loss of control. While the author referred to the dependent variable as binge eating, the ESM state measures in Study II lacked an objective assessment of whether a binge episode occurred. Rather, the study utilised subjective ratings, with higher scores (i.e., more items endorsed) indicating greater likelihood – but not certainty – that a binge episode occurred. The operationalisation of binge eating or of a binge episode was defined in light of the presence of (one or more of) the five criteria that has been frequently used to describe a binge episode in previous literature (Fuller-Tyszkiewicz & Mussap, 2008; Nangle et al., 1994). Unfortunately these five criteria alone do not define or diagnose a binge episode. Future ESM studies would benefit from incorporating objective assessments of binge eating (as outlined in the above paragraph) to verify whether a binge episode actually occurred.

Despite the aforementioned limitations, this was the first ESM study to examine the full dual pathway model in real time. The findings here exemplify the need to investigate empirically the influences of dietary restraint and negative affect, both individually and jointly, in the pathway between state body dissatisfaction and binge eating, as is intended in this model. The findings demonstrate that ESM approaches provide a uniquely fine-grained, time-sensitive

approach to measuring binge eating behaviours. Furthermore, the findings broadly echo earlier findings, and suggest that the model is robust with respect to individual differences in key appearance-related trait variables. The present study supports selected parts of the dual pathway model and offers new areas of research to this model. In light of the questionable mediating effect of dietary restraint in the main analyses, the study undertook supplementary analyses to further evaluate the influence of operationalisation and modeling approach on ability to test the need for dietary restraint in this model. Further, the study examined alternative modeling of negative affect as a way to understand best practice for conceptualizing this construct.

Based on these supplementary findings, the following recommendations can be made for further use of ESM for testing the dual pathway model:

1. Consecutive attempts to restrict food intake is a superior predictor of binge eating outcomes than single instances of restraint.
2. The threshold approach is more fruitful for negative mood than the group-mean centered approach (i.e., single or consecutive scores above one's own average mood state).
3. It remains questionable whether trajectory and/or consecutive approach for assessing impact of mood is valuable.

Consistent with Study I, the results of Study II provided some support for the various aspects of Stice's (2001) dual pathway model. The following chapter (General Discussion) will summarize the key findings in light of the previously conducted research and objectives for this thesis.

CHAPTER FOUR:

GENERAL DISCUSSION

Overview

This thesis reported on the results of two studies investigating the relationship between body dissatisfaction and binge eating behaviours in young Australian women. The researcher evaluated this relationship in non-clinical women as the relationship has been found in this cohort as well as in clinical populations. A review of the literature identified three commonly cited theoretical explanations for the relationship between body dissatisfaction and binge eating; the dual pathway model (Stice, 2001), escape from awareness model (Heatherton & Baumeister, 1991), and objectification theory (Noll & Fredrickson, 1998). Since extant empirical evidence supported each of the explanatory models, this guided the decision in Study I to test each of the models individually and as a hybrid model as it is presently unclear: (i) which of the models best accounts for this phenomenon, and (ii) whether the models, in combination, fully explain the body dissatisfaction-binge eating association. Given the complexities in the link between body dissatisfaction and binge eating, a comparative analysis of the models/theories explicating this relationship was deemed an essential preliminary objective in order to refine the list of potential mechanisms responsible for the link between body dissatisfaction and binge eating. Thus, the approach in Study I was to cross-sectionally compare the variables of dietary restraint, negative affect, self-distraction, and interoceptive deficits for their ability to mediate the body dissatisfaction and binge eating relationship.

Study II was then informed by the findings of Study I. While the aim of Study I was to initially test a hybrid model, the results of Study I showed that the dual pathway model was sufficient by itself in view of the fact that the support for the escape model and objectification theory were negligible. Although experimental and ESM approaches have examined components of the dual pathway model in isolation, no study has tracked the complete series of events from body dissatisfaction to binge eating in real time and in naturalistic settings. As such, the literature on the mediating influences of dietary restraint and negative affect on the body dissatisfaction-binge eating link have developed in a piece-meal, and likely misdirected, manner. It is for these reasons that Study II was conducted with the aim to examine the dual pathway model in further detail, utilising an ecologically valid approach via the use of moment-by-moment assessments (ESM) to provide a more detailed insight into the context-dependent nature of body dissatisfaction and its relationship with binge eating. As the time to onset of key events, and nature of the association between these underlying psychological mechanisms for binge eating (e.g., restraint and negative mood state) have not been clearly elucidated in past research, an important supplementary aim of Study II was to extend upon the limitations of existing ESM literature by modeling the relationships between the variables in various ways in an effort to determine how best to model these relationships. In so doing, these methodological differences allowed for greater insights into *how* and *when* dietary restraint and negative mood may impact eating outcomes (as detailed later in this chapter). It was hoped that the inconsistencies in previous research could be explained by examining additional means of modeling these associations and

accordingly further refine the applicability of the dual pathway model in understanding the body dissatisfaction-binge eating relationship.

The following sub-sections consider in detail the key findings and their implications. In addition, they place these findings within the context of study design limitations. The findings from both Study I and II lead to meaningful revisions to models of the body dissatisfaction-binge eating relationship, by identifying the most relevant mediators, and discerning how these variables may impact on the outcome measures. Further alternate conceptualisations in the operationalisation of dietary restraint and negative affect are discussed as a way to more comprehensively test the components of the dual pathway model. Finally, the implications for future clinical research and treatment of body image and eating pathology are discussed which outline that negative affect is relevant to the body dissatisfaction and binge eating relationship, whereas dietary restraint is a less consistent predictor (at least in non-clinical populations).

Relationship between Body Dissatisfaction and Binge Eating

The present investigation sought to examine the extant models within the literature, which have been put forward in an attempt to explain the relationship between body dissatisfaction and binge eating. The results from both Study I and II confirmed the relationship between body dissatisfaction and binge eating, as well as the relationship between body dissatisfaction and associated eating outcomes (such as comfort eating and temptation to overeat). Study I found most support for the dual pathway model, with the other proposed mediators of interoceptive deficits (objectification theory) and self-distraction (escape theory) contributing little additional explanatory value. Further, Study II found negative affect to be a stronger mediator than dietary restraint with the pattern of results

obtained in Study II providing likely explanation for this finding. Dietary restraint was less frequently experienced (at least for the current sample) than extreme negative mood states. Moreover, consecutive dietary restraint attempts occurred in even less instances than single occurrences of restraint. This rarity and infrequency of dietary restraint occurrences is likely due to the difficulty of abstaining from food for a sustained period of time (Cooper & Shafran, 2008). The finding that consecutive restraint episodes was a better predictor of binge eating outcomes than a single instance of restraint, coupled with the infrequency of both single and consecutive attempts at restraint, provides a solid argument to suggest that dietary restraint is a far less frequent determinant of unhealthy eating outcomes than negative mood.

Although the three models of dual pathways, escape theory, and objectification theory have been used consistently in the body image and eating pathology research area, the results from Study I suggest that the escape and objectification theory add little over and above the dual pathway model. Since cross-sectional research in the past has only assessed each of the aforementioned model/theories in isolation, the results from the current thesis are novel. The findings illustrate that the dual pathway model demonstrates greater explanatory value in the body dissatisfaction-binge eating relationship for non-clinical samples of women than the escape and objectification theories.

Interestingly, while the dual pathway model was the model to reveal the strongest mediation effects in the link between body dissatisfaction and eating outcomes in Study I, the dual pathway model only accounted for approximately one-quarter of the shared variance between body dissatisfaction and binge eating. Further, only dietary restraint (a dual pathway proposed mediator) made a

significant unique contribution to the body dissatisfaction-binge eating relationship when all mediators were tested simultaneously. Accordingly, these findings suggest that: (1) the methodology (i.e., sample characteristics and/or research design) utilised to capture these relationships was inadequate, and/or that (2) the extant theories examined in the current thesis are not telling the complete story, and that the remaining unaccounted for covariance suggests need to consider alternative mechanisms that may further account for the relationship between body dissatisfaction and binge eating. While some of the unexplained variance may well be due to method effects in Study I (such as similarities in item structure or wording that provoke similar responses in participants, the proximity of items in an instrument, and/or similarities in the medium, timing, or location in which the measures were completed; Edwards, 2008; Podsakoff, MacKenzie, & Podsakoff, 2012), there may be other mediators that have not yet been adequately assessed in past literature. For example, self-esteem has been considered by some as a potential mediator in the relationship between body dissatisfaction and eating disorder symptomatology (Jonstang, 2009), with studies demonstrating the relationship between body dissatisfaction and low self-esteem (Paxton et al., 2006; Tiggemann, 2004), and the relationship between low self-esteem and disordered eating (Ricciardelli & McCabe, 2004). A second factor that may be important in the body dissatisfaction-binge eating relationship is social support. Studies have found that clinical samples of woman report having less social support networks (Tiller, Sloane, & Schmidt, 1997) and that the support received from family and friends predicts significant variance in body image issues and disordered eating symptoms (Hirsch, 1999; Tylka & Subich, 2004). Finally, perceived control has been considered as a factor associated with distorted body

image as well as the development of bulimia and binge eating patterns (Matheson et al., 2012; Zysberg & Tell, 2013).

While the findings from Study I indicated that dietary restraint was a stronger mediator of the body dissatisfaction-binge eating relationship than negative affect, in Study II, dietary restraint was found to be the weaker mediator irrespective of whether binge eating, comfort eating, or temptation to overeat was used as the outcome measures. A possible explanation for this discrepancy in findings may be that the self-report measures utilised in Study I failed to identify individuals who were actually restricting their intake in real-life contexts. This notion has been highlighted in several earlier studies that have found that individuals with high scores on self-report measures of dietary restraint do not consume less calories during single and multiple eating episodes (Stice, Sysko, Roberto, & Allison, 2010; Sysko et al., 2007).

An alternative explanation for the inconsistency in results could be that the dietary restraint measures used in Study I were considerably more extensive than the dietary restraint items administered in Study II (see Appendix B and C for questionnaire batteries used) and, as such, were better able to identify individuals restricting behaviours. For example, several items in Study I asked participants whether or not they had *succeeded* in their dieting efforts, which was not an aspect addressed in Study II. Accordingly, the more comprehensive item list featured in Study I may well have more accurately and frequently captured participants' attempts to diet than the items utilised in Study II. The desire to accurately measure the construct(s) while concurrently minimizing participant burden is a real tension in ESM research (Fisher & To, 2012; Shrout & Lane, 2011). Incorporating extensive items has the tendency to introduce measurement

error, as well as reduce reliability and validity of measures as participants may either: (1) utilise response heuristics to expedite the response process, or (2) discontinue or provide less frequent responses than required. While it would have been ideal in Study II to assess various forms of dietary restraint (as intended), the low frequency of these different types made this impractical. This difficulty is not uncommon within the ESM literature. For example, Colautti et al. (2011) intended to evaluate the relationship between social interaction and state body image, with particular reference to whom the participant was interacting. Unfortunately, the low frequency of each source of interaction (i.e., parent, friend, partner, stranger, work colleague, etc.) made this unattainable, and as such the researchers made the decision to revert to a single binary variable (social interaction: Yes versus No). Hence, whether in the form of dietary restraint or whom one is interacting, it is reassuring that relationships may be strong enough in spite of lack of specificity. It may be that the strong effect suggests the potential for generalisability of the present findings irrespective of these more fine-grained distinctions.

In light of the methodological challenges in prior ESM research, Study II examined various modeling approaches in the endeavor to achieve a more valid representation and accurate conceptualisation of the dual pathway model. The result of this experimentation elucidated the mechanisms involved in the model and allowed for deeper understanding of the relationships between dietary restraint, negative affect and binge eating outcomes. Hence, the results of Study II have established the following: (1) that effortful, sustained dietary restraint is more likely to lead to a binge/comfort eating episode than a single instance of dietary restraint, (2) that elevated levels of negative affect substantially increases the likelihood of a binge/comfort eating episode, (3) that the relationship between

dietary restraint and binge/comfort eating is strongest when a longer time frame is examined (i.e., when assessments are modeled in terms of the build up/consecutive instances of dietary restraint), and (4) that the relationship between negative affect and binge eating outcomes is strongest when shorter intervals are applied (i.e., when assessments are modeled in terms of concurrent or lag time of 1).

Limitations

There are several limitations that challenge the utility of this investigation. While a number of limitations are methodological, and relate to the specific nature of the research design and analytic approach employed throughout the thesis, other limitations are more general and derive from definitional issues that challenge the ability to measure and investigate constructs such as dietary restraint, negative affect, and binge eating.

Firstly, the research in Study I was conducted via the use of self-report questionnaires which may have influenced the accuracy of the data. Since the researchers were identifying the rate of engagement in unhealthy eating behaviours, there is a likelihood that participants minimized the degree to which they actually engaged in socially undesirable behaviours such as binge and/or comfort eating. While the researchers assured participants of anonymity in an effort to lessen bias in self-report, participants could have experienced hesitation in accepting symptoms or may have under-reported symptoms. Moreover, participants were asked to rate their feelings, attitudes, and behaviours related to eating, weight and shape over the previous twenty-eight day period, which may have further reduced the accuracy of participants recall. For these reasons, Study II utilised a daily diary method to more accurately assess body dissatisfaction and

disorder eating outcomes. While this form of methodology is expected to overcome the possibility of recall bias evident in Study I, it does not address the potential for under-reporting of eating disorder symptoms.

Second, in both Study I and II, non-clinical samples of convenience were employed, both in terms of body dissatisfaction and disordered eating symptomatology. Lack of a clinical sample in the present thesis makes it viable that null results obtained reflect lack of extreme scores on body dissatisfaction and/or binge eating. For instance, the weak association between body dissatisfaction and binge eating may be partially attributable to the under-representation of individuals with extreme levels of body dissatisfaction and/or binge eating symptoms, thus restricting the range of variance for these variables and, in turn, deflating the true correlations between these variables. Thus, it is difficult to ascertain whether the present results pertain to women whose symptoms require a clinical diagnosis of an eating disorder. Despite this, it is important to note that the descriptive statistics presented in each of the studies in this thesis revealed that: (i) most of the variables were normally distributed, and (ii) the average scores of trait measures (i.e., dietary restraint, internalisation of appearance standards, and body dissatisfaction) revealed moderate levels of symptom expression for these participants. Thus, at least some of the individuals in these samples exhibited heightened levels of body dissatisfaction and/or disordered eating symptoms. Further, while the current thesis did not include those with a clinically diagnosed eating disorder, the results are valuable in the fact that they generate understanding of fluctuations in symptoms that may have clinical significance (Barker & Galambos, 2006; Serpell & Troop, 2003). For example, symptoms of binge/comfort eating may be risk indicators for subsequent

eating pathology as binge eating frequently precedes compensatory behaviours related to bulimia nervosa by at least a year (Stice, 1998). Similarly, symptom expression of AN and BN in early and late adolescence has been shown to predict eventual eating disorder diagnosis in young adulthood (Kotler, Cohen, Davies, Pine & Walsh, 2001). Moreover, the results of Study I and II coincide with the results of studies examining individuals with clinically diagnosed eating disorders (e.g., Ouwers et al., 2009; Stein et al., 2007; van Strien et al., 2005; Zunker et al., 2011). Nevertheless, a replication of the thesis studies with a sample of individuals with higher rates of binge eating would undoubtedly add weight to the findings. The information obtained from the various modeling approaches in Study II meaningfully informs how best to capture the data and test these relationships in ED populations (with the advantage of limiting the time participants' are required to partake – a significant issue given the difficulty in recruiting ED patients for studies).

A third potential limitation of the present study is the fact that participants did not receive a training/information session orienting them to the procedure involved in completing Study II state-based measures nor was there a practice/trial period whereby participants were able to familiarize themselves with the task. Although the procedure was less complex than prior ESM studies utilising hand-held computer devices such as Personal Digital Assistant (PDA) (e.g., Colautti et al., 2011; Stein & Corte, 2003), an opportunity for participants to attend an orientation session or be provided with an instruction manual on the interview questions and procedures for recording their behaviours may have reassured participants and enhanced the validity of their responses.

Moreover, the choice of questionnaires utilised in both Study I and II were guided by past research, and were considered optimal choices based on the current level of knowledge in this area. The negative affect items in Study II accord with prior ESM research, which attempted to utilise the fewest number of items to most accurately measure the construct. However, it is possible that other aspects of negative affect were missed. Similarly, it is possible that different operationalisations of other study variables would further improve modeling. The current study tested various versions of the key, outcome measure, and different modeling approaches to add to substantive and methodological knowledge in this area.

Finally, Study II utilised a procedure whereby participants responded to surveys over the course of seven days, at random intervals between the hours of 10am and 8pm. This time frame was elected to avoid potential disruptions to participants sleep, and with the desire to limit the intrusion on participant's lives. It appears probable that episodes of binge or comfort eating may have occurred in the evening (after 8pm) once participants have completed work and study and may have time alone. This omission therefore presents a deficiency in the analyses as it prevents the researcher from capturing important behaviours that potentially shed light on understanding the relationship between body dissatisfaction and binge eating in varied contexts. Study II was designed to mirror the interval contingent response design adopted in previous studies (e.g., Engel et al., 2009; Freeman & Gil, 2004; Stein et al., 2007). Future research could potentially overcome this issue by incorporating an event contingent option for participants to report episodes of binge or comfort eating that occur outside of the standard testing time frame.

Clinical Implications

The findings of the current thesis may well have several clinical implications, for not only the individual-level management of eating disorders, but also for the improvement and expansion of prevention and intervention programs intending to lessen the rates of poor body image or body dissatisfaction and problematic eating behaviours within the general population.

Researchers have explored the associations between body dissatisfaction and eating disordered behaviours over several decades. However, it has only been recently that research has attended to the assessment of individual's body image experiences over time and its relationship with eating pathology in real time in every day life (Lavender et al., 2013). There is an unfortunate paucity of research that evaluates body image variability in naturalistic environments (Colautti et al., 2011; Heron & Smyth, 2013; Lattimore & Hutchinson, 2010; LePage & Crowther, 2010; Rudiger, Cash, Roehrig, & Thompson, 2007) given the clinical significance of understanding individuals who are susceptible to unstable body image states from day-to-day or context-to-context.

ESM permits the understanding of real-life situational contexts that can initiate fluctuations in body image states and subsequent binge or comfort eating. The use of ESM via web-based devices to record individuals' fluid body image experiences and eating practices in their actual lives provides hope if researchers are to progress away from a single assessment, trait-oriented perspective on body image (Rudiger et al., 2007). This rich moment-to-moment data allow for a more fine-grained examination of individual body image experiences, affective states, and eating pathology. This then yields knowledge on individual-specific mechanisms that provide insight into the nature of individual vulnerabilities such

as the specific aspects that produce or prolong adverse patterns of affect or problematic eating behaviour. Accordingly, this may help generate clinically relevant information and identify distinct patterns in the lives of patients in need of intervention (Oorschot, Lataster, Thewissen, Wichers, & Myin-Germeys, 2012; Wichers, 2013). In other words, not only has ESM been found to be feasible as a research method (Jacobs et al., 2005), but this development may offer knowledge that is of direct use not merely as an assessment tool but also as a therapeutic tool in clinical settings (Myin-Germeys et al., 2011).

Future ESM research has the capacity to add to the progression of more effectual treatments. The development of this novel technology has made it feasible to transform collected data into individual graphs that can be accessible to patients and their treating professionals (Wichers, 2013). For example, Norton, Wonderlich, Myers, Mitchell, and Crosby (2003) reviewed a clinical application of palmtop devices as therapy extension tools by combining integrative cognitive therapy (ICT) to attend to aspects of BN such as cultural variables, cognitions reflecting self-discrepancy, interpersonal schemas, interpersonal relationship patterns, and affect regulation. The palmtop served as a reminder to the patients to complete modules that focused on the aforementioned factors and also as a coping resource that could be utilised away from the therapy during times of distress or crisis, and serve as a reminder to the patient of the content discussed in therapy. This would then allow the therapist and patient to examine and appraise the previous week's data together.

In a more recent study, Myin-Germeys, Birchwood, and Kwapil (2011) used palm devices to introduce a feedback system in the treatment of paranoia by identifying a candidate putative mechanism (i.e., self esteem) to counter this issue.

Interventions (via the means of PDAs) were administered, with the aim of boosting self-esteem when it drops below a certain level as measured by ESM data, with the intention of then reducing or preventing subsequent experiences of paranoia. Myin-Germeys et al. (2011) reported that changes in the symptom (paranoia) were used as feedback to adjust the threshold for the intervention on the mechanism (self-esteem).

Thus, these studies demonstrate the application of ESM as psycho-educational tools or therapy extension devices, and these extensions may be used to assist individuals with eating disordered behaviours at key times across the course of a day and throughout the week when therapist-client consults are not viable.

The knowledge derived from the present thesis could help feed into the creation of these monitoring devices as present findings inform researchers and clinicians about the likely timeframe for the influence of risk factors on disordered eating outcomes. If the relationship between negative affect and binge eating outcomes is considered to have a relatively prompt onset, then treatment needs to equip individuals with psycho-education around the potential precipitants and likely time course from negative mood to binge eating outcomes. For example, this may be undertaken by engaging in techniques such as cognitive reappraisal (i.e., reconsidering an individual's view of a situation) (Larson, 1993), exercise (Craff & Perna, 2004), and methods of active distraction such as pleasant and rewarding activities (Fichman, Koestner, Zuroff, & Gordon, 1999) that have been shown to have quick and effective relief of negative mood. On the other hand, understanding that dietary restraint influences eating pathology via build-up may lend itself to intervention strategies that seek to disrupt the accumulation of

sustained dieting efforts (Heron & Smyth, 2010). For example, efforts could be made to find: (1) healthy alternatives (such as eating healthy foods rather than engaging in complete starvation) or (2) challenging of thoughts that prompt the urge to diet. Each of these possible occurrences informs therapists about when and how to potentially intervene and accordingly may well enhance and improve the diagnosis, monitoring and treatment of mental health issues.

Conclusions and Future Research Directions

The main analyses in Study II examined the dual pathway model in accordance with the way the relations have been operationalized and modeled in previous experimental and ESM research. This led the researcher to identify various modeling alternatives to further understand the mediating influences of the pathways of negative affect and dietary restraint. To the author's knowledge, the present study is the first study to consider and analyse the variations in the conceptualisation and modeling of the state-based associations of the dual pathway model. Importantly, the present findings cast doubt on the possibility that the link between body dissatisfaction and binge eating is adequately explained by the mechanisms involved in the traditional (or usual) methods of modeling the dual pathway model.

What has been achieved in the present thesis is the recognition that there are varying methods for which to model the relations of dietary restraint and negative affect. This recognition and further expansion of the dual pathway model contributes deeper understanding of the complex relationships between body dissatisfaction and binge eating. This provides a number of implications for research in the field of binge eating, in terms of guiding the use of theoretical frameworks, as well as developing models of binge eating. In regards to dietary

restraint in particular, the discrepant findings have a number of implications concerning efforts to clarify the nature of dietary restraint and improve assessment measures of this construct. Future implementations of our ESM approach should operationalize negative affect in terms of symptom severity rather than single or consecutive scores. Further, aspects of eating behaviour such as the urge/temptation to eat unhealthy foods and comfort eating (a less restrictive outcome) should be considered as outcomes in future research. Moreover, research should use consecutive attempts to restrict food intake as an alternative predictor of binge eating outcomes to single instances of restraint. Finally, modeling the time lag between the predictor and outcome measures is an important consideration that requires due consideration in future ESM research.

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APPEDIX A:

Letter Confirming Ethics Approval for Studies I and II

Human Research Ethics


DEAKIN
 UNIVERSITY AUSTRALIA

Deakin Research Integrity
 70 Elgar Road Burwood Victoria
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Memorandum

To: Dr Matthew Fuller-Tyszkiewicz
 School of Psychology
 B

cc:

From: Deakin University Human Research Ethics Committee (DUHREC)
Date: 27 January, 2012
Subject: 2010-006
 Accounting for moment-by-moment fluctuations in body satisfaction

Please quote this project number in all future communications

The modification to this project, submitted on 16/01/2012, has been approved by the committee executive on 27/01/2012.

Approval has been given for Dr Matthew Fuller-Tyszkiewicz, School of Psychology, to continue this project as modified to 25/03/2013.

The approval given by the Deakin University Human Research Ethics Committee is given only for the project and for the period as stated in the approval. It is your responsibility to contact the Human Research Ethics Unit immediately should any of the following occur:

- Serious or unexpected adverse effects on the participants
- Any proposed changes in the protocol, including extensions of time.
- Any events which might affect the continuing ethical acceptability of the project.
- The project is discontinued before the expected date of completion.
- Modifications are requested by other HRECs.

In addition you will be required to report on the progress of your project at least once every year and at the conclusion of the project. Failure to report as required will result in suspension of your approval to proceed with the project.

DUHREC may need to audit this project as part of the requirements for monitoring set out in the National Statement on Ethical Conduct in Human Research (2007).

Human Research Ethics Unit
 research-ethics@deakin.edu.au
 Telephone: 03 9251 7123

APPEDIX B:

Questionnaire Battery Used in Study I

Please provide the following information:

Age (in years) _____

Weight (in kgs) _____

Height (in meters) _____

Instructions: The following questions are concerned with the past four weeks (28 days) only. Please read each question carefully. Please answer all the questions. Thank you.

Questions 1 to 12: Please circle the appropriate number on the right. Remember that the questions only refer to the past four weeks (28 days) only.

On how many of the past 28 days	No days	1-5 days	6-12 days	13-15 days	16-22 days	23-27 days	Every day
1 Have you been deliberately <u>trying</u> to limit the amount of food you eat to influence your shape or weight (whether or not you have succeeded)?	0	1	2	3	4	5	6
2 Have you gone for long periods of time (8 waking hours or more) without eating anything at all in order to influence your shape or weight?	0	1	2	3	4	5	6
3 Have you <u>tried</u> to exclude from your diet any foods that you like in order to influence your shape or weight (whether or not you have succeeded)?	0	1	2	3	4	5	6
4 Have you <u>tried</u> to follow definite rules regarding your eating (for example, a calorie limit) in order to influence your shape or weight (whether or not you have succeeded)?	0	1	2	3	4	5	6
5 Have you had a definite desire to have an <u>empty</u> stomach with the aim of influencing your shape or weight?	0	1	2	3	4	5	6
6 Have you had a definite desire to have a <u>totally flat</u> stomach?	0	1	2	3	4	5	6
7 Has thinking about <u>food, eating or calories</u> made it very difficult to concentrate on things you are interested in (for example, working, following a conversation, or reading)?	0	1	2	3	4	5	6
8 Has thinking about <u>shape or weight</u> made it very difficult to concentrate on things you are interested in (for example, working, following a conversation, or reading)?	0	1	2	3	4	5	6
9 Have you had a definite fear of losing control over eating?	0	1	2	3	4	5	6
10 Have you had a definite fear that you might gain weight?	0	1	2	3	4	5	6
11 Have you felt fat?	0	1	2	3	4	5	6
12 Have you had a strong desire to lose weight?	0	1	2	3	4	5	6

Questions 13-18: Please fill in the appropriate number in the boxes on the right. Remember that the questions only refer to the past four weeks (28 days).

Over the past four weeks (28 days)

13 Over the past 28 days, how many <u>times</u> have you eaten what other people would regard as an <u>unusually large amount of food</u> (given the circumstances)?
14 On how many of these times did you have a sense of having lost control over your eating (at the time that you were eating)?
15 Over the past 28 days, on how many <u>DAYS</u> have such episodes of overeating occurred (i.e., you have eaten an unusually large amount of food <u>and</u> have had a sense of loss of control at the time)?
16 Over the past 28 days, how many <u>times</u> have you made yourself sick (vomit) as a means of controlling your shape or weight?
17 Over the past 28 days, how many <u>times</u> have you taken laxatives as a means of controlling your shape or weight?
18 Over the past 28 days, how many <u>times</u> have you exercised in a "driven" or "compulsive" way as a means of controlling your weight, shape or amount of fat, or to burn off calories?

Questions 19 to 21: Please circle the appropriate number. Please note that for these questions the term "binge eating" means eating what others would regard as an unusually large amount of food for the circumstances, accompanied by a sense of having lost control over eating.

19 Over the past 28 days, on how many days have you eaten in secret (ie, furtively)? Do not count episodes of binge eating	No days	1-5 days	6-12 days	13-15 days	16-22 days	23-27 days	Every day
	0	1	2	3	4	5	6
20 On what proportion of the times that you have eaten have you felt guilty (felt that you've done wrong) because of its effect on your shape or weight? Do not count episodes of binge eating	None of the times	A few of the times	Less than half	Half of the times	More than half	Most of the time	Every time
	0	1	2	3	4	5	6
21 Over the past 28 days, how concerned have you been about other people seeing you eat? Do not count episodes of binge eating	Not at all		Slightly		Moderately		Markedly
	0	1	2	3	4	5	6

HOW OFTEN DOES EACH STATEMENT APPLY TO YOU?

Never Rarely Sometimes Often Usually Always

1.	I get frightened when my feelings are too strong	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2.	I get confused about what emotion I am feeling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3.	I can clearly identify what emotion I am feeling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4.	I don't know what's going on inside me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5.	I get confused as to whether or not I am hungry	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6.	I worry that my feelings will get out of control	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7.	When I am upset, I don't know if I am sad, frightened, or angry.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8.	I have feelings I can't quite identify	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9.	I can't get strange thoughts out of my head	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Here are a number of personality traits that may or may not apply to you. Please write a number next to each statement to indicate the extent to which you agree or disagree with that statement. You should rate the extent to which the pair of traits applies to you, even if one characteristic applies more strongly than the other.

1 = Disagree strongly

2 = Disagree moderately

3 = Disagree a little

4 = Neither agree nor disagree

5 = Agree a little

6 = Agree moderately

7 = Agree strongly

I see myself as:

1. ____ Extraverted, enthusiastic.
 2. ____ Critical, quarrelsome.
 3. ____ Dependable, self-disciplined.
 4. ____ Anxious, easily upset.
 5. ____ Open to new experiences, complex.
 6. ____ Reserved, quiet.
 7. ____ Sympathetic, warm.
 8. ____ Disorganized, careless.
 9. ____ Calm, emotionally stable.
 10. ____ Conventional, uncreative.
-

We are interested in how people respond when they confront difficult or stressful events in their lives. There are lots of ways to try to deal with stress. This questionnaire asks you to indicate what you generally do and feel, when you experience stressful events. Obviously, different events bring out somewhat different responses, but think about what you usually do when you are under a lot of stress. Then respond to each of the following items by selecting one number for each, using the response choices listed just below.

1 = I usually don't do this at all

2 = I usually do this a little bit

3 = I usually do this a medium amount

4 = I usually do this a lot

I refuse to believe that it has happened.

I pretend that it hasn't really happened.

I act as though it hasn't even happened.

I say to myself "this isn't real."

I give up the attempt to get what I want.

I just give up trying to reach my goal.

I admit to myself that I can't deal with it, and quit trying.

I reduce the amount of effort I'm putting into solving the problem.

I turn to work or other substitute activities to take my mind off things.

I go to movies or watch TV, to think about it less.

I daydream about things other than this.

I sleep more than usual.

I use alcohol or drugs to make myself feel better.

I try to lose myself for a while by drinking alcohol or taking drugs.

I drink alcohol or take drugs, in order to think about it less.

I use alcohol or drugs to help me get through it.

APPEDIX C:

Questionnaire Battery Used in Study II

Please provide the following information:

Age (in years) _____

Height (in meters) _____

Weight (in kgs) _____

Education level:

- ☐ Completed some high school, but did not finish
- ☐ High school graduate
- ☐ Completed some university (no degree)
- ☐ Bachelor's degree
- ☐ Completed some postgraduate
- ☐ Master's degree
- ☐ PhD, law or medical degree
- ☐ Other advanced degree beyond a Master's degree

Employment status:

- ☐ Full-time
- ☐ Part-time/casual job
- ☐ Home-maker
- ☐ Full-time student
- ☐ Retired
- ☐ Not currently employed

Please read each of the following items carefully and indicate the number that best reflects your agreement with the statement.

Definitely Disagree = 1 Mostly Disagree = 2 Neither Agree Nor Disagree = 3 Mostly Agree = 4 Definitely Agree = 5

1. I do not care if my body looks like the body of people who are on TV.
2. I compare my body to the bodies of people who are on TV.
3. I would like my body to look like the models who appear in magazines.
4. I compare my appearance to the appearance of TV and movie stars.
5. I would like my body to look like the people who are in movies.
6. I do not compare my body to the bodies of people who appear in magazines.
7. I wish I looked like the models in music videos.
8. I compare my appearance to the appearance of people in magazines.
9. I do not try to look like the people on TV.

For each of the following questions, please indicate your level of satisfaction using the scale provided below.

0	1	2	3	4
Very	A bit	Neutral	A bit	Very
Unhappy	unhappy		happy	happy

1. Thinking about your body, how happy are you with your weight?
2. Thinking about your body, how happy are you with your body shape?
3. Thinking about your body, how happy are you with your muscle size?
4. Thinking about your body, how happy are you with your hips?
5. Thinking about your body, how happy are you with your thighs?
6. Thinking about your body, how happy are you with your chest?
7. Thinking about your body, how happy are you with your abdominal region/stomach?
8. Thinking about your body, how happy are you with the size/width of your shoulders?
9. Thinking about your body, how happy are you with your legs?
10. Thinking about your body, how happy are you with your arms?

		Never (1)	Seldom (2)	Sometimes (3)	Often (4)	Very often (5)
1.	If you have put on weight, do you eat less than you usually do?					
2.	Do you try to eat less at mealtimes than you would like to eat?					
3.	How often do you refuse food or drink offered because you are concerned about your weight?					
4.	Do you watch exactly what you eat?					
5.	Do you deliberately eat foods that are slimming?					
6.	When you have eaten too much, do you eat less than usual the following days?					
7.	Do you deliberately eat less in order not to become heavier?					
8.	How often do you try not to eat between meals because you are watching your weight?					
9.	How often in the evening do you try not to eat because you are watching your weight?					
10.	Do you take into account your weight with what you eat?					

For each of the items below, check the box beside the one statement that best describes how you feel RIGHT NOW AT THIS VERY MOMENT. Read the items carefully to be sure the statement you choose accurately and honestly describes how you feel right now.

1. Right now I feel...

Extremely dissatisfied with my physical appearance

Mostly dissatisfied with my physical appearance

Moderately dissatisfied with my physical appearance

Slightly dissatisfied with my physical appearance

Neither dissatisfied nor satisfied with my physical appearance

Slightly satisfied with my physical appearance

Moderately satisfied with my physical appearance

Mostly satisfied with my physical appearance

Extremely satisfied with my physical appearance

2. Right now I feel...

Extremely satisfied with my body size and shape

Mostly satisfied with my body size and shape

Moderately satisfied with my body size and shape

Slightly satisfied with my body size and shape

Neither dissatisfied nor satisfied with my body size and shape

Slightly dissatisfied with my body size and shape

Moderately dissatisfied with my body size and shape

Mostly dissatisfied with my body size and shape

Extremely dissatisfied with my body size and shape

3. Right now I feel...

Extremely satisfied with my weight

Mostly dissatisfied with my weight

Moderately dissatisfied with my weight

Slightly dissatisfied with my weight

Neither dissatisfied nor satisfied with my weight

Slightly satisfied with my weight

Moderately satisfied with my weight

Mostly satisfied with my weight

Extremely satisfied with my weight

4. Right now I feel...

Extremely physically *attractive*

Very physically *attractive*

Moderately physically *attractive*

Slightly physically *attractive*

Neither attractive nor unattractive

Slightly physically *unattractive*

Moderately physically *unattractive*

Very physically *unattractive*

Extremely physically *unattractive*

5. Right now I feel...

A great deal worse about my looks than I usually feel

Much worse about my looks than I usually feel

Somewhat worse about my looks than I usually feel

Just slightly worse about my looks than I usually feel

About the same about my looks as usual

Just slightly better about my looks than I usually feel

Somewhat better about my looks than I usually feel

Much better about my looks than I usually feel

A great deal better about my looks than I usually feel

6. Right now I feel that I look...

A great deal better than the average person looks

Much better than the average person looks

Somewhat better than the average person looks

Just slightly better than the average person looks

About the same as the average person looks

Just slightly worse than the average person looks

Somewhat worse than the average person looks

Much worse than the average person looks

A great deal worse than the average person looks

How **happy** do you generally feel?

Not at All 0 1 2 3 4 5 6 7 8 9 10 Extremely

How **content** do you generally feel?

Not at All 0 1 2 3 4 5 6 7 8 9 10 Extremely

How **satisfied** do you generally feel?

Not at All 0 1 2 3 4 5 6 7 8 9 10 Extremely

How **unhappy** do you generally feel?

Not at All 0 1 2 3 4 5 6 7 8 9 10 Extremely

How **discontent** do you generally feel?

Not at All 0 1 2 3 4 5 6 7 8 9 10 Extremely

Have you experienced any of the following since last assessment? (You may select more than 1 option):

1. Comfort eating (eating to feel better)
2. Dietary restraint (deliberately restricting food intake)
3. Urge to eat unhealthy foods that you otherwise wouldn't

Follow up questions for those who selected 'Yes' to 'comfort eating'

When eating, which of the following occurred (you can select more than one):

1. Rapid consumption of food
2. Eating until uncomfortably full
3. Eating despite not being hungry
4. Eating large quantities of food (relative to your usual meal size)
5. Eating alone
6. Feeling guilt and shame after eating

Follow up questions for those who selected 'Yes' to 'dietary restraint':

When restricting your food intake, did you: (you can select more than one)

1. Eat nothing
2. Eat only healthy foods
3. Eat less than required to satisfy your hunger

Follow up questions for those who selected 'Yes' to 'urge to eat unhealthy foods that you otherwise wouldn't'

How tempted were you to eat unhealthy foods? (1 = not at all, 7 = extremely)