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Investigation of a Model of Weight Restricting Behaviour  
Amongst Adolescent Girls

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RUNNING HEAD: MODEL OF WEIGHT RESTRICTING BEHAVIOUR

KEYWORDS: WEIGHT RESTRICTING BEHAVIOUR, PREDICTION, DIETING,  
EXERCISE, PURGING

### Abstract

**Objective:** This study examined the validity of a model predicting weight restricting behaviour both cross-sectionally and longitudinally. **Method:** Participants comprised 1,207 girls aged 12 to 14 years. The girls completed self-report questionnaires at three time points over one-year intervals. **Results:** The cross-sectional results suggested that weight preoccupation and body dissatisfaction directly predicted weight restricting behaviour. In addition, upset induced by teasing, depressive symptoms, BMI and negative attributional style demonstrated indirect effects on weight restricting behaviour through their effects on body dissatisfaction and / or weight preoccupation. Longitudinally however, only weight restricting behaviour and body dissatisfaction were significant in the prediction of weight restricting behaviour. **Discussion:** The implications of the results are discussed, together with suggestions for future research.

## Investigation of a Model of Weight Restricting Behaviour Amongst Adolescent Girls

Female obesity represents a major health concern and there are strong arguments for women to remain within a healthy weight range. However, in an attempt to reach the unrealistically thin ideal of today's society and the positive virtues perceived to be associated with it, many women diet, exercise, and / or engage in other weight restricting behaviours to an extent that is regarded as extreme and undesirable (Grigg, Bowman, & Redman, 1996; Kenardy, Brown, & Vogt, 2001; Neumark Sztainer, Story, Falkner, Beuhring, & Resnick, 1999; Patton, Carlin, Shao, Hibbert, & et al., 1997). Such unnecessary and potentially dangerous behaviours have been associated with a number of negative consequences. Extreme weight loss behaviours such as purging and fasting have been linked to dental complications and severe deleterious cardiovascular, gastrointestinal and endocrinological effects (Chial, McAlpine, & Camilleri, 2002; Gupta & Gupta, 2000; Lambert & Boland, 2000; Newton & Travess, 2000; Tamburrino & McGinnis, 2002; Winston & Stafford, 2000). Other weight restricting methods such as dieting and high-level exercise have been implicated in increased rates of depressed mood and impairment on cognitive tasks (Green & Rogers, 1995; Koenig & Wasserman, 1995; Laessle, Platte, Schweiger, & Pirke, 1996). Furthermore, weight restriction methods have been repeatedly implicated in the pathogenesis of clinical eating disorders (e.g., Ackard, Croll, & Kearney Cooke, 2002; Bulik, 2002; Davis, 1997; Favaro, Ferrara, & Santonastaso, 2003; King, 1989; Marchi & Cohen, 1990; Nevenon & Broberg, 2000; Patton, Johnson Sabine, Wood, Mann, & et al., 1990; Patton, Selzer, Coffey, Carlin, & Wolfe, 1999; Rathner & Messner, 1993; Rojo et al., 2003).

In order to improve upon the treatment and prevention of any physical or psychological problem, a thorough understanding of associated and /or predictor variables associated with the issue must be ascertained. However, with a few notable exceptions (e.g., Huon et al., 2002; Stice, 1994; Thompson, Coovert, Richards, Johnson, & et al., 1995), research in the area of weight restricting behaviour has not been guided by coherent models, but rather has been largely fragmented in nature. As a result, a myriad of associated variables have been investigated and supported with respect to weight restriction methods, and yet the ways in which they may interact have not been adequately tested. The purpose of this paper is to evaluate a proposed model of weight restricting behaviours (Model A) outlined in Figure 1 that not only incorporates a number of proposed predictor variables, but also investigates the ways in which these variables may interact with each other to lead to engagement in weight restricting behaviour. Inherent to the model is that more distal variables have their effect on weight restricting behaviour through more proximal variables. Inclusion of the proposed distal variables within the model is important as they may represent early markers in a trajectory towards problematic weight restriction methods. Targeting such variables in prevention programs may break the trajectory at an early stage before excessive and / or unwarranted weight restricting practices are able to begin.

Before discussing the individual links within the proposed model, a few general comments regarding the model should be made. First, unlike many investigations in the area, this study takes a broad perspective regarding methods of weight restriction. It is proposed that by employing a measure of weight restricting behaviour that incorporates and combines dieting, exercise, purging strategies, and fasting, the present study will provide a more realistic view of the factors important to female adolescent weight

restricting practices. Most previous studies have focused on dieting exclusively, even though it has been found that weight restricting methods frequently co-occur (Kenardy et al., 2001; Perry Hunnicutt & Newman, 1993),

Second, although the development of problematic weight restricting behaviour is likely to comprise a complex interplay between biological, familial, social and individual-intrinsic variables, this paper is primarily concerned with predictor variables intrinsic to the individual for a number of reasons. Biological factors are for the most part currently unchangeable, and hence are not able to be targeted through psychological intervention. In addition, although some familial factors may be amenable to psychological assistance in the form of family therapy, such interventions are frequently beyond the control of the afflicted individual and are highly dependent upon family members' willingness to engage in therapy. Similarly, most social factors such as the sociocultural thin ideal and negative life events are not readily amenable to change at the individual level. In contrast, factors intrinsic to the individual are more likely to be responsive to treatment and prevention strategies of a psychological nature, and are thus the focus of this investigation.

Third, with the exception of BMI, and consistent with a cognitive-behavioural perspective, all individual-intrinsic variables included in the model are of a psychological nature. The cognitive-behavioural paradigm suggests that it is our thoughts, attitudes, beliefs and interpretations that determine our emotions and behaviours, rather than events or conditions per se. From this perspective, it may be suggested that while other variables (such as negative life events, exposure to media images and overprotective parenting) may indeed be associated with attempts to restrict

weight, they are likely to have a more distal association, being moderated or mediated by more proximal psychological variables such as those suggested by the model.

***INSERT FIGURE 1 ABOUT HERE***

Turning now to the hypothesized links between the model variables, it is proposed that only body dissatisfaction (BD) and weight preoccupation (WP) lead directly to weight restricting behaviour as illustrated in Figure 1. All other variables are suggested to influence weight restricting behaviour through BD, WP or both. Body dissatisfaction reflects a cognitive or affective disturbance involving a negative evaluation of one's body. While closely related to BD, WP refers to a persistent overconcern with body shape and weight and a desire or intention to lose weight. As such, WP includes motivational components of a drive to become thin (in fact WP is often referred to as a "drive for thinness") and, depending on the measure employed, a fear of fatness or weight gain.

Consistent with Sands (2000), the proposed model suggests that if BD increases, one may become preoccupied with one's weight as one attempts to reduce the discontent. Indeed, Sands (2000) found that body dissatisfaction was significantly associated with WP for his sample of young adolescent girls aged 11-13 years. The present model extends Sands' (2000) theory by suggesting that when individuals are dissatisfied with their body, or preoccupied with their weight, they may further seek to reduce the discontent by attempting to restrict their weight. Certainly, several studies have found associations between weight restricting behaviour and both BD and WP (e.g., Ackard et al., 2002; French, Perry, Leon, & Fulkerson, 1995).

The model also suggests that the distal variables of depressive symptoms, upset induced by teasing, BMI, and negative attributional style act to influence weight

restricting behaviour indirectly, through their effects on WP, BD or both. It is predicted that elevated depressive symptoms will lead to increased WP, which in turn may lead to weight restricting behaviour. Such a supposition is consistent with a theory put forward by Strober and Katz (1988), who suggested that if a person is feeling down about themselves, they may become preoccupied with their weight, and in turn may attempt to restrict their weight so as to combat the initial depressed affect. Indeed, some empirical support has been found for this association (Willcox & Sattler, 1996).

In addition, the proposed model predicts that upset induced by teasing leads to WP, BD and depressive symptoms, and that BD may lead to depressive symptoms. If individuals are not only teased about their weight, but are upset by that teasing, they may not only begin to believe that they are overweight (and hence become dissatisfied with their body), but they may also begin to believe that they possess the negative attributes society frequently associates with overweight status such as unattractiveness, laziness, and lack of popularity. The lowering of self-esteem and feelings of worthlessness that such teasing may produce, may in turn lead the adolescent to feel somewhat depressed. The upset induced by teasing about weight may also lead an adolescent girl to become preoccupied with her weight and subsequently attempt to restrict it, simply to alleviate the teasing.

There has been some empirical support for the association between upset induced by teasing and the parameters discussed above. For instance, teasing about weight has been associated with BD both cross-sectionally and longitudinally (Cattarin & Thompson, 1994; Fabian & Thompson, 1989; Thompson et al., 1995; Thompson & Heinberg, 1993). More importantly, the mediational role of BD in the relationship between teasing about weight and disordered eating has been tested and supported by



both van den Berg, Wertheim, Thompson and Paxton (2002) and Cattarin and Thompson (1994). There is some evidence to suggest that teasing about weight is related to WP. For example, Thompson et al. (1995) demonstrated that higher BMI leads to teasing about weight, which in turn leads to both BD and disordered eating. However, their measure of “disordered eating” was actually a measure of WP (i.e., the drive for thinness scale from the Eating Disorders Inventory (Garner, 1991; Garner & Olmstead, 1984), suggesting that teasing about weight is associated with both BD and WP. Finally, studies have provided support for both a cross-sectional and longitudinal positive association between BD and depressive symptoms (e.g., Stice & Bearman, 2001; Wiederman & Pryor, 2000).

With respect to the role of BMI in the model, it is proposed that high BMI increases both BD and the chance of being upset when teased about weight. The higher an adolescent girl’s BMI, the more distant she and others perceive her to be from what society considers the “ideal”. She is therefore more likely to become dissatisfied with her body, particularly if teased about her weight. Indeed, it has been empirically demonstrated that higher BMI is associated with higher BD (Jones, Vigfusdottir, & Lee, 2004; Ricciardelli, McCabe, Holt, & Finemore, 2003). Furthermore, it has been found that overweight girls are more likely to be teased about weight by their peers and family compared to normal weight girls (Neumark Sztainer et al., 2002), and that teasing about weight mediates the influence of BMI on both BD and disordered eating / restriction (Cattarin & Thompson, 1994; Lunner et al., 2000; Thompson et al., 1995; van den Berg et al., 2002).

The proposed model suggests that negative attributional style plays a significant distal role in weight preoccupation, in that it predicts level of upset induced by teasing

about weight, BD and depressive symptoms. Negative attributional style refers to a pessimistic pattern of cognition whereby an individual tends to attribute negative life events to stable, global and internal causes. Much empirical support has been found for the reformulated helplessness theory of depression (Abramson, Seligman, & Teasdale, 1978) which suggests that those with a negative attributional style feel helpless and are therefore vulnerable to depression (e.g., Joiner, 2001).

With the exception of a recent study suggesting that eating disordered patients report higher levels of internal, stable and global attributions compared to controls (Dalgleish et al., 2001), there has been a paucity of research conducted on attributional style within the domain of weight restricting behaviour and disordered eating. However, there are logical reasons for the inclusion of this variable in the proposed model. If a person tends to attribute negative events to internal, global and stable characteristics associated with the self, then when the negative event involves teasing about weight, that person will be more likely to attribute it to stable personal failings, which in turn is likely to lead to feelings of hopelessness and depression. Similarly, if the negative event involves a perceived discrepancy between the self and what is ideal in terms of weight and shape, those with a negative attributional style may be more likely to attribute it to a personal failing and hence become dissatisfied with their body.

This study provides an important contribution to the weight restricting behaviour literature in three ways. First, it attempts to combine the various fragmented findings from past research into a coherent model and assess it accordingly. Second, the previously neglected yet potentially important variable of negative attributional style has been included within the model. Finally, the model will be assessed both cross-sectionally and longitudinally using the structural equation modeling procedure of path

analysis. This procedure allows for a simultaneous test of all model parameters that other statistical procedures such as regression, are unable to provide.

## Method

### *Participants*

Participants initially comprised 1,207, Australian female Grade 8 students who ranged in age from 12-14 years ( $M = 12.83$  years;  $SD=.51$ ). Of the 1,207 participants who completed the questionnaire package in Grade 8, 797 participants (66%) were missing less than one full questionnaire and were available for all annual assessments in Grades 8, 9 and 10.

Participants were recruited from public and private high schools in metropolitan Brisbane and Gold Coast areas of South-East Queensland, Australia. Schools agreeing to participate in the study were provided with information sheets and consent forms that were distributed by teachers to Grade 8 students. Precise consent rates are unable to be determined as it is not known exactly how many Grade 8 students actually received a consent form. A conservative estimate of project participation rate based on the percentage of female Grade 8 students enrolled in participating schools for whom parental consent was received, suggests a minimum consent rate of 52.6%. Potential participants were excluded if they were non-English speaking or if they were unable to complete the questionnaire package due to low literacy levels (as communicated to the researcher by school teachers).

The percentages of participants and their parents born in Australia and overseas were consistent with the broader Australian populace as compared to the 2001

Australian census data (Australian Bureau of Statistics, 2001). Parental occupation, as reported by the participant, was used to determine socioeconomic status (SES). Based on the Australian Standard Classification of Occupations Dictionary (ASCO: Australian Bureau of Statistics, 1997), the percentages of parents represented in various occupational categories were broadly representative of the Australian and Queensland populations according to the 2001 census data (Australian Bureau of Statistics, 2001).

Participants were recruited from 28 high schools, eight of which were private, and 20 of which were public. Due to time and resource practicalities associated with such a large sample size, data were collected over two consecutive years. Fourteen of the schools (648 participants) were recruited during the first year and 14 (559 participants) were recruited in the subsequent year.

### *Measures*

Questionnaire packages were counterbalanced across schools using three “versions” that differed only in component questionnaire order.

*Demographic information.* Participants were required to provide demographic information including their age, school, grade, country of birth, parental country of birth, parental occupation, height in centimeters, and weight in kilograms.

*Weight loss behaviour history.* Participants were required to complete three author-developed questions regarding weight loss behaviour. The first asked participants to indicate the age in years when they first began dieting to lose weight (if they had indeed dieted). The second and third questions required participants to indicate “Yes” or “No” whether they would like to lose and gain weight respectively.

*Weight restricting behaviour.* Weight restricting behaviour was measured by seven author-developed questions assessing various weight loss methods. Specifically, participants were required to indicate “Never” (0), “Yes” (1) or “Yes in the past month” (2), whether they had tried to lose weight through each of seven weight-loss methods (dieting, laxatives, diet pills, vomiting, exercising, fasting, and other). Responses across the seven weight loss methods were summed to provide a total score. Higher scores indicated greater involvement in weight restricting behaviours.

*Weight preoccupation.* Weight preoccupation was measured by the Drive for Thinness sub-scale of the Eating Disorder Inventory–2 (EDI-2: Garner, 1991). Completion of the EDI-2 requires participants to rate on a 6-point scale whether an item applies to them always, usually, often, sometimes, rarely or never. Responses are scored from 0 to 3, with 3 representing the most pathological response. A score of 2 is given to the immediately adjacent, second most pathological response, while a score of 1 is given to the next adjacent, third most pathological response. A score of 0 is given to the three least pathological responses. Using this scoring system, a maximum score of 21 and a minimum score of 0 are possible on the Drive for Thinness sub-scale, with higher scores indicating greater WP.

The Drive for Thinness sub-scale has been found to demonstrate high internal consistency and adequate to high test-retest reliability, and criterion and convergent validity (Crowther, Lilly, Crawford, & Shepherd, 1992; Rathner & Rumpold, 1994; Ryu, Lyle, Galer Unti, & Black, 1999; Steinhausen, Neumaerker, Vollrath, Dudeck, & et al., 1992; Wear & Pratz, 1987; Welch, Hall, & Norring, 1990). Although the Cronbach’s coefficient alpha was .80 in the present study using all items on the Drive for Thinness sub-scale of the EDI-2, one item “I eat sweets and carbohydrates without

feeling nervous” demonstrated an item-total correlation of  $-.05$ . This item was therefore excluded from analyses and the Drive for Thinness Scale sub-score was computed with the remaining items.

*Body dissatisfaction.* Body dissatisfaction was measured using an adaptation of the Body Dissatisfaction sub-scale of the EDI-2 (Garner, 1991). The Body Dissatisfaction sub-scale of the EDI-2 requires participants to rate whether an item such as “ I think that my stomach is too big” is true about them always, usually, often, sometimes, rarely or never. Items assess satisfaction with overall body, stomach, thighs, buttocks and hips. The Body Dissatisfaction Scale employed in the present study retained the focus on overall body shape and various lower body parts, but allowed the level of dissatisfaction with each body part to be assessed more thoroughly. Specifically, participants were required to rate whether they thought their waist, tummy, hips, bottom, thighs and overall body were “about right” (3), “a little too big” (4), “very big” (5), “a little too small” (2) or “very small” (1). For analytic purposes, the mean of these items was calculated. A Cronbach’s coefficient alpha of  $.91$  was found for the Body Dissatisfaction Scale.

*Body mass index.* BMI was calculated by dividing the participants’ weight in kilograms by their height in metres squared. Both height and weight were obtained through self-report. Although it is preferable to objectively measure height and weight, subjective measures have been found to correlate between  $.94$  to  $.99$  with objective measures (Attie & Brooks Gunn, 1989; Goodman, Hinden, & Khandelwal, 2000).

*Upset induced by teasing about weight.* Upset induced by teasing about weight was measured through an item developed by Thompson, Fabian, Moulton, Dunn & Altabe (1991). Participants were required to rate on a 5-point scale ranging from 0 (did

not upset me) to 4 (really upset me), the extent to which they were affected by any teasing about their weight that they may have endured.

*Depressive symptoms.* Depressive symptoms were assessed using the Beck Depression Inventory (BDI: Beck, Ward, Mendelson, Mock, & Erbaugh, 1961). For the purposes of the present study, three minor modifications were made to the original questionnaire to increase its suitability for the young adolescent sample. First, the question regarding regularity of sexual activity was excluded due to fear by some schools that the question would be regarded as inappropriate by parents. Second, the weight loss question was reworded and converted from pounds to kilograms for an Australian population. Third, item 19 relating to weight loss was not included in the analyses given the potential confound with weight related scales employed in the study.

High internal consistency, adequate test-retest reliability, and high convergent validity have been demonstrated for adolescent samples (Ambrosini, Metz, Bianchi, Rabinovich, & et al., 1991; Barrera & Garrison Jones, 1988; Carter & Dacey, 1996; Strober, Green, & Carlson, 1981; Teri, 1982; Wilcox, Field, Prodromidis, & Scafidi, 1998). Furthermore, the BDI has been shown to discriminate well between depressed and non-depressed adolescents (Ambrosini et al., 1991; Barrera & Garrison Jones, 1988).

*Negative attributional style.* The composite negative events score (CN) of the Children's Attributional Style Questionnaire-Revised (CASQ-R: Kaslow, Tanenbaum, & Seligman, 1987) was employed in the present study to assess negative attributional style. The CASQ-R consists of 24 items and 6 sub-scales that allow the determination of internality, stability and globality dimensions for both positive and negative events. Each item puts forward a hypothetical event for which participants are required to

choose the most likely explanation from a choice of two alternatives. Each sub-scale contains 4 items that may be scored as either 0 or 1. As a result, the scores for each sub-scale may range from 0 to 4. The CN score is calculated by adding together the internality, stability and globality scores for negative events. Thus, CN scores may range from 0 to 12, with higher scores indicating a more depressogenic or negative attributional style. The CN scale has been found to demonstrate moderate internal consistency, fair test-retest reliability and high criterion validity (Thompson, Kaslow, Weiss, & Nolen Hoeksema, 1998).

### *Procedure*

Questionnaires were administered by teachers and / or researchers during a class period that was convenient for the individual school. Teachers were provided with standardised instructions that were read to students prior to questionnaire completion. Participants were initially assessed in Grade 8 and were subsequently followed up at yearly intervals in Grades 9 and 10.

## Results

Missing data were mean substituted at the item level using the sample mean for the particular item. Overall, approximately 2% of missing data was replaced.

### *Cross-Sectional Analyses*

Table 1 provides the means and standard deviations for the subscales and / or total scores employed in both the cross-sectional and longitudinal analyses. EQS for Windows 5.7b was employed to perform a path analysis testing Model A with the



original sample of 1,207 Grade 8 girls. The model was specified with seven variables and 1,207 cases using the covariance matrix and a maximum likelihood (ML) method of estimation. Due to kurtosis on a number of variables, the Satorra-Bentler (S-B) Scaled Statistic was included in the assessment of model fit. Analysis of Model A produced a CFI of .99, a robust CFI of .99, a RMSEA of .05 (90% confidence interval = .03-.07), and a chi square ( $\chi^2$ ) and S-B chi square (SB  $\chi^2$ ) of 31.28,  $p=.001$ , and 24.16,  $p=.002$ , respectively, ( $df=8$ ). With the exception of the link between BD and depressive symptoms, all paths were found to be significant.

***INSERT TABLE 1 ABOUT HERE***

While Model A represented a good fit of the data, the Wald Test for dropping parameters suggested that the nonsignificant link between BD and depressive symptoms be dropped. In addition, the LaGrange Multiplier (LM) Test for adding parameters suggested that a link between BMI and negative attributional style would improve model fit. The link proposed by the LM test suggested that BMI may affect depressive symptoms not only through upset induced by teasing (as predicted by the original model), but also through attributional style. It is possible that those with a higher BMI view their higher weight as a stable personal failing, and in turn become depressed. Furthermore, inclusion of a link between BMI and negative attributional style in the model suggests that BMI may lead to upset induced by teasing and BD both directly (as predicted by the model) and indirectly through its effect on negative attributional style. If as proposed above, those with a higher BMI view their higher weight as a stable personal failing, they may be both more dissatisfied with their body, and more upset by teasing about weight if it occurs.

As the proposed link between BMI and negative attributional style can be logically justified, the model was respecified (Model B), with the pathway between BD and depressive symptoms being omitted and a pathway between BMI and negative attributional style included.

The chi-square and S-B chi-square statistics of the respecified Model B were 11.24,  $p=.189$ , and 8.88,  $p=.353$ , respectively, ( $df=8$ ). The CFI was .99 and the robust CFI was 1.00 with a RMSEA of .02 (90% confidence interval =.00-.04). This provided a significant improvement in model fit compared with Model A,  $\Delta SB\chi^2 = 15.28$ ,  $\Delta df=0$ ,  $p<.001$ . Indeed, all pathways were significant (see Figure 2). Furthermore, the chi-square and S-B chi-square statistics became nonsignificant, suggesting a particularly strong fit of the data given the large sample size employed and all indirect effects predicted by the model were found to be significant ( $p<.001$ ). Model B was retained as the final model.

### ***INSERT FIGURE 2 ABOUT HERE***

In order to validate Model B, the sample was randomly split into two subsamples and the fit of the model to each was tested independently. For both subsamples, Model B provided a strong fit of the data and all predicted direct and indirect pathways were significant.

#### *Longitudinal Analyses*

*Dropouts.* As described above, 66% of the sample were available at 1- and 2-year follow-ups. A between groups MANOVA was conducted to compare girls who were retained with girls who were not available at 2-year follow-up. The analysis revealed a significant difference between the two groups, *Pillais F* (8, 1189) = 3.11,

$p=.002$ ,  $\eta^2=.02$ , with univariate analyses indicating significant differences between groups on weight restricting behaviour,  $F(1, 1196) = 9.53$ ,  $p=.002$ ,  $\eta^2=.008$ , WP,  $F(1, 1196) = 5.94$ ,  $p=.015$ ,  $\eta^2=.005$ , depressive symptoms,  $F(1, 1196) = 10.57$ ,  $p=.001$ ,  $\eta^2=.009$ , and negative attributional style,  $F(1, 1196) = 5.43$ ,  $p=.020$ ,  $\eta^2=.005$ . Compared to girls who remained in the study, those girls who were not available demonstrated significantly higher levels of weight restricting behaviour, depressive symptoms, and negative attributional style at baseline.

To ensure that any differences found between cross-sectional and longitudinal models are not due to the selective drop-out of participants with high levels of weight restricting behaviour, depressive symptoms and negative attributional style, the cross-sectional model was tested with the 797 longitudinal participants. For the smaller Grade 8 sample, the chi-square and S-B chi-square statistics for the fit of the cross-sectional model were found to be 11.68,  $df=8$ ,  $p=.17$ , and 9.64,  $df=8$ ,  $p=.29$ , respectively. The CFI and S-B CFI were .998 and .999 respectively, with a RMSEA of .02 (90% confidence interval = .00-.05). The pathway coefficients were all found to be significant. Thus, any differences found between cross-sectional and longitudinal models are unlikely to be attributable to differences in sample characteristics.

*BMI and weight restricting behaviour data.* The average age of dieting onset for this sample of young adolescent girls was 11.6 years (SD=1.11). Categorisation of adolescent girls into underweight, normal weight and overweight status varies depending on age. According to criteria from the National Center for Health Statistics & National Center for Chronic Disease and Health Promotion (2000), 6.8%, 6.3% and 4.9% of the Grade 8, 9 and 10 girls respectively were underweight, 84.4%, 83.8% and

85.7% of the Grade 8, 9 and 10 girls respectively were of healthy weight, and 8.8%, 9.9% and 9.4% of the Grade 8, 9 and 10 girls respectively were overweight.

Table 2 provides information on the percentage of girls engaging in each weight restricting behaviour as well as the percentage of girls who reported a desire to lose and gain weight. This information is provided for girls in the underweight, healthy weight and overweight categories, in addition to the sample overall. One of the most striking characteristics of Table 2 is the considerable proportion of girls wishing to lose weight and who engage in weight restricting behaviour despite being of healthy or underweight status. For example, 40.8% of underweight Grade 9 girls wished to lose weight and 30.6% of them had dieted at some point. Similarly, 68.3% of healthy weight Grade 9 girls wished to lose weight, and 44.5% of them had dieted at some stage in their lives.

***INSERT TABLE 2 ABOUT HERE***

*Trends over time.* A repeated measures MANOVA conducted across the three successive time points for all model variables revealed a significant multivariate effect for time, *Pillais*  $F(14, 3174) = 26.31, p=.000, \eta^2=.104$ . Subsequent univariate analyses suggested that from Grade 8 to Grade 9, girls in the study increased in weight restricting behaviour  $F(1, 796) = 33.73, p=.000, \eta^2=.040$ , BD,  $F(1, 796) = 63.22, p=.000, \eta^2=.074$ , upset induced by teasing,  $F(1, 796) = 7.67, p=.006, \eta^2=.010$  and BMI,  $F(1, 796) = 67.38, p=.000, \eta^2=.078$ , and decreased in negative attributional style  $F(1, 796) = 34.05, p=.000, \eta^2=.041$ . Similarly, from Grade 8 to Grade 10, girls demonstrated an increase in weight restricting behaviour,  $F(1, 796) = 49.91, p=.000, \eta^2=.059$ , BMI,  $F(1, 796) = 160.75, p=.000, \eta^2=.168$  and BD  $F(1, 796) = 84.63, p=.000, \eta^2=.096$ , and a decrease in negative attributional style,  $F(1, 796) = 24.97, p=.000, \eta^2=.030$ . Finally, from Grade 9 to Grade 10, only an increase in BMI,  $F(1, 796) = 21.99, p=.000, \eta^2=.027$ , was evident.

*Longitudinal test of Model B.* Figure 3 illustrates the non-recursive longitudinal structural paths of Model B. As for the cross-sectional analyses, EQS for Windows 5.7b was employed using the maximum likelihood method and the covariance matrix. In order to account for residual within-time variance after controlling for each variables' predictors at an earlier time point, all variables in Grade 8 were allowed to covary with each other, all error variances in Grade 9 were allowed to covary with each other, and all error variances in Grade 10 were allowed to covary with each other. Although not included in Figure 3, autoregressive effects of each variable at an earlier time point were controlled for by allowing structural paths from Grade 8 to Grade 9, from Grade 9 to Grade 10, and from Grade 8 to Grade 10, for each variable across time.

***INSERT FIGURE 3 ABOUT HERE***

The longitudinal analysis of Model B demonstrated a CFI of .984, a Robust CFI of .983, and a RMSEA of .045 (90% confidence interval = .038-.052). The chi square and S-B chi-squares of 228.60,  $p < .001$ , and 196.12,  $p = .000$ , ( $df = 87$ ), respectively, were significant. However, as significant chi-squares are frequently the case with large sample sizes (see above) (Kline, 1998), fit indices suggest a good fit of the data to the model.

All recursive pathways were significant at the .001 level and indicated significant stability of measures over time. However, the results provided only partial support for the individual structural pathways proposed by Model B, with several pathways being nonsignificant and the Wald Test identifying a number of parameters to exclude. Specifically, the links between depression and WP, between upset induced by teasing and WP, between negative attributional style and upset induced by teasing, and between BMI and negative attributional style, were not significant at any time point. In

addition, the link between WP and weight restricting behaviour was nonsignificant from Grade 8 to Grade 10, as were the links between BD and weight restricting behaviour and between BMI and BD from Grade 9 to Grade 10. The link between BD and WP, and the link between negative attributional style and depression, were only significant from Grade 8 to Grade 9. Links between upset induced by teasing and both depressive symptoms and BD, were only significant from Grade 9 to Grade 10. Similarly, the links between negative attributional style and BD, and between BMI and upset induced by teasing were significant only from Grade 8 to Grade 10. Finally, all predicted indirect effects were nonsignificant, with the exception of BD on weight restricting behaviour through WP.

The LM Test identified a number of parameters to include. Specifically, it was suggested that a reciprocal link from BMI to BD from Grade 8 to Grades 9 and 10 should be added to the model. Similarly, it was suggested that links from BD to upset induced by teasing, from weight restricting behaviour to depressive symptoms, and from weight restricting behaviour to BD, be added from Grade 8 to Grade 9. Finally, it was suggested that a link from weight restricting behaviour in Grade 8 to WP in Grade 10 be added to the model. The model was therefore respecified with the suggested pathways included and nonsignificant pathways deleted (Model C) and retested.

For Model C, the chi-square and S-B chi-square statistics for Model C were 142.53,  $p=.01$ , and 125.12,  $p=.12$ ,  $df = 108$ . The CFI and S-B CFI were .996 and .997 respectively, with a RMSEA of .02 (90% confidence level = .009 - .028). Model C was found to be a significant improvement on Model B longitudinally,  $\Delta S-B \chi^2 = 71$ ,  $\Delta df=21$ ,  $p<.001$ . All recursive and non-recursive pathways were again significant at the .001 level and all indirect effects of Grade 8 variables on Grade 10 variables specified by

Model C were significant (see Tables 3 and 4 and Figure 4). Of particular note was that BD in Grade 8 had a significant indirect effect on depressive symptoms in Grade 10 through its effect on upset induced by teasing about weight in Grade 9.

***INSERT TABLES 3 AND 4 ABOUT HERE***

***INSERT FIGURE 4 ABOUT HERE***

The Wald Test did not suggest that any additional parameters be dropped, and the LM Test did not identify any meaningful parameters for addition. Therefore, as Model C represented a good fit to the data, it was retained as the final longitudinal model.

#### Discussion

It is clear from the present study that the prevalence of weight restricting behaviour and the desire to lose weight were extremely high among this sample of adolescent girls. It would also seem that the period from Grade 8 to Grade 9 is a particularly tumultuous time for adolescent girls, with significant increases in weight restriction practices, body dissatisfaction, upset induced by teasing and BMI. This is perhaps not surprising given the multitude of physical, social and psychological changes associated with both puberty and transition to high-school that girls of this age are experiencing.

The primary aim of the study was to test a proposed model of weight restricting behaviour both cross-sectionally and longitudinally with a large community sample of female adolescents. The results of these analyses will be discussed separately below.

### *Cross-sectional Findings*

Cross-sectional examination of Model A suggested that, as hypothesized, girls with higher weight preoccupation (WP) and body dissatisfaction (BD) engaged in more weight restricting behaviours. In addition, it was found that girls reporting higher upset induced by teasing about weight, more depressive symptoms, higher BMI, and a more negative attributional style, were more preoccupied with their weight, dissatisfied with their bodies, and engaged in more weight restricting practices. As predicted, the distal variables of upset induced by teasing, depressive symptoms, BMI and negative attributional style had their influence on weight restriction via their association with WP and / or BD. Also, girls who were more upset by teasing about their weight and had a more negative attributional style were found to report more depressive symptoms. Finally, adolescents with a higher BMI and a more negative attributional style were found to be more upset by teasing about their weight.

The cross-sectional examination of Model A suggested only two alterations to the proposed model. First, as higher BD was not found to lead to more depressive symptoms, it was suggested that this link should be excluded from the model. Second, although not originally hypothesized, higher BMI was found to lead to a more negative attributional style. Thus, the analyses suggested that this link be added to the model. Following these two alterations, the resulting respecified model (Model B), provided an extremely good fit to the data cross-sectionally and was validated through split half procedures.

### *Longitudinal Findings*

Findings from the longitudinal investigation were less supportive of the proposed model than the cross-sectional results. Although the final model, Model C,



provided a good fit to the data, it only partially supported the original hypotheses. The originally predicted associations will be discussed below, followed by discussion of additional non-predicted associations suggested by Model C.

*Hypothesised Model Links.* With respect to the prediction of weight restricting behaviour (the major focus of the present study), greater BD and WP at earlier time points were found to predict higher-level weight restricting behaviour at later time points consistent with the proposed model. BD was also found to have an additional indirect effect on weight restricting behaviour through its relationship with WP as predicted. That is, girls who were more dissatisfied with their bodies in Grade 8 were more likely to be preoccupied with their weight in Grade 9, and were subsequently more likely to participate in weight restricting behaviours in Grade 10. Longitudinally however, upset induced by teasing about weight, depressive symptoms, BMI and negative attributional style did not demonstrate the predicted relationship with methods of weight restriction. Of all the variables assessed therefore, it would appear that only WP and BD are important in predicting changes in weight restricting behaviour over the time frame examined in the present study.

A number of the hypothesized inter-associations between variables were supported by the longitudinal investigation. As predicted, girls with higher BD were more likely to be preoccupied with their weight later on. Girls who reported greater upset induced by teasing about weight, higher BMI and a more negative attributional style, were more likely to be dissatisfied with their bodies at later time points. Similarly, girls reporting greater upset induced by teasing about weight and a more negative attributional style, were more likely to experience depressive symptoms in subsequent years. Finally, girls with a higher BMI were more likely to be upset by teasing about

their weight later on. As noted above however, none of the distal variables predicted changes in weight restricting behaviour.

The first implication of these findings is that the focus on BD and WP evident in most treatment and prevention strategies for maladaptive weight restricting behaviour is justified and should continue. A second implication is that longitudinal research in the area of weight restriction methods is an important and necessary requirement. If the cross-sectional results were taken in isolation, invalid conclusions could be drawn concerning the importance of some variables in the prediction of weight restricting behaviour. The results of the longitudinal investigation suggest that some of the cross-sectional associations may have been due to shared variance among variables that was the result of taking measures at the same time point. Future longitudinal research is necessary to clarify variables important to the prediction of weight restricting behaviour over time.

Before concluding that upset induced by teasing about weight, depressive symptoms, BMI and negative attributional style are not significant in the prediction of weight restricting behaviour however, it must be remembered that a large percentage of girls were already engaged in weight restricting practices when first assessed in Grade 8. Indeed, the average age of dieting onset for this sample was 11.6 years and yet the Grade 8 questionnaire package was completed at an average of 12.8 years of age. At this time, 40.7% of the sample had already dieted, 4.7% had already vomited, and 73.2% had already exercised in order to lose weight. For many girls therefore, re-engagement or maintenance of weight restricting behaviour rather than onset of weight restricting behaviour was being predicted. This is perhaps not surprising given that

weight restricting behaviour has been found to be alarmingly prevalent in girls as young as 7 years (Edlund, Halvarsson, & Sjoeden, 1996).

There is also the possibility that yearly assessment intervals are too long to adequately capture the effects of the more distal variables on weight restriction methods. Thus, upset induced by teasing about weight, depressive symptoms, negative attributional style and BMI should not yet be ruled out as important predictor variables for weight restricting behaviour. It is important for future research to follow the progress of girls from an early age over a longer period of time with more regular assessments. Such large-scale, longitudinal studies are expensive, time-consuming, and difficult to conduct. However, they are essential if an accurate picture of weight restricting behaviour is ever to emerge.

*Non-hypothesised model links associated with weight restricting behaviours.*

While not predicted originally, the results suggested that the more girls engaged in weight restricting practices, the more depressive symptoms they would experience later on. In retrospect, we can see that such a pathway could be justified theoretically. McCarthy (1990) asserted that because weight is considered controllable in our culture, dieting failure leads to helplessness, low self-esteem and ultimately depression in women. Similarly, Stice and colleagues suggested that dieting by women leads to depression through either failure of dieting or through the physiological effects of dieting on mood (Stice, 1994; Stice & Bearman, 2001; Stice, Hayward, Cameron, Killen, & Taylor, 2000). In fact, both authors suggested that the gender difference evident in both BD and dieting practices is responsible for the greater proportion of depressed females compared to males. Indeed, there have been several studies supporting the supposition that weight restricting behaviour leads to depressive

symptoms consistent with the present findings (e.g., Cowen, Clifford, Walsh, Williams, & et al., 1996; Hartley, 1998; Keith, O'Keeffe, Blessing, & Wilson, 1991; Koenig & Wasserman, 1995; Roncolato & Huon, 1998; Stice & Bearman, 2001; Stice et al., 2000).

The longitudinal results also suggested that the more girls engaged in weight restricting practices in Grade 8, the more BD they experienced in Grade 9 and the more preoccupied with their weight they became in Grade 10. If, as the theoretical and empirical research discussed above suggests, failure in dieting leads to depressive symptoms, it also stands to reason that an individual would become further dissatisfied with her body and preoccupied with her weight if she engaged in high levels of weight restricting behaviour, attempts at which are likely to fail. In fact, this assertion has been supported by Byely, Archibald, Graber & Brooks-Gunn (2000), who found that high dieting significantly predicted high BD one year later in a longitudinal study of girls aged 10-14 years.

*Non-Hypothesised links associated with body dissatisfaction.* The longitudinal results also suggested that the higher a girl's BD in Grade 8, the higher her BMI and the more upset she would be due to teasing about her weight later on. Furthermore, the results suggested that girls with high BD in Grade 8, were more likely to be upset by teasing about their weight in Grade 9, and were subsequently more likely to report more depressive symptoms in Year 10. These links were not initially hypothesised and thus require some discussion.

The findings suggested not only that high upset induced by teasing lead to increases in BD as predicted, but also that the reciprocal relationship was true. Thus, BD may lead a person to feel more upset by teasing, perhaps because they are already

sensitive about their weight. The upset induced by teasing may in turn lead to a heightened sense of BD, and so the cycle may continue.

Although it was initially proposed that a link would exist between BD and depressive symptoms, the cross-sectional results failed to support the association. The longitudinal findings however, suggested that BD may indeed have an effect on depression, although only indirectly through its effect on upset induced by teasing about weight. It would appear that those who are dissatisfied with their bodies are more upset by teasing about weight when it occurs, which in turn leads them to feel more depressed.

That BD was found to predict BMI longitudinally is more difficult to explain and understand. It may be argued that as BD predicts weight restricting behaviour, those who are dissatisfied with their bodies may be more likely to diet, purge or exercise, which in turn may lead to binge eating and subsequent weight gain. However, a direct link between weight restricting behaviour and BMI was not found, nor was BD found to have an indirect effect on BMI through weight restricting behaviour. It should also be noted that BMI in Grade 8 was found to predict BD in Grades 9 and 10, thus suggesting a potential reciprocal relationship between the two variables.

#### *Strengths, Limitations, and Suggestions for Future Research*

There are a number of strengths associated with the present research, the most important of which is its longitudinal design that enabled the examination of causal relationships between variables. A second strength of the current research is the use of path analytic procedures over regression analyses. The number of regressions required to test the vast number of links over three time periods in the present study, would have led to extremely confusing results, some of which were likely to have been spurious.

The ability of path analysis to take into account all model links over successive time periods simultaneously is of extreme benefit when testing longitudinal links of a complex model.

The third strength of the present study was the inclusion of negative attributional style as a predictor variable within the domain of weight restricting behaviour. As discussed above, negative attributional style has rarely been studied in this context. While negative attributional style was not found to be important longitudinally in the prediction of weight restricting behaviour, it was found to be predictive of BD over time.

A final strength of the current investigation pertains to the broader conceptualization of weight loss strategies. While many previous studies have typically assessed dieting, purging and exercise behaviours separately, the present study approached the concept of weight restriction methods as a broader construct.

While the present research included a number of strengths, a number of weaknesses were also evident. First, the somewhat weak reliability of the CASQ-R and the use of a singular item in the operationalisation of upset induced by teasing comprise measurement limitations of the study. Future research should aim to employ more reliable and inclusive measures of these constructs.

A second limitation of the present research concerns consent and retention rates. While every effort was made to encourage students and parents to provide consent for study participation and to remain in the study, the consent and retention rates for the study raise issues concerning the generalisability of results.

In addition to the suggestions for future research already alluded to above, it would be beneficial to include a number of other predictor variables within the model.

Although the proposed model included only those variables amenable to individual psychological intervention, most researchers agree that weight restricting behaviour is the result of a complex interplay between biological, psychological and social factors. In particular, it is likely that peer attitudes / behaviours towards weight restricting behaviour and the sociocultural thin ideal are important factors related to weight restricting behaviours. Inclusion of such variables within the model may improve its predictive power over time.

### *Summary*

Partial support was found for a proposed model of weight restricting behaviour. As hypothesised, both the cross-sectional and longitudinal analyses found that WP and BD predicted weight restricting behaviour, and that BD had an additional indirect association with weight restricting behaviour through its relationship with WP. As hypothesized, cross-sectional analyses found that upset induced by teasing about weight, depressive symptoms, BMI and negative attributional style, affected weight restricting behaviour indirectly through their relationship with BD and / or WP. However, longitudinal analyses suggested that these more distal variables were not significant in the prediction of weight restricting behaviour over time.

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