Analysis of Aberrant Eating Behaviors and Body Mass Index on Weight Cycling in Women

by

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(ABSTRACT)

The purpose of this study was to explore the relationships between weight cycling and dietary restraint, disinhibition, binge eating, emotional eating and body mass index (BMI) while controlling for their simultaneous effects in women selected from a general population. Moreover, the interrelationships between the measures of dietary restraint, disinhibition, binge eating, and emotional eating were examined. The Disinhibition Subscale (DS) and the Cognitive Restraint Subscale (CRS) of the Three Factor Questionnaire (TFQ), the Emotional Eating Subscale (EE) of the Dutch Eating Behavior Questionnaire, and the Bulimic Inventory Test (BITE) were administered to 350 women in accordance with the Dillman protocol, and BMI was calculated. Significant positive correlations between weight cycling and the CRS($r = 0.23$), DS ($r = 0.38$), BITE ($r = 0.39$), EE ($r = 0.36$), and BMI ($r= 0.28$) were found. Together these variables accounted for 26% of the total variance in number of weight cycles. The EE and BMI had the strongest effect on weight cycling. The next strongest effects were the BITE and CRS; although, they were not statistically significant. The results suggest that obese women

who diet repeatedly may be successful at losing weight but are not successful at long-term weight loss maintenance due to factors such as emotional and binge eating.

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INTRODUCTION

For several years, health and nutrition experts have been praising the health benefits associated with weight losses that bring individuals to their "ideal" body weights; however, recently the benefits of weight loss have come under close scrutiny (Lee & Paffanbarger, 1992; Lissner et al., 1991; Pamuk et al., 1992). Dieting and weight cycling, defined as a cycle of weight loss followed by weight regain, have been shown to cause several adverse metabolic and physiologic adaptations. Some of the adaptations include a decrease in resting metabolic rate (RMR) (Barrows & Smook, 1987), an increase in food efficiency (Monroe, Berry, Skinner, & Carrol, 1991), and an increase in percentage of body fat (Blackburn et al., 1989). Based on these findings, researchers have hypothesized that each full weight cycle intensifies these metabolic adaptations (Blackburn et al., 1989). In addition to the suspected metabolic risks of weight cycling, there may be other health risk. Recently, the results of large scale epidemological studies have indicated that losing and regaining weight during adulthood can increase an individual's mortality rate by 50 % from all causes, especially from coronary heart disease (Lee & Paffanger, 1992; Lissner et al., 1991; Pamuk et al., 1992).

The initial weight cycling findings described above have spurred much debate regarding the potential hazards of weight cycling on an individual's health and metabolism. Some researchers have even gone as far as suggesting that obese individuals remain obese instead of entering into a lifetime struggle of weight cycling (Garner & Wooley, 1991).

Recently the National Task Force on the Prevention and Treatment of Obesity reviewed all of the current scientific literature on weight cycling (National Task Force, 1994). They concluded that, to date, the research is not sufficiently compelling to outweigh the potential benefits of moderate weight loss in significantly obese patients. Therefore, obese individuals should continue to try to maintain a healthy body weight through dieting and ignore the concerns about the hazards of weight cycling. However, they also concluded that the data regarding the long-term effects of weight cycling is inconclusive, and that non-obese individuals should strive to maintain a stable weight during adulthood. Additionally, the Task Force concluded that weight cycling could be detrimental to an individual's psychological well being, and that further investigation in this area is needed.

Weight cycling can be distressing to an individual. Many dieters experience an improvement in depression and self esteem levels with weight loss; although, the improvements are short lived and quickly return to initial levels or lower when the lost weight is regained (Wadden, Stunkard, Liesbschutz, 1988; Wooley & Garner, 1991). Additionally, regaining lost weight may cause dieters to see themselves as failures, and this feeling intensifies with each weight cycle (Wooley & Garner 1991).

America has become a nation obsessed with dieting. At any given time, approximately 50 million Americans are dieting (Consumer Reports, 1993). Certainly, many are dieting because of the negative health risks associated with obesity (Brownell and Stein, 1988),

but for many others the motivating factor for dieting has more to do with cultural standards of beauty than with health issues.

The current feminine ideal body shape is a thin, almost girlish, athletic physique, and for most adult age females, its attainment through normal dietary eating habits is almost impossible. Men, as well, have a masculine ideal body shape to strive for, but the pressure to obtain the societal "ideal" is much more intense and unrealistic for women than for men (Anderson & DiDomenico, 1992; Wardle 1987). Thus, women are particularly vulnerable to the pressure to diet as a means of meeting the current standards of beauty and are at a greater risk of weight cycling and the associated dangers. Indeed, two groups of researchers both reported in large scale survey studies that between 20 - 25% of adult age American women have dieted in the last two months (Langer, Warheit, & Zimmerman, 1991; Rand & Kuldau, 1990). In addition, Langer et al. (1991) reported that 55% of the women felt guilty after they ate.

Unfortunately, not much research has focused on identifying the eating behaviors that may exacerbate weight cycling, although there is some indication that dietary restraint, emotional eating, and binge eating may be associated with weight cycling (Tuschl 1990; Wardle, 1988). Additionally, a high body mass index (BMI) also has been suggested to increase an individual's likelihood of weight cycling (Wadden et al., 1992). Some researchers feel that overweight or obese women may weight cycle more often because they are continually trying to conform to societal standards of feminine beauty.

Before the cycle of weight loss and regain can be stopped, the abberrant eating behaviors which exacerabate its occurrence must be identified. As of today, no study the author is aware of has evaluated the simultaneous effects of dietary restraint, disinhibition, binge eating, and emotional eating on weight cycling in a general population of women. Thus, the purpose of this thesis was to explore the relationships between weight cycling and these aberrant eating behaviors as well as body mass index. In addition, the interrelationships between dietary restraint, disinhibition, binge eating, emotional eating, and body mass index were examined. Responses of 230 women to a mail survey were used as the data in these analyses.

LITERATURE REVIEW

DIETING AND WEIGHT CYCLING

In our society, great emphasis is placed on possessing a slim, athletic body shape, and the pressure to obtain the "ideal" shape falls much harder on women than on men (Polivy & Herman, 1987; Wismen, Gray, Mosimann, & Ahrens, 1992). Obtaining the feminine ideal is strongly enforced by the media. Since the 1960's when the "Twiggy" body shape emerged as the feminine ideal body shape, the number of articles and advertisements promoting dieting has increased dramatically (Garner, Garfinkle, Schwartz & Thompson, 1980). Similarly, the number of women concerned about their body weight and attempting to reduce it through dieting also increased significantly (Herman & Polivy, 1987). Today, dieting behavior seems to be the norm. One cannot turn on the television or open a women's magazine without being bombarded with weight loss gimmicks, products, and plans.

Recently Wismen et al. (1992) examined American society's depiction of the "ideal" feminine physique. Body measurements and weights of Playboy Magazine's centerfolds and Miss America contestants were evaluated from 1979-1988. Playboy centerfolds and Miss America contestants had body weights that were 13-19% below ideal body weights for women in their age groups. Additionally, the Miss America contestants exhibited a significant decrease in weight from 1979-1988. Wismen et al. also investigated the number of "diet for weight loss" and exercise articles in six leading women's magazines from 1959-1988. They revealed a significant increase over time in the number

of dieting and exercise articles and suggested that over valuing thinness in women continues to occur and is becoming more intense.

Myers and Biocca (1992) recently conducted a study to determine if the emphasis the media had placed on the thin feminine physique was responsible for women's distorted body images and was an indirect cause of anorexia and bulimia. They studied the effect that media programming and commercials had on subject's self perception of body image. The subjects exhibited an elastic body image meaning that the subjects' actual body size was in conflict with the media dictated ideal body size. The subjects' exhibited an unstable self perceived body image which seemed to change with watching only 30 minutes of television programming or advertising.

The pressure to be thin is more intense for females than males. Seim and Fiola (1990) surveyed 109 women and 89 men between the ages of 15-80 years. The women reported dissatisfaction with their body image and weight five times more than the men. Twice as many women as men felt that being overweight has a moderate to strong effect on their self-esteem, and felt guilty when they overate. Moreover, 68% of the women dieted monthly to a few times per year; whereas, 75% of the men dieted once per year or have never dieted. Stake and Lauer (1987) also reported that women exhibited lower self esteem levels due to being overweight compared to men. In addition, they also reported that being overweight negatively affected the quantity and quality of women's relationships with men, but had little or no effect on men's relationships with women.

Rozin and Fallon (1988) explored differences in body image, attitudes toward eating and weight, and eating behaviors in male and female college students and their biological parents. Both the mothers and the daughters believed that men in their generation preferred much thinner women than did the men surveyed. The mothers and daughters exhibited concern over weight and eating; whereas, the fathers and sons were relatively unconcerned about weight and eating. Rozin and Fallon suggested that the major concern about body image and weight is dependent upon gender, not generation.

Several researchers have suggested that the media hype given to dieting and the attainment of the feminine ideal is one of the critical factors for the substantial differences in incidences of eating disorders between men and women. Anderson and DiDomenico (1992) investigated the number of advertisements and articles promoting weight loss or shape change in ten popular magazines most commonly read by young men and women between the ages of 18-24. The women's magazines contained 10.5 times as many articles and advertisements promoting dieting compared to the men's magazines. Anderson and DiDomenico concluded that the frequency of differences in eating disorders between men and women are more likely due to differing gender related reinforcement of dieting and obtaining the feminine ideal than any biological parameter. Women may strive harder than men to obtain the cultural ideal body shape because they seem to judge their self worth more on their outward appearance than men.

Several researchers have revealed that dieting begins in the preteen years (Hawkins, Turell, & Jackson, 1983; Paxton et al., 1991). Hawkins et al. reported that 80% of the

preteen girls surveyed reported they had been on a diet at least once compared with only 10 % of the boys. Thelen, Powell, Lawrence, & Kuhnert (1992) showed that 4th and 6th grade girls were significantly more concerned about being or becoming overweight, more concerned about the effects of eating fattening foods, and had a history of more dieting behavior compared to boys of similar age.

A high incidence of dieting is seen not just during the preteen and teen years but also seen throughout adulthood. A recent Gallop poll (Brownell & Stein, 1988) revealed that an alarming number of adults, mainly women, are chronic dieters. Ninety percent of the adults surveyed believed they were overweight, 31% of the women stated they dieted at least once a month, and 16% of the women stated they dieted on a continuous basis. A 1985 Health Interview survey reported that 25% of the men and 44% the women were dieting to lose weight (Blackburn et al., 1985).

Today, many leading researchers believe that the pressure to be thin in the female population is so persuasive and widespread that dieting behavior and preoccupation with food and weight is considered normal (Polivy & Herman, 1987; Seim & Fiola, 1990; Wiseman et al., 1992).

Many individuals who diet lose weight and then regain it many times throughout their adult lives. This cycle of losing and regaining weight is termed weight cycling. Initial studies on the metabolic effect of weight cycling were conducted on rats. Brownell et al. (1986) evaluated the metabolic effects of repeated weight cycling in obese male rats. The rate of weight loss was shown to be lower during the second weight cycle compared to

the first. Specifically, the cycling rats lost 152 grams in 21 days during the first weight cycle; whereas during the second weight cycle it took 46 days to lose the same amount of weight. The cycled rats also exhibited an increase in food efficiency (weight gain/kcal of food intake) during the second weight cycle. Gray, Fisher, and Bray (1986) provided additional evidence of the detrimental effects of weight cycling in rats. They reported that weight cycled rats lost energy stores more slowly during the second weight cycle compared to the first. Results were corroborated in a rat study conducted by Archambault, Czyzewski, Cruz, Foreyt, & Mariotto (1989) who concluded that weight cycling in rats results in more difficult weight maintenance during the refeeding period.

About the same time the initial research in weight cycling was being conducted on rats, researchers were evaluating the metabolic effects of dieting through caloric restriction. What the researchers knew at this time was that the body protects itself from caloric deprivation by decreasing its overall energy expenditure by suppressing resting metabolic rate (RMR) and increasing food efficiency. Because of this fact, several researchers hypothesized that dieting through severe caloric restriction would decrease an individual's RMR during the dieting and post dieting period. Barrows and Snook (1987) and de Groot, van Es, van Raajj, Vogt, and Hautvast (1990) found that an individual's RMR declines significantly when short term weight loss is achieved through caloric restriction. Furthermore, Frey-Hewitt et al. (1990) and van Dale, Harris, & Ten Horr (1990) reported that lowering of an individual's RMR through dieting persists during the post dieting period.

Frey-Hewitt et al. (1990) studied the effect of energy restriction and exercise on weight loss and RMR over a one year period in 121 overweight men. The men were randomly assigned into three groups: control (C), energy restriction (D), and exercise only (E); RMR measurements were taken at baseline and after one year. After one year, the D group exhibited a significant decline in RMR from baseline compared to the C and E groups; therefore, a one year weight loss by energy restriction produced a significant decline in RMR while weight loss by exercise did not change RMR.

A similar study conducted by van Dale et al. (1990) investigated the effects of dieting (D) and dieting plus exercise (DE) on body composition and sleeping metabolic rate (SMR) in 44 participants over a period of 18, 36, 42 months post diet treatment. Over the experimental period, the D group regained 90% of their lost weight compared with the DE group which had regained only 60%. The SMR during the last follow up measurement for the D group was 18% lower than pre-treatment values. The DE group also experienced a decline in SMR; however the decline was significantly smaller, only 9.8% lower than pre-treatment values.

The studies reviewed above reveal that dieting is accompanied by a lowering of an individual's RMR which occurs because the body is attempting to conserve energy and become more efficient. Based on these findings and the findings from the initial weight cycling studies on rats, many of the leading researchers in the field of weight loss began to hypothesize that the metabolic adaptations to dieting may be enhanced with repeated

cycles of weight loss and regain in humans making subsequent weight loss attempts more difficult (Blackburn et al., 1989; Brownell et al., 1986).

Some researchers find that weight cycling subjects exhibit an increase in food efficiency (Monroe et al., 1991; Tuschl et al., 1992), have higher BMIs (Monroe et al., 1991; Tuschl, 1990; Wadden et al., 1992), and lose weight more slowely during subsequent weight loss cycles (Blackburn et al., 1990). However, other researcher have not been able to duplicate these findings and showed no differences between RMR, BMI, food efficiency, and weight loss velocities of weight cyclers versus non-weight cyclers (Jebbs, Goldberg, & Cosward, 1991; Steen, Opplinger, & Brownell, 1988; Van Dale & Saris, 1989).

One of the most frequently cited studies on weight cycling was conducted by Blackburn et al. (1989). They evaluated the effects of weight cycling on 1000 obese patients who had participated in a weight loss program that employed very low calorie diets as the diet regimen from 1973 to 1982. In accordance with the animal studies cited above, the velocity of weight loss of the obese patients was significantly slower in cycle 2 compared with cycle 1. The authors suggested that the body responds to dieting the same way it does to starvation: by increasing food efficiency and decreasing energy expenditure. Chronic dieting may lead to permanent metabolic and physiologic alterations which enhance weight gain and make successive weight loss attempts more difficult.

Many weight loss professionals believe that an extensive history of dieting is a negative prognostic sign (Brownell and Stein, 1988). One explanation for this may be that

repeated bouts of dieting increase the food efficiency of an individual making them resistant to weight loss. Support of this hypothesis was revealed in a study conducted by Monroe et al. (1991). The researchers showed that non-obese female cycling dieters experienced an increase in food efficiency during exercise compare to the nondieting controls; however, no differences in absolute resting energy expenditure were revealed between the two groups. This may be due to the relatively small sample size (n=23). Additionally, the cyclical dieters had a higher BMI, body weight, and percent body fat; although, fat free tissue was similar in the two groups indicating that differences in weight can be attributed to a higher percent body fat in the cyclical dieters. The cyclical dieters also reported consuming similar amounts of calories per day suggesting that weight cycling causes a decrease in overall energy expenditure.

A study conducted by Wadden et al. (1992) also examined the relationship between weight cycling/dieting history, RMR, body composition, and subsequent weight loss in 50 obese women. The subjects were asked to report the number of diets they had attempted that resulted in a ten pound or greater weight loss. Weight cycling was measured by the amount of lifetime weight loss, including only the diets that resulted in a ten pound or greater weight loss. The subjects reported that they had dieted an average of 4.9 times and lost a total of 55.9 lb. On average the subjects first began to diet at age 19.6 years and weighed 70.8 kgs. A significant relationship was found between increased weight cycling and earlier onset of obesity, a higher BMI, percent body fat, and waist to hip

circumference. Weight cycling was not associated with RMR, fat-free mass, or waist to hip ratio. Total number of diets was significantly related to age of onset of obesity.

The subjects scores on the Three Factor Questionnaire (TFQ) (Stunkard & Messick, 1985), Binge Eating Scale (Gormally & Black, 1982), and Beck Depression Inventory (Black et al., 1961) also were measured. None of the scales were significantly correlated with weight cycling or number of diets. The Cognitive Restraint Subscales (CRS) of the TFQ exhibited the highest correlation with weight cycling ($r = 0.24$) followed by the Disinhibition Subscale (DS) of the TFQ ($r = 0.21$). None of these correlations were significant at $p < 0.05$.

Wadden et al. (1992) also examined the relationship between subsequent weight loss with number of diets and weight cycling. They did not find that weight cycling or number of diets was significantly related to a smaller amount of weight loss during a very-low-calorie-diet and behavior therapy regimen. Subjects identified as high weight cyclers (7.1 diets and 78.3 kgs of lifetime weight loss) lost similar amounts of weight and at virtually the same velocity as the low weight cyclers (2.8 diets and 26.4 kgs of lifetime weight loss). However, one interesting finding was that women who reported dieting four times or more, each time losing more than ten pounds, reported higher weights with each completed weight cycle. These subjects ended up approximately 22 lb. heavier after five weight cycles.

Wadden et al.'s study design could have been improved by comparing the RMRs of obese subjects whom reported two or more dieting episodes that resulted in a ten pound

weight loss, with obese individuals who never dieted Even though the low weight cycling obese in this study reported a mean of only 2.8 diets, they may have, in fact, dieted more but the diets did not result in ten pound weight loss. Researchers do not know at what point metabolic adaptation to dieting occurs, thus one or two long-term diets may be the breaking point, or the deciding factor may also be several small chronic diets that only last a few days.

Like Wadden et al. (1993), several other researchers have not found weight cycling to be detrimental to an individual's RMR or increase an individual's total body fat. Rebuffe-Scrive et al. (in press) evaluated the RMR and fat free mass of 24 normal weight and mildly obese women. They found no differences in RMR between the weight cyclers and non-weight cyclers. In addition, there was no difference in fat free mass among the two groups.

Not only may there be potential metabolic hazards of weight cycling, but there may also be psychological ones as well. Wadden, Stunkard, Libschutz (1988) conducted a follow up study over a three year period which assessed the efficacy of three different treatments of obesity. They revealed that individuals experienced an improvement in self esteem, depression, and general psychological function with weight loss; although, these improvements proved to be short lived. Dieters returned to their initially low level when lost weight was regained. Moreover, regaining lost weight may cause the dieters to see themselves as failures which may be intensified with each weight loss weight regain cycle (Wooley & Garner, 1991).

Goodrich, Raynaud, Pace, and Foreyt (1993) found that patients attending very low calorie diet programs overestimated the overall success of the program and blamed themselves if successful weight loss was not achieved. Many of the patients painfully explained their previous failures with weight loss, describing the worthlessness and hopelessness they felt. Wooley and Garner (1991) believed that the inability to attain thinness, to garner social approval, and to be regarded as attractive is a serious loss that obese individuals experience with each unsuccessful weight loss attempt. Having this goal repeatedly denied may fill a lifetime with despair (Wooley & Garner, 1991) .

Because of all the controversy surrounding the potential hazards of weight cycling, the National Task Force on the Prevention and Treatment of Obesity decided, in 1994, to review all of the current literature available on weight cycling so that they could provide health care professionals with safe guidelines on the risk to benefit ratio of attempts at weight loss. The conclusions of the task force are as follows: 1) the evidence supporting the hazards of weight cycling on body composition, energy expenditure, risk factors for cardiovascular disease, or the effectiveness of future weight loss in humans are inconclusive. 2) "The currently available evidence regarding the increased morbidity and mortality with variation in body weight is not sufficiently compelling to override the potential benefits of moderate weight loss in significantly obese individuals." (pg. 1201) 3) Determination of psychological damage of weight cycling needs further investigation. 4) Individuals who are not obese should not attempt to lose weight through dieting but should focus on a healthy lifestyle. 5) Although conclusive evidence regarding the long-

term effects of weight cycling are lacking, obese individuals who do try to lose weight should focus on lifelong changes in their behavior, diet, and activity level.

SUMMARY

Several findings can be drawn from the above review of literature. The first is that women in the American society feel extreme pressure to obtain the ideal feminine body shape. For the vast majority of women, the attainment of the feminine ideal is almost impossible through normal dietary habits. Thus, many women diet repeatedly or chronically in the hope of obtaining it. The pressure to be thin is so intense and wide reaching that many girls begin to diet before their preteen years. The second conclusion that can be drawn is that calorically restricting ones dietary intake results in a decrease in RMR during the dieting period and the post dieting period. Third, the evidence supporting the detrimental effects of weight cycling are controversial and inconclusive. Some researchers have shown that weight cycling causes a decrease in RMR and an increase in body fat; whereas, others have not been able to replicate these findings. However, several of the researchers who reported conflicting results showed that there was a relationship between weight cycling and a heavier body weight for height. Fourth, weight cycling may have deleterious effects on a dieter's self esteem. The dieter may feel more and more like a failure with each weight loss - regain cycle. Very little research about the psychological effects of weight cycling has been conducted.

DIETARY RESTRAINT

THE BOUNDARY MODEL OF DIETARY RESTRAINT

Based on the assumption that dieting is a key factor in food regulation, Herman and Polivy (1980) constructed the boundary model of dietary restraint. The model is based on behavioral research that attempted to classify differences in eating behaviors of obese and normal weight individuals as a function of weight status (Schachter & Rodin, 1974); however, the research indicated that eating differences were not attributable to weight status but rather to attempted weight suppression or dieting behavior (Heatherton, Herman, Polivy, King, & McGree, 1988).

The boundary model of dietary restraint proposes that a dieter's eating behavior is governed by the balance between physiological factors promoting the desire to eat, and the effort of resisting that desire in an attempt to keep dietary intake in line with weight loss aspirations (Herman & Polivy, 1984). Individuals vary in their degree of practicing dietary restraint. Restrained eaters are individuals who are constantly preoccupied with what they are going to eat and continually resist food in an attempt to lose or maintain weight. They are overly concerned with their appearance and usually have a negative body image (Heatherton et al., 1988). Restrained eaters are considered chronic dieters. On the other end of the continuum lie the unrestrained eaters. These individuals eat freely, without guilt, whenever the desire arises. Unrestrained eaters rarely diet and are not preoccupied with food and weight status.

Restrained eaters' cognitive control over eating can be undermined by their perception of events or conditions called disinhibitors (Herman & Polivy 1980,1984). When disinhibiting events occur, restrained eaters' desire for food prevails over self imposed dietary restriction, and they consume large quantities of food; i.e., overeat/binge yhus, disinhibitors are believed to precipitate binge eating (Herman & Polivy, 1988, Polivy 1988, Tuschl, 1990). Disinhibitors include emotional states such as anxiety and depression, alcohol consumption, and dietary violation. The term dietary violation is described as the restrained eaters perception of having "blown the diet thus, why not indulge?" (Ruderman, 1980). Disinhibition of dietary restraint seems inevitable secondary to the restrained eater's intense preoccupation with food and biological defenses against periodic starvation.

DISINHIBITION OF DIETARY RESTRAINT VIA DIETARY VIOLATION

As mentioned above, restrained eaters' control over eating can be disinhibited by their perception of events or conditions called disinhibitors. In the laboratory setting, researchers have achieved dietary violation by manipulating restrained eaters into thinking they have "blown the diet". This is accomplished by giving subjects a milkshake which is described as a high calorie food prior to their participation in a taste test. The milkshake is called a preload or a forced preload.

In the classic study conducted by Herman and Mack (1975), subjects were classified as either restrained or unrestrained by their scores on the Restraint Scale (RS). The RS was developed for the purpose of identifying individuals who are chronic dieters.

It consists of two factors: the Concerns for Dieting factor and the Weight Fluctuation factor. One half of each of the two groups, restrained and unrestrained, received a preload prior to their participation in the taste test, and the other half of the two groups did not receive a preload. The restrained eaters who received the preload ingested more ice cream compared to the restrained eaters who did not receive the preload. Conversely, the unrestrained eaters exhibited the opposite eating behavior. They ingested less ice cream following the preload compared to the unrestrained eaters who did not receive the preload.

The restrained eaters' consumption of more food following the preload was termed "counterregulation", and the unrestrained eaters consumption of less food following the preload was termed normal "regulation" (Hibersher& Herman, 1977). The degree of counterregulatory eating was believed to be dependent upon the size of the preload; i.e., the larger the preload the greater the amount of food consumed following it. Heatherton et al. (1988) believe that ingestion of the preload temporarily sabotages the restrained eater's current dieting intention making further dieting not to be worth the effort.

The above findings concerning counterregulatory eating have been replicated in several studies employing the classic preload experimental design used by Herman and Mack (1975) (Herman et al., 1987; Ruderman & Christen, 1983). These researchers showed that unrestrained eaters regulated their eating, reaching satiety after ingesting approximately the same amount of food (preload + ice cream) compared to the restrained

eaters who exhibited two different satiety levels. The restrained eaters exhibited a low satiety level (ingested a small amount of food) when they did not receive a preload and a high satiety level when they did receive a preload, suggesting that eating regulation and satiety are controlled by cognitive factors not physiological ones.

Support for this assumption is found in a study conducted by Woody, Constanzo, Liefer, and Cogner (1981). The purpose of the study was to determine if counterregulatory eating was controlled by cognitive or physiological factors. Woody et al. employed the classic preload design but they manipulated the conditions of caloric information and taste. Caloric information was manipulated by presenting isocaloric preloads to the subjects as either "high" calorie or "low" calorie, and taste was manipulated by making the preload and the ice cream either good tasting or bland tasting achieved via the addition of quinine sulfate. In the "good tasting" condition, the restrained eaters ate significantly more ice cream following the "high" calorie preload than they did following the "low" calorie preload as well as ingesting significantly more ice cream than the unrestrained eaters in either preload condition. However, differences in the amounts eaten by the unrestrained and restrained eaters in the bad tasting ice cream condition were not significantly different.

The findings of this study show that cognitive rather than physiological factors mediated the eating behavior of the restrained eaters since manipulating them into thinking they ingested a "high" calorie milkshake induced counterregulatory eating whereas the perception of ingesting a "low" calorie milkshake did not (Woody et al., 1981).

As more findings were being presented on the behaviors of restrained eaters, Herman and Polivy (1984) began to explain the dietary restraint phenomenon in terms of a boundary model. In this model, the restrained eater has a self imposed "diet boundary" which lies somewhere on a continuum between hunger and satiety. This diet boundary represents the upper and lower limits of the restrained eater's allotted dietary "allowances" that correspond with their dieting intention (Herman et al., 1987). If a dietary violation (a preload in laboratory studies) exceeds the upper limit of the dieter's diet boundary, then counterregulation or binge eating occurs (Herman & Polivy 1984). The effect of a given preload or dietary violation will depend upon the perceived size of the preload compared to the permissible limit of dietary intake dictated by the diet boundary (Heatherton et al., 1988). In the study conducted by Woody et al. (1981), the "low" calorie preload may not have exceeded the restrained eaters' diet boundary thus, disinhibition of dietary restraint was not achieved.

When the Herman and Polivy (1984) began to use the boundary model to futher explain dietary restraint, they proposed another interpretation of counterregulation from the initial proposal made by Hibersher and Herman (1977); namely that counterregulatory eating is unregulated by physiological satiety therefore independent of the amount of preload ingested. Herman and Polivy (1984) proposed that termination of eating by the restrained eater occurs at two levels: one before the diet boundary is exceeded and one after. When the diet boundary remains intact, minimal amounts of food are ingested and termination of eating occurs before physiological satiety is reached; however, when the

diet boundary is surpassed considerably more food is ingested and termination of eating occurs when satiety is reached. The comparison of the amount of ice cream ingested by restrained eaters before and after the preload is what produces the counterregulatory illusion i.e. that eating is unregulated by physiological control (Herman et al., 1987). Preloaded restrained eaters have been shown to eat more than preloaded unrestrained eaters in several studies (Ruderman & Christensen, 1983; Ruderman, Belzer, & Halperin, 1985; Wardle & Beales, 1988). This phenomenon has been suggested to be due to "delayed" or weakened satiety signals as a result of repeated dieting (Polivy, Herman, Olmsted, & Jazxeinski, 1984).

To illustrate the illusion of counterregulation, Herman et al. (1987) evaluated ad libitum eating of 30 restrained and 30 unrestrained eaters (a) without a preload, (b) after ingesting a large preload (15 oz. milkshake), and (c) after ingesting an extra large preload (30 oz. milkshake). The unrestrained eaters ate the most ice cream when they did not receive the preload, the least following the extra large preload, and an intermediate amount following the large preload. Hence, they exhibited regulatory eating. As expected, the restrained eaters exhibited counterregulatory eating. They ingested significantly more ice cream following the large preload (102 g) than after no preload (71 g). Interestingly, the restrained eaters ingested the least amount of ice cream following the extra large preload (37 g), suggesting counterregulatory eating is responsive to physiological satiety. The eating behavior displayed by the restrained eaters in the three experimental conditions supports Herman et al.'s assumption that (1) termination of eating

occurs at two levels in restrained eaters, one before the diet boundary is breached and one after, producing the illusion of counterregulation and (2) counterregulation is governed by physiological factors.

In the studies reviewed above, researchers revealed that the perception of having ingested a high calorie food disinhibits dietary restraint. Several researchers also wondered if anticipation of dietary violation would function as a disinhibitor. To test this hypothesis, Ruderman et al. (1985) measured initial cracker consumption in unrestrained and restrained subjects expecting a milkshake, a salad, or nothing before a second cracker consumption taste test. The restrained eaters expecting a milkshake prior to the second taste test consumed more crackers compared to the restrained eaters expecting either a salad or nothing. The opposite behavior was observed in the unrestrained eaters; the unrestrained eaters expecting a milkshake consumed fewer crackers than those who did not. Ruderman et al. (1985) concluded that the anticipation of dietary violation functions as a disinhibitor in the restrained eaters, producing counterregulation. Interestingly, anticipation of dietary violation by the unrestrained eaters functioned in a different way. The unrestrained eaters may have eaten less when expecting a milkshake in an attempt to compensate for calories that would be ingested later in the experiment.

Since perception and anticipation of having "blown the diet" leads to overeating in the laboratory, would it not also lead to overeating for the remainder of the experimental day? Wardle and Beales (1987) conducted a study to test this assumption by evaluating the disinhibiting effects of a preload on food intake in the laboratory setting and for the

remainder of the day. Level of dietary restraint was determined by the Dietary Restraint subscale of the Dutch Eating Behavior Questionnaire (DEBQ) (van Strein, Frijters, Bergers, & Defares, 1986). Twenty four hour dietary records were collected from 50 college age females for the day before the experiment and the day of the experiment. The data revealed that restraint was associated with lower food intake during everyday life, but higher intake in the laboratory setting following a forced preload. Restrained eaters reported ingesting an average of 300 kcal/day less than the unrestrained eaters. Wardle and Beales (1987) concluded that the restrained eaters did not exhibit counterregulation during the day of the experiment due to the self monitoring imposed by the 24 hour recall. Thus, disinhibition in a laboratory setting did not necessarily result in continued loss of control in daily life.

Two other explanations for the restrained eaters' behaviors in the study conducted by Wardle and Beales (1987) may be that they need a more substantial dietary violation to lose control over eating for the entire day, or that counterregulation occurs only immediately following a dietary violation. As time progresses, disinhibiting effects may diminish, enabling the restrained eater to regain cognitive control over eating.

The hypothesis that self monitoring of eating significantly influences food intake was supported by a study conducted by Kirschemaum and Tomarken (1982). Restrained eaters exhibited regulatory eating when ice cream was presented to them for ad libitum eating after a preload in small bowls labeled high calorie. By contrast, counterregulation was exhibited by restrained eaters when the ice cream was served in large bowls without

caloric labels. Polivy, Herman, Hackett, & Kuleshnyk (1986) found similar results regarding the influences of self monitoring on the eating behavior of restrained eaters. Self monitoring was achieved by focusing public and self attention on food intake. The restrained eaters exhibited counterregulation of eating following a forced preload only when no attention was drawn to their intake; however, when public or self attention was focused on food intake, the restrained eaters regulated their intake.

To elucidate further the link between dietary restraint and eating regulation, Wardle and Beales (1988) evaluated the eating behavior of 27 obese women attending a weight control program. The overweight women were assigned to either a diet group termed high restraint because the subjects were restricting their normal caloric intake by 500 kcal/day, an exercise group termed low restraint because they did not have to restrict their dietary intake, and a control group which was also considered a low restraint group. On Week 4 of the study, each subject's food intake was measured before and after a high calorie milkshake preload. The diet group (high restraint) ate twice as much ice cream as the other two low restraint groups. On Week 6, food intake was measured during a stressful condition induced by watching a frightening film. Again, the high restraint group exhibited counterregulatory eating, ingesting substantially more sweets and nuts than the two low restraint groups. Moreover, the Restraint Scale (Herman & Polivy, 1980) scores of the subjects in the high restraint groups decreased with dietary treatment.

Similar results were reported in two studies conducted by Rodin, Slochower, & Flemming (1977). In the first study, food intake of a test meal was evaluated in 20 obese

women before and after 10 weeks of participation in a weight loss program (weight loss was achieved via caloric restriction). Subjects ingested more food during the second test meal than they did during the first. In the second study, food intake during a test meal was compared in women participating in a weight reduction program and non-dieting controls. Food intake of the dieting women increased over the course of the program; whereas, that of the controls remained the same. These two studies and the one conducted by Wardle and Beales (1988) suggest that an increase in restraint behavior imposed by caloric restriction makes an individual more susceptible to disinhibiting events resulting in counterregulatory eating.

Based on the findings reported by Rodin et al. (1977) and Wardle and Beales (1988), Lowe and Klefield (1988) hypothesized that individuals who have lost weight by dieting are extremely susceptible to disinhibiting events. Thus, they evaluated the effect of long term weight suppression on eating regulation in 48 college age women. Subjects were classified as either high or low in both restraint and weight suppression. Weight suppression was calculated by [(greatest weight-current weight)/(ideal weight)] x 100. Subjects were given a milkshake preload and, after ingestion of the preload, were evaluated for ad libitum ice cream consumption. Unexpectedly, the classic counterregulatory behavior of restrained eaters was not seen. The level of dietary restraint was unrelated to the amount of ice cream ingested following the preload; whereas, the degree of weight suppression was related to the amount of ice cream ingested. Individuals who were classified as weight suppressers ingested significantly less ice cream following

the preload than individuals who were not weight suppressers. Furthermore, weight suppressers weighed more, and reported both consuming less food prior to participation in the study and being less hungry before and after the study than non-weight suppressers.

Lowe and Klefield (1988) provided two explanations why their subjects behaved differently than the subjects in the two studies conducted by Rodin et al. (1977) and Wardle and Beales (1988). The first is that susceptibility to overeating may be increased during and shortly after weight loss and that susceptibility dissipates with time as weight loss is maintained. In Lowe and Klefield's (1988) study, the weight suppressers had been at their current suppressed weight for at least a year (average of 20 months) compared to the subjects who had very recently experienced weight loss in Rodin et al.'s study (1977) and Wardle and Beales (1988). Another explaination for Lowe and Klefield's (1988) findings is that there may there may be a subset of dieters who never become susceptible to counterregulation.

Overall, the weight suppressing subjects seemed to have adapted to their new lower weights in several ways such as reporting being less hungry and ingesting significantly fewer calories per day. It appears that weight suppressers are metabolically more efficient than non-weight suppressers as evidenced by the weight suppressers higher weights for height in spite of consuming fewer calories. They may have to consume fewer calories to maintain their suppressed weight. Metabolic efficiency may be a result of recent weight loss, habitual dieting, or weight cycling; however, it is more likely due to combination of all three.

DIETARY RESTRAINT AND WEIGHT CYCLING

Several researchers have alluded to a significant relationship between weight cycling and dietary restraint (Laessle, Tuschl, Kotthaus, & Pirke, 1989a; Tuschl, 1990). As mentioned previously, weight cyclers weigh more and exhibit a higher BMI than non-weight cyclers, and a similar trend in regard to weight and BMI has been seen in restrained eaters when compared with unrestrained eaters. Both Wardle and Beales (1987) and Laessle et al. (1989a) reported that restrained eaters exhibited a higher BMI despite consuming significantly fewer calories ($p<0.05$) per day (approximately 400 kcal/day less), than unrestrained eaters. In addition, in Laessle et al.'s study (1989a), the restrained eaters reported being on intensive weight reducing diets more often than the unrestrained eaters, and 23% of the restrained eaters had lost at least 4 kg of body weight nine times; whereas none of the unrestrained eaters exhibited such a dieting frequency. Laessle et al. (1989a) provided two explanations for the restrained eater's higher BMI: (1) the restrained eaters underestimated their self reported intake or (2) the restrained eaters have a lower daily total energy expenditure than unrestrained eaters.

To conclusively determine which of these explanation was correct, Tuschl, Plate, Laessle, Stichler, and Pirke (1990) used the double labeled water method to measure energy expenditure in 23 healthy college age women who were classified as either restrained or unrestrained by the CRS of the Three Factor Questionnaire (TFQ) (Stunkard & Messick, 1985). Like the DEBQ, the TFQ was developed to improve the measure of

dietary restraint over the Restraint Scale (Herman & Polivy, 1980). As reported in the studies conducted by Wardle and Beales (1987) and Laessle et al. (1989a), the restrained eaters in this study exhibited a significantly higher BMI and a slightly higher weight despite consuming 409 kcal/day less ($p<0.05$). Moreover, the restrained eaters had a significantly higher maximum BMI since adulthood, reported a significantly greater number of dieting attempts in which they had lost 4 kg or more, and reported dieting significantly more days per month. The total daily energy expenditure of the restrained eaters was found to be 620 kcal/day less ($p<0.005$) than the unrestrained eaters when adjustments for higher body weight were done. In addition, restrained eating behavior accounted for 47% of the variability in energy expenditure.

Tuschl et al. (1990) concluded that the significantly lower energy expenditures of restrained eaters reflects diminished caloric requirements, and that they regulate their weight below a level at which they would without caloric restriction. One of the major consequences of restrained eating appears to be a decrease in RMR and an increase in food efficiency thus, to prevent weight gain, the dietary intake of restrained eaters may have to become more and more restrictive as time progresses (Tuschl et al., 1990).

Dietary restraint, disinhibition, and counterregulation appear to function in a circle which may eventually lead to repeated weight fluctuations (weight cycling). For example, the dieter engages in restrained eating in the hope of obtaining or maintaining the feminine ideal body shape; however, at some point in time, a disinhibiting event occurs precipitating counterregulatory eating (overeating). The calories consumed during counterregulation

are used very efficiently due to metabolic adaptations of dietary restraint resulting in weight gain. Due to the negative body image that accompanies weight gain coupled with the guilt of overeating, the restrained eater begins to diet starting the vicious cycle in motion again.

Evidence that restrained eaters diet after periods of overeating is presented in a study conducted by Kleges et al. (1989). Food intake records of 65 college age subjects (31 males and 34 females) were evaluated for the two days prior to the four days of the Thanksgiving Day holiday weekend, and the two days following it. In general, dietary intake increased during the Thanksgiving Holiday, and the males consumed more calories per day than the females. The dietary intake of the individuals who scored high on the Restraint Scale (Herman & Polivy, 1980) decreased significantly over the eight day period. By the end of the study period, the restrained eaters were clearly in a dieting state, consuming an average of only 1226 kcals/day. Furthermore, overweight subjects consumed significantly fewer calories compared to the normal weight subjects over the study period with the overweight restrained eaters consuming the least. The level of dietary restraint was also significantly negatively correlated with weight gain.

Researchers suggested that a "history of chronic dieting status may place an individual at metabolic risk for future weight gain thus, restrained eaters may need to be chronically dieting if they are to maintain their desired weight" (pg. 499; Kleges et al., 1989). An additional conclusion is that the adverse metabolic effects of dietary restraint may be more pronounced in the overweight restrained eaters than in the normal weight

restrained eaters based on the findings that the overweight subjects chronically restricted their intakes except in the presence of a disinhibitor (i.e., Thanksgiving); compared to the normal weight subjects who only restricted their intakes after a disinhibitor. Heatherton et al. (1988) stated that dietary restraint probably does not lead to obesity, but that individuals who are obese probably engage in dietary restraint behavior more frequently than normal weight individuals secondary to the social pressure to be thin and the stigma attached to being obese.

MEASURES OF SUCCESSFUL AND UNSUCCESSFUL DIETING

In the studies conducted by Laessle et al. (1989a) and Tuschl et al. (1990) the Cognitive Restraint Subscale of the Three Factor Questionnaire (CRS-TFQ; Stunkard and Messick, 1985) was used to classify individuals as either restrained eaters or unrestrained eaters, and in the study conducted by Wardle and Beales (1987) the Dietary Restraint Subscale of the Dutch Eating Behavior Questionnaire (DRS-DEBQ; van Strein et al. 1986) was used to measure dietary restraint. These two scales were constructed to improve the measure of dietary restraint over the original Restraint Scale (RS) developed by Herman and Polivy (1980). Recently Heatherton et al. (1988) suggested that the CRS-TFQ and the DRS-DEBQ measure successful caloric restriction in everyday life; whereas the RS measures unsuccessful caloric restriction. This statement in based on the following findings: 1) the RS has been shown to be a significant predictor of counterregulation in the laboratory setting (Herman et al., 1987; Ruderman & Christensen, 1983); whereas the CRS- TFQ and the DRS-DEBQ have not (Lowe & Kleifield, 1988; Wardle & Beales,

1988) and 2) individuals who score high on the CRS-TFQ and the DRS-DEBQ report consuming significantly fewer calories per day than individuals who score low on these measures (Tuschl et al., 1990; van Strein et al., 1986). Dietary restraint appears to be a very complex behavior, and it seems plausible that CRS-TFQ, DRS-DEBQ, and RS measure different behaviors in the dietary restraint model.

Laessle et al. (1989b) evaluated the construct validity of the RS, CRS-TFQ, and DRS-DEBQ by comparing them via factor analysis with self reported caloric intakes and instruments that measure anorexia, bulimia, and body consciousness. Subjects in the study consisted of women between the ages of 18-30 who were of normal weight for height. Factor analysis revealed that the three scales measured different aspects of dietary restraint despite being significantly related to each other . The RS was closely related to disinhibited/counterregulatory eating, higher weight for height, and weight fluctuation (highest BMI and difference minimum/maximum BMI), all of which are viewed as unsuccessful dieting. By contrast, the behaviors which represent successful dieting such as daily caloric restriction, were closely related to DRS-DEBQ and CRS-TFQ. The instruments which measured drive for thinness and concerns about weight and body shape showed high loadings on all factors thus, the three scales have in common the motivational component of restrained eating. Laessle et al. (1989b) stated that all of the three scales were appropriate for measuring concerns of body shape and weight, but if caloric intake in everyday life is to be measured, the CRS-TFQ and the DRS-DEBQ are the appropriate tools to use.

Additional support for the conclusion that the CRS-TFQ correlates with successful dieting in everyday life was revealed in a study conducted by Bjovell, Rossner, and Stunkard (1986). The TFQ was administered to 88 men and women attending a behavior therapy program for obesity and to a control group consisting of 16 obese and 60 normal weight individuals. The obese subjects in the behavioral therapy program scored higher on the CRS-TFQ compared to the obese and normal weight controls. Moreover, the correlation between the RS and weight loss increased over time suggesting that the treatment subjects gained more control over eating and were less susceptible to disinhibitors possibly enabling them to maintain lost weight.

SUMMARY

In response to the intense social pressure to be thin, many women engage in the aberrant eating behavior of dietary restraint. One of the detrimental consequences of dietary restraint is binge eating which is precipitated by the restrained eater's perception of events called disinhibitors. The cyclical eating pattern of dieting and overeating seems to function in a feedback loop. For example, strict dieting is believed to lead to periodic episodes of overeating or binge eating. Since dieting causes an increase in food efficiency and a decrease in RMR, the calories consumed during the binge are used very efficiently resulting in weight gain. Because the weight gain intensifies the restrained eater's negative body image, dieting behavior is resumed. Therefore, the consequences of dietary restraint seem to be weight cycling and, possibly, an increase in weight for height and a lower daily caloric requirement for weight maintenance.

BINGE EATING

DIETARY RESTRAINT AND BINGE EATING

According to the boundary model of dietary restraint, chronic dieting leads to alterations in the regulations of food intake which make an individual more vulnerable to binge eating. Evidence supporting this hypothesis has been revealed in several survey studies examining the relationship between dietary restraint and binge eating. In these studies, researchers revealed that a large number of dieters engaged in binge eating (Herman & Polivy, 1980; Gormally, Black, Daston, & Rardin, 1982; Loro & Orleans, 1980), and that there is a statistically significant correlation between binge eating and dietary restraint (Greenberg, 1986, Hawkins & Clement, 1980; Lowe & Caputo, 1991; Marcus, Wing, & Hopkins, 1988). Wardle (1987) hypothesized that restrained eaters may practice strict dieting regimens following a binge to compensate for the excess calories consumed during the binge.

Data confirming the significant relationship between binge eating and dieting was provided by Hawkins and Clement (1980) and Gormally, et al. (1982). Hawkins and Clement (1980) investigated the relationship between dietary restraint and binge eating in college age students using an instrument called the Binge Scale (BS). Two thirds of the female students and one half of the male students reported binge eating occurrences. Data analysis revealed two main effects: (1) females obtained higher scores on the BS compared to the males, and (2) overweight subjects reported more severe binge eating behavior than

did normal weight subjects. In addition, a significant positive relationship between dietary restraint and binge eating emerged. The more severe the binge eating behavior, the higher the individual scored on the RS (Herman and Polivy, 1980). Hawkins and Clement concluded that individuals who attempt to maintain their weight below a biological set point through dieting increases their likelihood of engaging in periodic binge episodes.

Greenberg (1986) assessed the relationship between depression, dietary restraint, assertiveness, life stress, and binge eating in a group of 20 college age women with bulimia and 114 college age women without bulimia. In the non-bulimic subjects, both RS (Herman & Polivy, 1980) scores and Beck Depression Inventory (BDI) (Beck, Medelson, Bock, and Erbaugh, 1961) scores were independent predictors of the severity of binge eating. For the bulimic subjects, the only independent predictor of binge eating severity proved to be RS scores. Greenberg (1986) believed that binge eating episodes may be the "reaction to depression in women who are in a state of physiological deprivation because of their restrained eating habits" (Greenberg, 1986; pg. 269).

Further support for the association between dietary restraint and binge eating was revealed in two later studies conducted by Greenberg (Greenberg & Harvey, 1986; Greenberg & Harvey, 1987). In the first study, the interrelationships between dietary restraint, binge eating and depression were assessed as well as their stability over time in college age females. Subjects were administered the following instruments at two testing sessions 5 weeks apart: RS, BS, and the BDI (Beck et al., 1961). The scores of the three instruments remained stable over time. The combination of the RS score and the BDI

score was a stronger predictor of binge eating severity over time than either of the two scores alone. This study was unique from the previous study conducted by Greenberg (1986) in that it evaluated the interrelationships among binge eating, dietary restraint, and depression over time, allowing the researchers to conclude that high levels of dietary restraint and depression are needed for the development of binge eating.

Replication of the significant relationship between dietary restraint and binge eating was revealed in a another study conducted by Greenberg and Harvey (1987). Again, the subjects consisted of college age females. The interaction between dietary restraint and dysphoric mood was a significant predictor of the severity of binge eating and accounted for 57% of the variance in BS scores.

A definite relationship seems to exist between dietary restraint and binge eating; however, still unanswered is how restrained eating alters the regulation of food intake manifested as binge eating. Herman and Polivy (1988) and Tuschl (1990) have proposed that the repeated dieting enhances the attractiveness of palatable (high calorie) foods while simultaneously destroying or weakening physiological responses to satiety such as gastric distention. In addition, dietary restraint is believed to alter the microstructure of eating resulting in larger and longer meals; i.e., binges (Bellisle, Lucas, & Le Magnen, 1984).

Some factors which are believed to contribute to the impairment of the satiation process of restrained eaters are high variability in food intake such as skipping meals and starvation diets (Tuschl, 1990) and consumption of large amounts of artificial sweeteners and reduced calorie foods (Blundell & Hill, 1986). Consumption of these diet foods have

been revealed to increase food intake due to over compensation from caloric dilution (Foltin, Fischman, Emurian, & Rachlinski, 1988; Hill, Leathwood, & Blundell, 1987; Louis-Sylvestre et al., 1989). The combination of these factors may make food intake regulation of the restrained eater difficult if not impossible.

BINGE EATING AND OBESITY

Due to the intense societal pressure to be thin, many obese women diet repeatedly with aspirations of approaching an unrealistically slim body shape which is unattainable due to genetic factors. Such practices may increase the likelihood of binge eating. A casual link between binge eating and dietary restraint has been well established (Greenberg, 1986; Greenberg & Harvey, 1987; Gormally et al., 1982). Other survey studies have reported that from 23% to 50% of obese individuals engage in binge eating (Hawkins & Clement, 1980; Keefe, Wyshogrod, Weinberger, & Agras, 1984; Loro & Orleans, 1981; Marcus, Wing, & Lamparski, 1985; Marcus et al., 1988). Moreover, obese binge eaters also have been shown to be more prone to drop out of weight loss programs and regain weight following treatment (Keefe et al., 1984; Marcus, et al., 1988).

The frequency of binge eating in 280 obese women entering a weight loss clinic was assessed by Loro and Orleans (1981) using the Diagnostic and Statistical Manual of Mental Disorders (DSM-III) (American Psychiatric Association, 1980) as a criterion. Binge eating was defined as consuming large quantities of food in a short period of time. Twenty nine percent of the women reported binge eating regularly or at least two times per week, and an additional 22% of the women reported binge eating frequently (at least

once per week). Similar prevalence rates of binge eating were reported in a study conducted by Jackson and Orminston (l977). Binge eating, defined as periods of uncontrollable, excessive eating, were reported by 27% of the subjects two to seven times per week, and 23% reported bingeing once per week. Other researchers have reported binge eating episodes in 23% to 40% of their obese subjects (Hawkins & Clement, 1980; Marcus et al., 1985).

The relationship between binge eating and dietary restraint in 432 obese women seeking treatment for obesity was evaluated by Marcus et al. (1985). Binge eating was found to be extremely prevalent among these obese women. For example, 46% of the subjects reported serious problems with binge eating. Individuals with severe binge eating behaviors were both significantly younger and significantly heavier. Furthermore, severity of binge eating was significantly related to the degree of dietary restraint, a finding which has previously been supported by Gormally et al. (1982), Greenberg & Harvey (1986), and Hawkins and Clement (1980).

A study conducted by Marcus et al. (1988) compared mood assessed by the BDI (Beck et al., 1961) and dieting behavior in 98 obese female binge eaters and non-binge eaters enrolled in a weight control program. Obese binge eaters exhibited significantly more depressive symptoms, psychological distress, a higher level of dietary restraint, and more unrealistic dieting aspirations at pretreatment assessment, six month follow up assessment, and one year after follow up. Additionally, binge eaters had a higher drop out rate compared to the non-binge eaters. Differences in weight loss at a post treatment

assessment of one year were not significantly different between the two groups; however, binge eaters regained significantly more weight at the 6 month follow up. Keefe et al. (1984) reported a similar trend. Initial weight loss was comparable between the obese binge eaters and non-binge eaters, but the obese binge eaters regained weight more rapidly.

The occurrence of binge eating and scores obtaind on the TFQ (Stunkard & Messick, 1985) and Eating Disorder Inventory (EDI) (Garner, Olmsted, & Polivy, 1983) were evaluated in 436 obese men and women entered into a modified fast weight loss program (Lowe & Caputo, 1991). The EDI was developed to assess specific psychological and behavioral traits of particular significance among individuals diagnosed with an eating disorder. The combination of the scores obtained on the TFQ and the Drive for Thinness subscale of the EDI accounted for 60-65% of the variance in binge eating scores. In addition, scores obtained on the DS of the TFQ alone accounted for 41% of the variance in binge eating scores. The CRS of the TFQ was negatively correlated with binge eating, possibly because the CRS assesses rational and temperate attitudes about caloric restriction which may be associated with a decreased risk of binge eating. Eating and weight related measures (TFQ and Drive for Thinness) proved to be better predictors of severity of binge eating in obese individuals attending a weight loss program compared with eating psychopathology measures of the EDI (Ineffectiveness, Perfectionism, Interpersonal Distrust, Interceptive Awareness, and Maturity Fears subscales); however

Lowe and Caputo (1991) did not discount the importance of psychopathology in the development of binge eating.

Self reported and interview data from 81 obese patients enrolled in a weight loss clinic were collected to evaluate the prevalence of binge eating, defined by the DSM-III (Telch, Agras,& Rossiter, 1988). As the degree of obesity increased, so did the occurrence of binge eating behavior. A number of explanations regarding the association between severity of binge eating and the degree of obesity were advanced. The first was that excessive dieting by the obese subjects secondary to societal pressure to be thin and the social stigma attached to being obese may lead to binge eating, which in turn increases caloric intake and adiposity (Telch et al., 1988). Another possibility is that weight cycling, as a result of repeated dieting and refeeding, not only leads to a more rapid weight gain in future weight cycles but also may predispose an individual to binge eating (Brownell et al., 1986; Polivy and Herman, 1985).

It is highly unlikely that the majority of obese individuals who exhibit binge eating tendencies suffer from the full blown psychiatric syndrome of bulimia; especially since the DSM-III R does not include a definition of binge eating that quantifies binge eating severity and body weight (Marcus et al., 1988). Furthermore, purging techniques such as vomiting and laxative abuse appear to be extremely uncommon in the obese binge eaters; whereas they are quite prevalent in the normal weight bulimic population (Hawkins & Clement, 1984; Hudson et al., 1987; Wardle and Beinart, 1981). In addition, McCann, Rossiter, King and Agras (1991) revealed that non-purging bulimics were older, more

likely to be overweight, and binged less frequently than purging bulimics. More purgers had major depression, panic disorder, or anorexia nervosa than did non-purgers. All of this suggests that non-purging bulimics constitute a distinct clinical disorder and that there are major differences in the core pathology of purging and non-purging bulimics (McCann et al., 1991).

Even though obese binge eaters do not exhibit all of the symptomology of full blown bulimia like the normal weight purgers, researchers have shown that similarities between the two populations exist. Both normal weight bulimics and obese binge eaters have been reported as being preoccupied with weight and possess rigid dieting standards (Gormally et al., 1982; Kolotkin et al., 1987; Marcus et al., 1985). Like normal weight bulimics, obese binge eaters have been reported to feel unable to control their urges to eat, are in a constant struggle to avoid binge eating, and feel extreme guilt and self hatred after they binge (Gormally et al., 1982; Marcus et al., 1988).

The leading researchers in the field of obesity and binge eating have proposed that a new clinical eating disorder be included in the DSM-IV (Spitzer et al., 1992). The new eating disorder will be called Binge Eating Disorder (BED) and is characterized as follows: frequent binge eating episodes occurring at least two times per week over a six month period without the characteristic purging of bulimia nervosa, a sense of lack of control over eating during binges, and consuming a large amounts of food in a short amount of time (less than two hours). The central construct of the BED is recurrent

episodes of binge eating. The researchers believe that this diagnosis would be appropriate for a subset of individuals who binge eat frequently.

Spitzer et al. (1991) have conducted a preliminary field trial of the BED diagnosis with 723 patients attending eight different weight control programs, with 1031 individuals from three different community sites, and with 230 member of Overeaters Anonymous. Preliminary data strongly supports the validity of the BED diagnosis. BED proved to be extremely prevalent among members of Overeaters Anonymous (71.2%), moderately prevalent among subjects attending hospital affiliated weight control programs (30.1%), and relatively rare in the community setting (2.0%). Additionally, the disorder is more common in females than in males and is associated with severity of obesity and history of marked weight fluctuation. The weight fluctuation average per weight cycle was 20 pounds.

Using the newly proposed BED diagnostic criteria, Wilson, Nonas, and Rosenblum (1993) conducted a study to elucidate differences in weight related attitudes and eating behaviors of non-binge eating obese and binge eating obese subjects attending a weight loss clinic. Obese binge eaters were defined as individuals who reported uncontrolled consumption of food which others would consider excessive for at least once a week during the previous month. Eighteen percent of the subjects who entered into the weight loss program met the BED criteria. The binge eaters reported being significantly more dissatisfied with their bodies, felt fatter, feared gaining weight more, and thought more about food and their weight than did the obese women who did not binge eat. In addition,

more binge eaters reported a history of weight cycling; although, the differences did not reach statistical significance. Body composition measures revealed that the binge eaters tended to have a higher percentage of body fat compared with the non-binge eaters.

SUMMARY

The research reviewed in this section clearly shows a significant relationship between dietary restraint and binge eating. It is hypothesized that the self denial of food alters the regulation of food intake or anticipatory feeding responses resulting in larger and longer meals. Since there is such intense societal pressure to be thin, many women with a negative body images, either normal weight or overweight, may alternate between periods of strict dieting and overeating which increases the likelihood of binge eating.

Overweight or obese women may be more susceptible to engage in this cyclical eating pattern since they are constantly confronted with the social prejudice associated with being obese or overweight. However, the societal pressure to obtain the perfect feminine physique is so strong and portrayed so effectively in the media that even normal and underweight women may succumb to the pressure and engage in this cyclical eating pattern as well.

EMOTIONAL EATING

NEGATIVE EMOTIONS AND DIETARY RESTRAINT

As mentioned previously in the Dietary Restraint section of this review, negative emotions are believed to act as disinhibitors of dietary restraint (Herman & Polivy, 1984; Ruderman, 1986). Herman and Polivy (1980) have hypothesized that strong negative emotions make demands on the restrained eater's cognitive energies, thereby, temporarily decreasing their motivation to diet. The result is in overeating. Although exact emotions have not been explicitly defined, researchers do make reference to negative emotions such as anxiety and depression (Herman & Polivy, 1984; Ruderman, 1986).

The association between negative emotional states and dietary restraint has been evaluated in several studies. Polivy and Herman (1976) investigated the eating behaviors of clinically depressed patients. They found that depressed unrestrained eaters reported significant weight loss during periods of depression. By contrast, restrained eaters reported significant weight gains.

Other researchers have utilized mood induction procedures to examine the effects of negative moods on food intake in restrained and unrestrained eaters. The first study in this area was conducted by Herman and Polivy (1975). They examined the influence of anxiety on food consumption in restrained and unrestrained eaters. Anxiety was produced in the subjects by leading them to expect either a painful electrical shock (high anxiety group) or a mild electrical shock (low anxiety) after which cracker consumption was

measured. As expected, the unrestrained eaters ate significantly less in the high anxiety condition compared to the low anxiety condition. The restrained eaters exhibited the opposite eating behavior. They ate more in the high anxiety condition compared to the low anxiety condition; however, the difference was not statistically significant.

Ruderman (1985) evaluated the eating behavior of restrained and unrestrained eaters during dysphoric and non-dysphoric moods. Mood was manipulated by having the subjects complete an assigned task and either succeed (non-depressed mood) or fail (depressed mood) after which cracker consumption was measured. A significant Mood x Restraint interaction was revealed. The restrained eaters consumed significantly more crackers when they were in a dysphoric mood than when they were in a non-dysphoric mood. Conversely, unrestrained eaters ate less when in a dysphoric mood. A significant interaction between dysphoric mood and dietary restraint has been revealed in several other studies employing similar mood induction procedures (Baucom & Aiken, 1982; Frost et al. 1982; Herman et al., 1987). Again, the restrained eaters ingested significantly more food when in a dysphoric mood than when they were in a non-dysphoric mood.

The findings of these studies support the general hypothesis that negative emotions act as disinhibitors and enhance the intake of restrained eaters. Food which is restricted by the restrained eater may become potentially more rewarding and used as a source of comfort during periods of emotional distress (Ruderman, 1986). Thus, repeated association between negative moods and dietary intake may cause the restrained eaters to eat even in the absence of hunger.

BINGE EATING AND EMOTIONAL EATING

Subjects' descriptions of binge eating and eating in response to emotions are quite similar: occurring in secrecy, a reaction to negative emotions, and involving high calorie and high carbohydrate foods (Ganely, 1988). Jackson and Ormistion (1977) and Wilson (1976) reported that external stimuli for the initiation of binge eating are stress related events and interpersonal stresses such as pressure from school, personal losses, and disagreements with loved ones. These external stimuli provoke internal emotions such as anxiety, frustration, and depression (Loro & Orleans, 1982). Moreover, several researchers have explicitly evaluated the effect of depression on food intake and revealed that the presence of depressive symptomology increases the likelihood of binge eating (Greenberg, 1986; Marcus et al., 1988; Prussin & Harvey, 1991).

Several such studies were conducted by Greenberg (1986) and Greenberg and Harvey (1986; 1987) and have been described previously in the Binge Eating section. In these studies, a significant relationship between binge eating and depression was revealed. Interestingly, the ability of depressive symptomology to predict severity of binge eating was significantly strengthened when combined with the level of dietary restraint (Greenberg, 1986; Greenberg & Harvey, 1986; 1987).

Due to the findings of her first study (Greenberg,1986) that binge eaters were significantly more likely to score high on both depression and dietary restraint measures, Greenberg and Harvey (1986) conducted a second study to determine the casual order between dietary restraint, depression, and binge eating. They revealed that the

combination of the severity of depression and the level of dietary restraint predicted the severity of binge eating over time. They concluded that it was extremely probable that certain levels of restraint and depression are required for the development of binge eating behavior.

To further elucidate the association between binge eating and emotions, Marcus et al. (1988) conducted a study in which they evaluated the association between severity of depressive symptomology assessed by the BDI and binge eating tendencies assessed by the Binge Scale, in female obese binge eaters and obese non-binge eaters. Obese binge eaters' scores were comparable to those of psychiatric patients experiencing mild depression (Beck et al., 1961) and to those of normal weight bulimics (Hatusukari, Eckert, Mitchell, & Pyle, 1984).

Additional evidence supporting the association between binge eating and depression in binge eaters was revealed by Wing, Marcus, Epstein, Blaire and Burton (1989). Binge eating severity and depressive symptomology were evaluated in 98 obese type II diabetics participating in a behavioral weight control program at pretreatment, post-treatment (at the end of 20 weeks) and one year later. Binge eating severity was shown to be significantly correlated with depressive symptomology. Over the course of the study, decreases in binge eating severity were accompanied by improvement in mood.

The end result of periodic binge eating precipitated by negative emotions may be obesity and/or weight cycling. Evidence supporting the assumption that emotional eating results in a higher weight for height has been revealed by researchers who showed that

obese individuals more frequently binge eat in response to negative emotions and gain weight during stressful life events compared with normal weight individuals (Rand & Stunkard, 1978, Woodman, 1980). Holiberg et al. (1980) reported a significant correlation between BMI and binge eating in response to depression, anger, boredom, anxiety, frustration, and loneliness. Moreover, Rand (1982) cited that 79% of the obese individuals studied gained ten or more pounds during periods of emotional life stress compared to only nine percent the non-obese individuals ($p< 0.05$).

Studies which compared eating in response to negative emotions between normal weight individuals and obese individuals found significant differences in the prevalence of emotional eating among the two groups. Woodman (1980) reported that, for obese individuals, food was associated with negative emotions such as anxiety, depression, and repressed anger 95% -100% of the time compared with a 10% association by normal weight individuals. Rand and Stunkard (1978) compared emotional eating among obese and normal weight patients receiving psychotherapy. Ninety eight percent of the obese patients and 43% of the normal weight patients reported eating in response to negative emotions. Weight gains in response to negative emotions (90% vs. 14%), stress related weight gains (79 % vs. 9 %), and weight loss associated with positive emotions (83% vs. 26%) were reported significantly more often in the obese subjects compared with the normal weight subjects.

Evidence supporting the latter assumption that engaging in emotional eating leads to

weight cycling has been revealed by researchers who assessed the relationship between weight loss maintenance and emotional eating (Blair, Lewis, & Booth, 1990; Kayman et al., 1990; Leon & Chambrerlin, 1973a,b). Leon and Chamberlin (1973a,b) assessed the association between weight maintenance and emotional eating in two separate studies. Both weight maintainers and regainers reported eating when emotionally aroused, and the frequency of emotional eating of both groups was significantly higher compared to controls. The regainers reported that a much greater range of emotions triggered emotional eating (loneliness, frustration, anger); whereas the maintainers reported eating only in response to boredom and loneliness.

A more recent study conducted by Blair et al. (1990) investigated the relationship between emotional eating and success at weight maintenance over a one year period. Initial BMI was significantly positively correlated with frequency of emotional eating. Furthermore, respondents with initially high levels of emotional eating who reported a decrease in emotional eating over the study period were significantly more successful at approaching their target weight and maintaining that weight for the one year study period compared to individuals who continued to report high levels of emotional eating. Individuals who increased their emotional eating over the course of the study period were significantly less successful at weight loss and maintenance compared to subjects who continued to report low levels of emotional eating. The data suggest that emotional eating may increase the rate of relapse, making weight loss and maintenance difficult.

Kayman et al. (1990) revealed additional evidence of differences in emotional eating between formerly obese individuals who had gained weight after weight reduction, formerly obese individuals who had maintained weight loss, and controls. Significantly more relapsers (70%) reported using food to escape or cope with emotional stress compared with both the maintainers (8%) and controls (9%). Additionally, only 10% of the relapsers reported confronting problems directly.

SUMMARY

The studies reviewed this section seem to indicate a significant association between binge eating and emotional eating. Whether binge eating causes the emotional distress, or the emotional distress precipitates binge eating has not been confirmed. It seems most likely that emotional distress, rigid dieting standards, and binge eating operate in a reciprocal feedback loop whereby emotional distress in the absence of flexible coping strategies increases the probability of binge eating. This in turn increases the individual's feeling of distress and need for rigid controls, and the cycle begins again (Kolotkin, Revis, Kirkley, & Janick, 1988).

Individuals who binge eat in response to negative emotions also may be unable to lose weight or maintain lost weight during stressful periods in their lives. For example, when a stressful life event arises, these individuals begin to binge eat, and consequently, gain or regain previoiusly lost weight. The final result of this type of eating behavior may be weight cycling accompanied by all its detrimental metabolic and psychological side effects.

HYPOTHESES

Based on the above review of literature, the following hypotheses will be tested in this study:

1) Disinhibition, measured by the Disinhibition Subscale (DS) of the Three Factor Questionnaire (TFQ) (Stunkard & Messick, 1985), is positively correlated with number of weight cycles among women.

2) Dietary restraint, measured by the Cognitive Restraint Subscale (CRS) of the TFQ, is unrelated to number of weight cycles among women.

3) Emotional eating, measured by the Emotional Eating Subscale (EE) of the Dutch Eating Behavior Questionnaire (DEBQ) (van Strein et al., 1986), is positively correlated with number of weight cycles among women.

4) Binge eating, measured by the Bulimic Inventory Test (BITE) (Henderson & Freeman, 1987), is positively correlated with number of weight cycles among women.

5) Disinhibition, dietary restraint, binge eating, emotional eating, and body mass index are related to number of weight cycles in women when controlling for their simultaneous effects.

METHODS

SUBJECT RECRUITMENT

Potential subjects consisted of 350 females between the ages of 18 to 65 years who were employed by Virginia Tech in administrative and supporting staff positions. Calculated upon a minimum response rate of 65%, 350 subjects were chosen so that 200 subjects would be evaluated. Upon receipt of approval by the Institutional Review Board for studies involving human subjects, the subjects were randomly selected from a list of female employees generated by the Payroll Department of Virginia Tech.

Respondents were excluded from the study if they were pregnant, had delivered a baby within one year, were breast feeding, or had experienced a weight loss due to illness within the last five years. These subjects were excluded because their weight loss was believed not to be due to dieting. The subjects were asked these screen questions as well as their gender on the first section of the questionnaire (Appendix A). If the subjects responded yes to any of these screen questions or if they were a male, they were asked to stop completing the survey and mail it back in the envelope provided. This was done to alleviate any speculation regarding poor response rate if a large number of the surveys were not returned.

SURVEY CONSTRUCTION

The subjects were asked to complete a confidential survey which was a compilation of three previously validated scales: the Three Factor Questionnaire (TFQ; Stunkard &

Messick, 1985), the Emotional Eating Subscale of the Dutch Eating Behavior Questionnaire (EE; van Strein et al., 1986), and the Bulimic Inventory Test (BITE; Henderson & Freeman, 1987). Each of these scales varied in length from 12 to 54 questions in their orginal form.

Since shortening the length of the survey was expected to increase the response rate the TFQ which contains three factors and 54 questions, was shortened to 10 questions and 2 factors - the Cognitive Restraint Subscale (CRS) and the Disinhibition Subscale (DS). Only the questions which had been shown by Ganley (1988) to exhibit factor loadings greater than 0.50 when a post factor analysis of the TFQ was conducted were used.

The subjects were asked to provide the following demographic and weight history information: age, race, height, weight, and highest adult weight, lowest adult weight, and detailed information regarding their dieting history.

MAILING PROCEDURE

The survey was mailed to the randomly chosen subjects through inter-campus mail. The subjects were asked to give serious consideration to their answers. They were provided with explicit instructions to seal the completed survey in the envelope provided and place it in inter-campus mail.

The mailing procedure used was the Total Design Method for Surveys developed by Dillman (Dillman, 1978). This method consists of three mailings and is expected to yield a 65% response rate. The first mailing consisted of a cover letter explaining the study (Appendix B) and a copy of the survey (Appendix A). The second mailing consisted of a

postcard (Appendix B) reminding the subjects about the survey and urging them to send it a back as quickly as possible. The postcard was mailed out approximately one and a half weeks after the initial letter. The third mailing consisted of another letter reminding the subjects how valuable their response was and included a second copy of the survey (Appendix B). The third mailing was sent out approximately two weeks after the postcard. Only surveys returned within the first six weeks following the initial mailing were used for data analysis so that statistical analysis could begin. Only three surveys were received after the six week cut off period.

OPERATIONALIZATION OF VARIABLES

Dependent Variable: Calculating Number of Weight Cycles

Number of weight cycles is the dependent variable and was defined as losing greater than or equal to six percent of total initial body weight before weight loss. This percentage of weight loss was chosen because several studies have shown that this percentage of weight loss results in a significant reduction in RMR and increase in food efficiency (Donahoe et al., 1984; Frey-Hewit et al., 1990; van Dale et al., 1990) as well as reduction in weight loss velocity during subsequent weight loss attempts (Blackburn et al., 1989).

Questions 35 to 43 (Appendix A) were used to calculate number of weight cycles that each subject experienced. First the subjects were asked if they ever dieted to lose weight. If they responded yes, then they were asked a series of questions about what their weight

was prior to dieting, how many pounds they lost, and what their final post dieting weight was.

Independent Variables

The Cognitive Restraint and Disinhibition Subscales of the Three Factor Questionnaire

The theoretical concepts of dietary restraint and disinhibition were measured by the Cognitive Restraint Subscale (CRS) and the Disinhibiton Subscale (DS) of the Three Factor Questionnaire (TFQ). The TFQ was constructed by Stunkard and Messick (1985) for the purpose of improving the measure of dietary restraint over the Restraint Scale developed by Herman and Polivy (1980). The TFQ was developed using item selection and factor analytic techniques. It contains three independent factors: Disinhibition, Perceived Hunger, and Cognitive Restraint. The scale was validated on 95 adult subjects who varied in orientation to food and weight controls including both dieting and obese individuals; therefore, the TFQ has been suggested to be the best instrument for measuring dietary restraint in the adult population (Ganley et al., 1988; Laessle et al., 1989b).

Ganely (1988) conducted the first post factor analysis of the TFQ on a population of 442 middle aged women between the ages of 25 and 40. The TFQ possessed a high internal consistency, as evidenced by coefficient alpha reliability of 0.92 for the Cognitive Restraint Subscale (CRS), 0.91 for the Disinhibition Subscale(DS), and 0.87 for the Perceived Hunger Subscale (PHS).

Stunkard and Messier (1985) found that both the CRS and the DS were able to significantly discriminate between restrained and unrestrained eaters (degree of restraint

determined by their total score on the TFQ); whereas the PHS was not. Additionally, several researchers have found that the DS is a significant predictor of binge eating severity (Marcus and Wing, 1983), weight fluctuation during depression (Weissenburg, Rush, Giles, & Stunkard, 1985), and counterregulatory eating in a laboratory setting (Shrager, Wadden, Miller, Stunkard, & Stellar, 1983). The CRS has been shown to be a significant predictor of successful weight maintenance in obese subjects (Bjorvell et al., 1986) and be significantly correlated with daily caloric restriction (Laessle et al., 1989a, Laessle et al., 1989b).

The Bulimia Inventory Test

The theoretical concept of binge eating was measured by the Bulimia Inventory Test (BITE). The BITE is a relatively new and brief self-rating scale which was designed by Henderson and Freeman (1987) to identify binge eaters, to provide clinical information on cognitive and behavioral aspects of binge eating disorder, and to have properties similar to the Eating Attitude Test (EAT; Garner & Garfinkle, 1979). The questions on the BITE were developed from a list of the symptoms and behaviors associated with binge eating cited in the literature (Russell, 1979; Bruch, 1973) and included in the DSM-III criteria for bulimia.

The BITE was tested for discriminatory validity and reliability on two different samples. In the first pilot study, subjects consisted of 15 female binge eaters receiving treatment and 40 controls (13 males, 27 females). On the basis of the scores obtained on the BITE, the subjects were separated into two groups: high scorers (> 20) and low

scorers (< 20). The high scoring group consisted of 14 binge eaters and two controls, and the low scoring group consisted of 38 controls and one binge eater. Thus, the BITE proved to be a valid instrument for identifying binge eaters ($p < 0.00001$).

In addition, the BITE was found to consist of two factors: the Symptoms Subscale made up of 30 items related to symptoms and behaviors associated with binge eating, and the Severity Subscale consisting of six items which measured frequency and severity of binge eating behavior. The Symptom Subscale has a maximum value of 30 with a cut-off score of 20. The maximum score on the Severity Subscale is 39 and a score of five is considered to be clinically significant. A total score obtained on the BITE of 25 is considered to be indicative of a disordered eating pattern

In the second study, the subjects consisted of 32 female binge eaters not receiving treatment and 32 controls. All of the binge eaters scored above the cut off points for the Symptom Subscale and for the total BITE score. Two of the binge eaters received a score of four on the Severity Subscale and the rest of the binge eaters received a score of five or above. None of the subjects in the control group received clinically significant scores on either of the subscales. The BITE had a high internal consistency (an alpha of 0.96 for the Symptom Subscale and 0.62 for the Severity Subscale).

The scores obtained on the BITE by the binge eaters were compared with their scores on two other eating disorder measures: the Eating Attitude Test (EAT) and the Eating Disorder Inventory (EDI). The BITE scores were significantly correlated with all but two

measures of the EDI: Perfectionism and Internal Distrust Subscales and one measure of the EAT: Oral Control Subscale.

Henderson and Freeman (1987) conducted a third pilot study in which scores obtained on the BITE by 27 subjects before treatment for bulimia, eight weeks after treatment, and at the end of treatment (15 weeks) were compared to determine if the BITE was sensitive to changes in binge eating behaviors. The researchers found that there was a significant reduction in the scores form baseline to week eight and from week eight to week 15. Thus, Henderson and Freeman (1987) concluded that the BITE is sensitive to changes in binge eating behaviors.

The results that Henderson and Freeman (1987) reported in three pilot studies clearly indicated that the BITE is able to distinguish binge eaters from non-binge eaters while at the same time identifying individuals with subclinical binge eating behaviors. Unlike the EDI and the EAT, the BITE does not differentiate subjects as either having or not having an eating disorder because of the wide range of score and its ability to identify subclinical binge eating behaviors. Hence, the BITE is able to identify individuals with varying degrees of severity of binge eating.

Emotional Eating Subscale of the Dutch Eating Behavior Questionnaire

The theoretical concepts of emotional eating was measured by the Emotional Eating subscale (EE) of the Dutch Eating Behavior Questionnaire (DEBQ; van Strein et al., 1986). The EE of the DEBQ was developed to evaluate the relationship between different emotional states and food intake. The EE subscale has been shown to be comprised of two

dimensions, one dealing with eating in response to diffuse emotions; i.e., feeling lonely or restless, and the other dimension dealing with eating in response to clearly labeled emotions; i.e., anger and fright (van Strein et al., 1986).

Different types of emotions have been observed to elicit different eating responses in normal weight and obese subjects (Slochower, 1983). Normal weight subjects were observed overeating in response to diffuse emotions; whereas, clearly labeled emotions did not precipitate overeating. Slochower also observed that overweight subjects had difficulty describing or labeling emotional experiences. This may explain why post hoc analysis of the factor loadings of the EE subscale revealed that the differences between the clearly labeled and diffuse emotion scores of the obese were less distinct than those of the normal weight subject (van Strein et al. 1986).

To investigate these differences in eating behavior, van Strein et al. developed three EE subscales of the DEBQ: a two dimension scale consisting of 13 items which they recommended for the general assessment of emotional eating, a "Clearly Labeled" scale consisting of 4 items, and a "Diffuse" scale consisting of 9 items. van Strein et al. (1986) recommend that the latter two scales be used for specific reseafch purposes.

The entire DEBQ was assessed for internal consistency and factorial validity on a subject population of 1051 individuals consisting of both normal weight and obese subjects. The EE subscale of the DEBQ had a high internal consistency and factorial validity as evidenced by Cronbach's alpha coefficient of 0.94. All of the questions on the EE subscale had factor loadings of no less than 0.5.

Wardle (1987) conducted a validation study on the DEBQ including the EE subscale. The sample consisted of normal weight men and women, overweight women attending Weight Watcher's, and patients diagnosed with anorexia and bulimia. In all four groups, the loading factors were similar to the original ones reported by van Strein et al. (1986). The analysis revealed a strong correlation between the EE subscale and the External Eating subscale of the DEBQ. The bulimic patients scored the highest on the EE subscale. The overweight subjects scored significantly higher than the normal weight subjects, and the anorexic patients scored the lowest. Overall, the EE subscale of the DEBQ was shown to be a useful and valid tool for the assessment of emotional eating.

Control Variables: Body Mass Index, Age, and Race

Body Mass Index (BMI) was included as a control variable because the literature suggests that it may be an important component in weight cycling. Some researchers feel that overweight or obese individuals may weight cycle more often because they may feel more intense societal pressure to diet. Telch et al. (1988) has suggested that the majority of obese women try to lose weight at least once in their lifetime with the ultimate goal of obtaining the femine ideal body image.

BMI was calculated by the equation: Wt (lbs)/Ht $(in)^2$ x 705. Values greater than 25 were considered obese; 19 - 25 were considered normal; and under 19 was considered underweight (Mahan & Arlin, 1992).

The following information was used for statistical analysis:

1. Demographic information

2. BMI

3. Number of weight cycles

4. Scores on the CRS of the TFQ

5. Scores on the DS of the TFQ

6. BITE scores

7. EE scores

STATISTICAL ANALYSIS

In addtion to the descriptive statistics, correlations were run between all of the independent and control variables and the dependent variable. Also, intercorrelations among the independent and control variables were analyzed for further insight into the weight cycling / aberrant eating behavior model. Finally, multiple regression analysis was run to determine the relationship between the number of weight cycles and CRS, DS, BITE, EE, and BMI when controlling for their simultaneous effects.

RESULTS

RESPONSE RATE

The total number of questionnaires returned over a six week period was 270 out of 350, or a 77% response rate. Thirty nine of the questionnaires were excluded from data analysis because the subject responded yes to one of the first five questions. During the first two and one half weeks, 185 questionnaires were returned. The remaining 85 were collected over the next three and a half weeks.

DESCRIPTIVE STATISTICS

The subjects in this study were predominately white (97%) and ranged in age from 20 to 68 years with a mean age of 40.5 years $\pm$ 9.7 (Table 1). Seventy one percent of the subjects were between the ages of 30 and 50 years. The means, standard deviations, and ranges for age, BMI, number of weight cycles, and scores on the CRS, DS, BITE, and EE are presented in Table 1.

All of the variables except the BITE and the number of weight cycles exhibited normal distributions. The BITE was skewed towards the low end of the scale with 53% of the subjects scoring less then ten and 99.5% scoring less than 25. A score of twenty five is considered to be indicative of a binge eating disorder. Like the distributions of the scores on the BITE, those representing number of weight cycles was also were skewed towards the low end. The average number of weight cycles reported by the subjects in this study was 1.2 $\pm$ 1.6. Forty four percent of the respondents reported that they had never weight cycled (Table 2). Ninety three percent of the respondents reported an incidence of weight

cycling three times or less, and only 7% reported a incidence of weight cycling four times or more.

Table 1. Descriptive Statistics

Variables	Number of Subjects	Mean	Standard Deviation	Range
Number of Weight Cycles	230	1.2	1.6	0 - 12
Age	230	40.5	9.6	20 - 68
Body Mass Index	227	25.0	5.3	16 - 44
Scores on the Eating Behavior Scales				
Three Factor Questionnaire				
Disinhibition Subscale	227	2.0	1.6	0 - 5
Cognitive Restraint Subscale	224	2.0	1.5	0 - 5
Dutch Eating Behavior Questionnaire				
Emotional Eating Subscale	229	29.9	10.9	12 - 60
Bulimia Inventory Test (BITE)	216	10.2	4.5	5 - 28

Table 2. Number and percentage of weight cycles reported by the subjects

Number of Weight Cycles	Number of Respondents	Percentage of Respondents
0	101	44%
1	59	26%
2	34	15%
3	20	9%
4	6	3 %
5	5	2 %
6	2	< 1%
7	1	< 1%
8	1	< 1%
12	1	< 1%

n=230; mean = 1.2; range 0 - 12

BIVARIATE RELATIONSHIPS

Correlation coefficients between the number of weight cycles and the independent and control variables are shown in Table 3. As previously mentioned, the BITE and the number of weight cycles exhibited non-normal distributions. Because of this, they were transformed to their natural logs prior running the correlations. The correlation results for the transformed and untransformed variables were substantively the same. Thus for the ease identifying with the variables in their original metric, the results from the correlation analysis will be discussed using the untransformed variables.

Table 3. Correlations between the dependent variable and the control and independent variables

Variables	Correlation Coefficients
Control Variables	
Age	0.01
Race	0.04
Body Mass Index	0.28***
Independent Variables	
Disinhibition Subscale - TFQ	0.38***
Cognitive Restraint Subscale - TFQ	0.23***
Emotional Eating Subscale - DEBQ	0.36***
Bulimia Inventory Test - DEBQ	0.39***

TFQ = Three Factor Questionnaire; DEBQ = Dutch Eating Behavior Questionnaire
*$p \leq 0.05$
**$p \leq 0.01$
***$p \leq 0.001$

Hypothesis 1 which stated that the Disinhibition Subscale (DS) of the Three Factor Questionnaire (Stunkard and Messick, 1985) is positively correlated with weight cycling among women was accepted at $p \leq 0.001$ level. Hypothesis 2 which stated that the Cognitive Restraint Subscale (CRS) of the Three Factor Questionnaire (Stunkard and

Messick, 1985) is not related to weight cycling among women was rejected at $p \leq 0.001$ level. Hypothesis 3 which stated that the BITE (Henderson & Freeman, 1987) is positively correlated with weight cycling among women was accepted at $p \leq 0.001$ level. Hypothesis 4 which stated that the Emotional Eating Subscale (EE) of the Dutch Eating Behavior Questionnaire (van Strein et al., 1986) is positively correlated with weight cycling among women was accepted at $p \leq 0.001$ level.

The intercorrelations between the independent and control variables are listed in Table 4. Although, several statistically significant correlations were found between the independent variables, three very high positive correlations should be noted. These are the correlations between the BITE and the EE ($r = 0.55$), the DS and the BITE ($r = 0.60$), the DS and the EE ($r = 0.70$). One explanation for these high positive intercorrelations may be that the scales measure very similar eating behaviors.

Table 4. Correlation matrix of the control and independent variables

	Age	Race	BMI	DS	CRS	BITE	EE
Age	1.00						
Race	0.00	1.00					
BMI	0.03	- 0.02	1.00				
DS	0.00	- 0.03	0.29***	1.00			
CRS	0.13*	0.14*	0.08	0.16*	1.00		
BITE	- 0.11	- 0.03	0.23***	0.60***	0.24***	1.00	
EE	0.02	- 0.16*	0.26***	0.70***	0.13	0.55***	1.00

BMI = Body Mass Index; DS = Disinhibition Subscale of the Three Factor Questionnaire; CRS = Cognitive Restraint Subscale of the Three Factor Questionnaire; BITE = Bulimia Inventory Test; EE = Emotional Eating Subscale of the Dutch Eating behavior Questionnaire

*$p \leq 0.05$

**$p \leq 0.01$

***$p \leq 0.001$

MULTIVARIATE RELATIONSHIPS

As previously mentioned, both the BITE and the number of weight cycles had exhibited non-normal distributions. As with the correlations, regression analyses also were conducted using both the transformed and the untransformed variables. Again, substantively the results were the same. Thus, the regression analysis will be discussed using the results from the untransformed variables.

The results of the regression analysis are presented in Table 5. The regression model was able to significantly predict 26% ($p \leq 0.001$) of the weight cycling variance. Hence, Hypothesis 5 which stated that dietary restraint, disinhibition, binge eating, emotional eating and BMI are able to significantly predict weight cycling among women when controlling for their simultaneous effects is substantiated. The EE and BMI were the only two independent variables that exhibited statistically significant Betas. Although not statistically significant, the Betas for the CRS and BITE were sufficiently large enough to warrant fuller substantive attention (Beta = 0.12, prob. = 0.7, Beta = 0.16, prob. = 0.6).

Table 5. Regression analysis evaluating the influence of the control and independent variables on the number of weight cycles in women

Variables	Beta	Significance Level
Control Variables		
Age	- 0.01	0.8681
Race	0.06	0.3669
BMI	0.20	0.0021**
Independent Variables		
Disinhibition Subscale - TFQ	0.10	0.2841
Cognitive Restraint Subscale - TFQ	0.12	0.0741
Emotional Eating Subscale - DEBQ	0.16	0.0573
Bulimia Inventory Test - DEBQ	0.18	0.0506*

TFQ = Three Factor Questionnaire; DEBQ = Dutch Eating Behavior Questionnaire
*$p \leq 0.05$
**$p \leq 0.01$
***$p \leq 0.001$
$R^2 = 0.26$
n = 216

DISCUSSION

DESCRIPTIVE STATISTICS

Incidence of Weight Cycling

Recall of body weight history and self-reported weight has been shown to be reliable in two long-term studies (Casey et al., 1991; Rhoads & Kagan, 1983). In addition, weight cycling and dieting history also has been shown to be reliable. Wadden et al. (1992) reported that their subjects were able to report with satisfactory reliability the number of diets in which they had engaged as well as the total amount of weight they had lost. Based on the findings of the above studies, the weight and weight cycling information reported by the subjects in this study is considered to be reliable.

Ninety three percent of the subjects reported weight cycling three times or less during their adult life. The average number of weight cycles reported in this study is considerably lower than what has been reported in the literature. Several researchers have found their subjects reported engaging in three to five weight cycles during their adult life (Kuehnel & Wadden, 1994; Spitzer et al, 1991; Wadden et al., 1992).

Unlike this study which was conducted on a general population of women with a wide range of BMIs, the above studies were conducted on obese women participating in a weight loss program. None of the other researchers compared the weight cycling incidence of their obese subjects with those of obese women who do not habitually diet or normal weight women who do or do not habitually diet. Thus, the finding of these studies seem to over report the incidence of weight cycling and are not generalizeable to women

in the general population. To date, the author is not aware of any other study that has evaluated the weight cycling incidence in a general population of women. Furthermore, the only studies which the author is aware of that have evaluated the incidence of weight cycling in normal weight women were conducted on college age females who were identified as either being restrained or unrestrained eaters (Laessle et al., 1989b; Tuschl et al., 1990). Like the obese women, the restrained eaters were found to have experienced a much higher number of weight cycles than the women in this study. Conversely, the number of weight cycles reported by the unrestrained eaters in these two studies more closely resemble the frequency reported by the women in this study.

Eating Behavior Scales

Since the BITE was the only eating behavior scale which was not shortened, it is the only mean scale score that can be compared to what has been reported in the literature.

In the validation studies for the BITE conducted by Henderson and Freeman (1987), a score of 25 was considered to be indicative of bulimia. The average score reported by the subjects in this study was 10.2 ± 4.5 with 99.5% of the subjects scoring 24 or less. Only one subject scored above 25. The average score reported by the controls in the studies conducted by Henderson and Freeman (1987) was 3.5 which is lower than the mean score of the subjects in this study. One explanations for the lower mean score of the controls in the study conducted by Henderson and Freeman (1987) may because they only administered one of the two factors of the BITE, the Symptom Scale; whereas our

subjects were administered both the Symptom Scale and the Severity Scale. In fact, their controls could may have scored higher on the BITE if they were given both of the scales.

Body Mass Index

The mean and standard deviation of body mass index (BMI) of the subjects was 25 $\pm$ 5.3 which is with in the normal range of BMI of 19 -27 (van Itallie, 1985) . Fifty four or 24% of the respondents reported BMIs of 28 or greater indicating obesity and 11 or 5% of the respondents reported BMIs of 18 or less indicating underweight. (van Itallie, 1985). The percentage of women who were found to be obese in this study is similar to what has been reported in the literature. In the 1974-1980 HANES III Survey (Van Itallie, 1985) and the MMWR Survey (1988), 1 of every 5 adults was found to be at least 20 % over their optimal body weight for height. More specifically, Rand and Kulkau (1991), reported that 18% of the Caucasian women they surveyed were at least 20% over their optimal body weight.

BIVARIATE RELATIONSHIPS

Correlations among the Dependent Variable and the Independent Varaibles

All of the independent variables were statistically significantly positively correlated with weight cycling. Thus, all but one of the author's first four hypotheses were confirmed. The independent variables which exhibited the highest positive correlations with number of weight cycles were the DS, BITE, and EE ($r = 0.38, 0.39$, and 0.36).

The similar high correlations that the DS, BITE, and EE exhibited with weight cycling is not surprising since they all measure overeating as a reaction to some cognitive stimuli.

For the EE, the stimuli are negative emotions, and for the DS and the BITE they are the perception of having broken ones diet and stressful life events, as well as negative emotions.

The previous research that has evaluated the simultaneous effects of disinhibition, binge eating, and emotional eating on weight cycle is extremely lacking as well as controversial. The majority of the research in this area has either only evaluated one or two of the eating behaviors relationships with weight cycling or explored their relationships in obese women participating in weight loss programs and college age females. No study to date has looked at the simultaneous effects of disinhibition, binge eating and emotional eating on weight cycling in a general population of women.

Support for the association between disinhibition and binge eating with weight cycling comes from several studies. Both Spitzer et al. (1991) and Wilson et al. (1993) revealed that obese women who engaged in frequent binge eating reported experiencing significantly more weight cycles than obese women who did not binge eat. More evidence supporting the relationship between disinhibition and binge eating with weight cycling comes from a study conducted by Zwan et al. (1994). They showed in that in obese women, binge eating was significantly related to weight cycling, habitual dieting, a drive for thinness, and disinhibited eating measured by the DS of the TFQ. Moreover, Marcus et al. (1988) and Keefe et al. (1984) both showed that obese women who binge ate gained weight significantly faster than obese women who did not binge eat during the post dieting period.

Emotional eating also was suggested to play a role in weight cycling because negative emotions have been shown to be disinhibitors which lead to binge eating in highly restrained individuals (Baucom & Aiken, 1981; Herman et al., 1987; Ruderman, 1985). Kayman et al. (1990) and Blair et al. (1990) both explored the relationship between weight loss maintenance and emotional eating. They found that that high levels of emotional eating were significantly negatively correlated with weight loss maintenance. Hence, Blair et al. (1990) concluded that a high level of emotional eating may increase the rate of relapse making weight loss maintenance extremely difficult if not impossible. Additional evidence supporting the association between emotional eating and weight fluctuation was provided by Eldredge, Agras, and Arrow (1994). They revealed that individuals who reported eating in response to anger and depression gained weight prior to entering into a weight loss program. Eldredge et al. (1994) suggested that the memories of past dieting failures evoked a pattern of binge eating in individuals who overate in response to these negative emotions.

Conflicting results regarding the association between disinhibition, binge eating and emotional eating were revealed by Wadden et al. (1992) and Kuehnel and Wadden (1994). Wadden et al. (1992)evaluated the relationship between weight cycling (total number of diets resulting in a weight loss of greater than ten pounds) and negative emotions, disinhibition, and binge eating in 50 obese women entering into a behavioral therapy weight loss program. Contradictory to this study and the studies listed above, Wadden et

al. (1992) did not reveal a significant relationships between weight cycling and disinhibition, binge eating, and emotional eating.

Similarly, Kuehnel and Wadden (1994) did not find significant relationships between either emotional eating or binge eating and weight cycling; however, they did show a significant positive correlation between disinhibition and weight cycling. They evaluated the differences in depression as measured by the BDI (Beck et al., 1961), binge eating behavior, disinhibition, and dietary restraint in 70 obese binge eaters and non-binge eaters. They grouped the subjects into two groups: low weight cyclers (less than three diets resulting in a ten pound weight loss) and high weight cyclers (greater than five diets resulting in a ten pound weight loss). No significant relationships were found between weight cycling and binge eating, depression, and dietary restraint (CRS), but one between disinhibition (DS) and weight cycling was.

Conflicting results revealed in the studies conducted by Wadden et al. (1992) and Kuehnel and Wadden (1994) may be due to two factors. The first is that the relationships between weight cycling and disinhibition, emotional eating, and binge eating were evaluated only in obese women participating in a weight loss program. It may be that obese women score higher on these scales as evidence by the significant positive correlations between BMI and the DS, BITE, and EE found in this study. Thus, Kuehnel and Wadden (1994) and Wadden et al. (1992) may have been unable to reveal significant relationships between weight cycling and these aberrant eating behaviors because of all

their subjects on average scored higher on these scales than the women from this study who were from a general population.

The second factor is that in the study conducted by Kuehnel and Wadden (1994) subjects were placed into two groups: low weight cyclers (three or less diet resulting in a ten pound weight loss) or high weight cyclers (five or more diets resulting in a ten pound weight loss). As previously mentioned, the average number of weight cycles in this study was slightly more than one, and only three percent of the subjects reported experiencing five or more weight cycles. Therefore, very few of the subjects in this study would be considered high weight cyclers by Keuhnel and Wadden (1994). Hence, grouping their subjects in this manner may have decreased the ability to identify significant relationships between binge eating and emotional eating with weight cycling because there may be a threshold effect of these abberrant eating behaviors on weight cycling. No one knows if these aberrant eating behaviors are present in individuals who weight cycle once, twice, three, or ten times (Kuehnel & Wadden, 1994).

Contrary to the hypothesis 2, the CRS was revealed to be significantly positively correlated with weight cycling. The initial hypothesis that the CRS is not correlated with weight cycling was drawn from findings that revealed the CRS measures dietary restriction in every day life (Laessle et al., 1989a; Tuschl et al., 1990; Wardle & Beales, 1987), successful weight loss maintenance (Lowe & Klefield, 1988), and inability to predict disinhibited eating in a laboratory setting (Wardle & Beales, 1987). Several researchers have suggested that the CRS of the TFQ measures a dieter's ability to

successfully maintain their weight at a new lower level (Lowe & Kleges, 1988, Tuschl et al. 1990) as well as assesses realistic views about dieting (Marcus et al., 1988). .

From the findings stated above, the author hypothesized that individuals who score high on the CRS would have strong cognitive control over their urge to eat, would not be disinhibited, and would not engage in binge eating. Therefore, they do not experience large weight fluctuations or weight cycling. This hypothesis was refuted.

Some of the same researchers who suggested that the CRS measures daily dietary restriction and weight loss maintenance also revealed that the subjects who scored high on the CRS experienced a significantly greater number of weight loss/ weight regain cycles and engaged in significantly more diets than individuals who scored low on the CRS (Laessle et al, 1989a; Tuschl et al., 1990). Thus these studies, as well as this one, suggest a definite link between dietary restraint measured by the CRS and weight cycling.

Some insight into these findings was provided by Eldrege and Agras (1994). They showed that scores obtained on the CRS and the DS are significantly different on binge days than they are on non-binge days. On binge days, the subjects scored higher on the DS and lower on the RS than on non-binge days. Hence, it appears that the CRS scores may only reflect dietary restriction on the day the scale was given and is not truly reflective of the individual's everyday eating behavior as several researchers have suggested.

One interpretation of the significant correlations between weight cycling and the CRS, DS, BITE, and EE is as follows. Individuals who score high on the CRS diet repeatedly

which increase their vulnerability to disinhibition. These individuals may exhibit control over their eating on most days, but binge eat on other days when a disinhibiting event occurs. The calories they consume during their binge episodes results in weight gain which spurs them to diet to lose weight. The vicious cycle of dieting /weight loss and over eating/weight gain is starting in motion again.

The conclusion that dietary restraint, binge eating, and disinhibition are related to each other as well as with weight cycling is supported by the significant positive intercorrelations between the three scales and their significant positive correlations with weight cycling. This dieting - bingeing eating behavior described above appears to strongly influence the incidence of weight cycling in women from a general population.

The finding that BMI is significantly positively related to weight cycling is not surprising since one would expect overweight individuals to diet more due to societal pressure and stigma attached to being obese. Several other researchers also have reported a significant correlation between BMI and weight cycles (Jeffery et al., 1992; Monroe et al. 1991). Telch et al. (1988) has suggested that the majority of obese women try to lose weight at least once during their lifetime spurred on by social prejudice with the ultimate unrealistic goal of obtaining the ideal feminine physique

Intercorrelations among the Independent and Control Variables

The DS, BITE, and EE were highly correlated with each other (Table 4). These findings are not surprising since, as previously mentioned, they all measure overeating in

response to a cognitive stimuli be they negative emotions or the feeling one has "blown the diet".

The significant interrelationships between emotional eating, binge eating, and disinhibition is well documented in the literature. In a construct validity study conducted by Laessle et al. (1989b), the DS of the TFQ and the EDI Subscale which measures binge eating behaviors loaded high on the same factor. In two survey studies, one conducted by Marcus et al. (1985) and the other by Lowe and Caputo (1991), severity of binge eating was revealed to be significantly correlated with the DS of the TFQ. In studies, Greenberg and Harvey (1986, 1987) revealed significant interrelationships between negative emotions, binge eating, and disinhibition as measured by the RS (Herman & Polivy) which has been shown to measure similar eating behaviors as the DS (Laessle et al., 1989b).

The highest correlation between the independent variables was seen between the EE and the DS ($r = 0.70$). This finding can be explained by a study conducted by Ganley (1988). He revealed, through factor analysis, that the DS contains two factors which he referred to as the weight liability factor and the emotional eating factor. Hence, the two scales measure some of the same eating behaviors.

As previously mentioned, the CRS was revealed to be significantly positively correlated with the DS ($r = 0.16$) and the BITE ($r = 0.24$); however the correlations were much lower than those exhibited between the DS, BITE, and EE. This finding is surprising since most of the research has either revealed no relationship or an inverse one between the CRS and the DS and BITE or similar scales (Ganley, 1988; Lowe & Caputo,

1991; Marcus et al., 1988; Stunkard and Messick, 1985). These researchers concluded that the CRS measures dietary restriction and the DS and the BITE measure loss of control over eating.

The significant relationships between the CRS and the DS and BITE may be explained by separating the dietary restraint model into its two components: The first component deals with motivational factors that lead to restrained eating such as the drive for thinness, and negative body image, and the second component deals with disinhibited or binge eating (Laessle et al. 1989b). For example, highly restrained individuals diet repeatedly by restricting their caloric intake. However on days when a disinhibiting event occurs their cognitive control over eating is undermined, and they begin to binge eat. From episodic binge eating which may occur on and off for a few days to week, the dieter gains weight. The weight gain intensifies the individual's already negative body image, and they begin to diet again. Thus one diet - binge cycle is completed.

MULTIVARIATE RELATIONSHIPS

Evaluating the simultaneous effects of dietary restraint, disinhibition, binge eating, emotional eating, and BMI through regression analysis was another purpose of this study. A total of 26 % of the variance in number of weight cycles experienced by the women was explained by the above proposed independent variables ($p \leq 0.0001$). Thus, the hypothesis that the CRS, DS, BITE, EE and BMI can significantly predict incidence of weight cycling in women was substantiated.

A finding that was interesting to the author was that only the EE and BMI were statistically significant predictors of weight cycling. However, the Betas for the BITE and CRS were large enough to suggest that they are substantively important to the incidence of weight cycling, but they were not statistically significant.

EE had a greater effect on the incidence of weight cycling in women from a general population than did the DS. This finding can be explained by suggesting that these scales measure similar eating behaviors evidenced by their extremely high correlation with each other ($r = 0.70$). Additional evidence that these scales measure similar eating behaviors was provided by Ganley (1988). He found that the DS contains two components: weight liability component and an emotional eating component. Once EE was controlled for, DS was no longer significant. Moreover, the effect of DS may have been undermined by shortening its length prior to its inclusion in the study survey; even though, the questions that were included in the survey were shown to exhibited the highest factor loadings of the DS (Ganley, 1988).

The EE and the BITE were significantly positively correlated with each other ($r = 0.55$), and it was suggested earlier that they both measure overeating in response to some cognitive stimuli. However, the BITE still exhibited some effect on the incidence of weight cycling in women from a general population even when controlling for the effect of EE; although the EE had a stronger effect.

As previously mentioned, the CRS was not statistically significantly related to weight cycling when all of the proposed variables were considered. Methodological reasons

rather than substantive reasons may explain this. The CRS was shortened prior to its inclusion on the survey. Like the DS, some of its predictive ability may have been undermined. Alternatively, emotional eating and binge eating may play a much greater role in the incidence of weight cycling in a general population of women than does dietary restraint.

Another surprising finding of the regression analysis was that BMI had the strongest effect on weight cycling in the regression equation. Based on these findings, the most influential factor of weight cycling in a general population of women was their BMI followed by emotional eating, binge eating, and dietary restraint. It may be that the overweight women try to diet or engage in dietary restraint more often due to societal pressure and the stigma attached to being obese but are unable to maintain their weight loss due to binge eating and emotional eating. This cyclical eating pattern of dieting and overeating results in repeated weight fluctuations or weight cycling.

Several researcher have found an association between emotional eating and both weight gain (Holiberg et al., 1980; Rand & Stunkard, 1978; Rand, 1982; Woodman, 1980) and unsuccessful weight loss maintenance (Blair et al., 1990; Kayman et al., 1990; Leon & Chamberlin (1973a, b). Rand and Stunkard (1978) and Woodman (1980) revealed that obese individuals report more frequent binge eating in response to negative emotions and more often gained weight during stressful life events than normal weight individuals. Moreover, Rand (1982) cited that 79% of the obese women they studied

gained ten or more pounds during stressful periods in their life; whereas only nine percent of the normal weight women they studied reported a weight gain of this magnitude.

Ganley (1989) reviewed all of the current literature on emotional eating in obese individuals. He concluded from the available research that emotional eating is most often precipitated by negative emotions such as anger and depression and bears an episodic relationship to stressful life periods. He also suggested that emotional eating manifests itself as binge eating in the obese population.

Additional evidence supporting the association between emotional eating and weight cycling is provided by two studies which evaluated emotional eating's relationship with weight loss maintenance. Blair et al. (1990) found that subjects who reported a decrease in their emotional eating were more successful at long-term weight loss maintenance than individuals who reported an increased their level of emotional eating. Moreover, a significant positive relationship between BMI and frequency of emotional eating was revealed. Further evidence supporting the association between weight loss maintenance and emotional eating was found by Kayman et al. (1990). They reported that significantly more individuals who regained lost weight (70%) reported using food to cope or escape emotional stresses than individuals who were able to maintain their lost weight (8%) and normal weight controls (9%).

From the findings reported in this study and others described above, overweight individuals may be more prone to weight cycling due repeated dieting spurred by societal pressure to obtain the feminine ideal body shape, high levels of emotional eating, and

frequent binge eating. These women may in fact achieve their desired lower body weight but for only a short period. Success at long-term weight maintenance is undermined by binge eating in response to negative emotions and stressful life events.

CONCLUSIONS

The stated purpose of this study was to explore the relationships between weight cycling and dietary restraint, disinhibition, binge eating, emotional eating, and BMI in a general population of women while controlling for their simultaneous effects. In addition, the interrelationships between dietary restraint, disinhibition, binge eating, and emotional eating were explored. It was hoped that by studying the relationships of these variables with weight cycling, factors that influence its occurrence could be identified in women from a general population.

It was found that weight cycling was significantly correlated to measures of dietary restraint, disinhibition, binge eating, emotional eating, and BMI. Moreover, most of the eating behaviors were significantly correlated with each other. Eating behaviors of interest in this study and BMI were found to significantly explain 26% of the total variance in number of weight cycles experienced by the women. Emotional eating and BMI had the strongest effect on weight cycling in the regression model. Binge eating and dietary restraint also may be substantively important; although , they were not statistically significant in this model.

In short, the incidence of weight cycling was significantly related to high levels of dietary restraint, disinhibition, binge eating, and emotional eating as well as a high BMI with emotion al eating and BMI being the most influential variables. The results from this

study suggest that these eating behaviors function in loop with the final outcome being repeated weight fluctuations or weight cycling.

It may be that overweight women practice dietary restraint as a means of reducing their weight to a more socially acceptable one. Since the practice of dietary restraint increases an individual's susceptibility to disinhibition, the overweight individual binge eats in response to a disinhibiting event such as a negative emotion. These periodic binge episodes may last from one day to several weeks during which time the overweight individual regains previously lost weight. They are again at a socially unacceptable weight. In an attempt to reduce their weight, dietary restraint is employed. Thus, the vicious cycle of dieting and binge and losing and gaining weight continues to turn round.

As previously mentioned, the metabolic hazards of weight cycling are controversial, but what all health care professionals agree with is reducing an overweight individual's weight to a healthy one and maintaining that weight loss long-term. However, long-term weight maintenance cannot be achieved until the factors that influences weight cycling are identified and treated. It seems in this study population of overweight women, weight cycling will continue to occur unless their behaviors of emotional eating and binge eating are addressed. These women do not need more counseling on how to decrease their weight through caloric restriction (dietary restraint) but on how to eat healthfully and cope with emotional and life stresses through other avenues besides food.

Americans are a nation obsessed with dieting and possessing the slim feminine ideal. Overweight women who do not meet this image are stigmatized and made to feel less self

worth. Consequently, they may continue to diet to lose weight and programs and gimmick to help them are advertised everywhere. Unfortunately what they do not need are new ways to lose weight since they are relatively successful at that, but ways to keep the weight off which is what they are unsuccessful at, evidence by their repeated weight cycling.

For successful weight loss maintenance and the psychological health of the overweight individual, clinicians need to learn how to treat the underlying behaviors which potentates weight cycling not the end results of engaging in these behaviors. Repeated joyful successes of weight loss followed by even more devastating failures of weight regain take a tool on an individual's self esteem and psyche. They may begin to envision their lives as a constant struggle between losing and gaining weight. Thus, it is imperative that clinicians try to identify and treat in their patients' high risk behaviors such as dietary restraint, disinhibition, binge eating and emotional eating that exacerbate weight cycling.

Further Investigation

Further investigation should be undertaken to address other variables that influence weight cycling such as body image and self esteem since only 26% of the variance in weight cycling was explained by the proposed variables. Also, more statistical analysis should be conducted on this population of women to determine if different eating behaviors influence weight cycling in overweight and normal weight women since BMI proved to be the strongest predictor of weight cycling in this population of women.

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APPENDIX A

ID NUMBER _____

ATTITUDES AND BEHAVIORS ABOUT FOOD AND WEIGHT

This questionnaire was designed to help us understand more about issues concerning weight fluctuation and eating behaviors. The questionnaire is completely confidential. The identification number is for mailing purposes only and will not be matched to your name. Thank you for your time in completing this questionnaire. When you have completed the questionnaire, please seal it in the envelope provided and place the sealed envelope in inter-campus mail.

Please write the appropriate answer or circle the answer that most closely represents your situation.

First we would like to know a few things about you.

1. What is your gender?

    1. MALE
    2. FEMALE

2. Are you currently pregnant?

    1. YES
    2. NO

3. Are you currently breast feeding?

    1. YES
    2. NO

4. Have you had a major illness within the last five years that had a significant effect on your weight?

    1. YES
    2. NO

Some people will be excluded from this study. So if you are a male or have answered yes to any of the above questions, we thank you for your time but will not be able to use your responses in data collection. We would appreciate it if you would mail back the survey in inter-campus mail.

In this next section, please circle the answer that best applies to you.

17. How often are you dieting in a conscious effort to control your weight?

    1. RARELY
    2. SOMETIMES
    3. USUALLY
    4. ALWAYS

18. Do your feelings of guilty about overeating help you to control your food intake?

    1. NEVER
    2. RARELY
    3. OFTEN
    4. ALWAYS

19. How likely are you to shop for low calorie foods?

    1. UNLIKELY
    2. SLIGHTLY UNLIKELY
    3. MODERATELY LIKELY
    4. VERY LIKELY

20. How likely are you to consciously eat less than you want?

    1. UNLIKELY
    2. SLIGHTLY UNLIKELY
    3. MODERATELY LIKELY
    4. VERY LIKELY

21. Do you go on eating binges though you are not hungry?

    1. NEVER
    2. RARELY
    3. SOMETIMES
    4. AT LEAST ONCE A WEEK

22. To what extent does this statement describe your eating behavior? " I start dieting in the morning, but because of any number of things that happen during the day, by evening I have given up and eat what I want, promising myself to start dieting again tomorrow."

    1. NOT LIKE ME
    2. LITTLE LIKE ME
    3. PRETTY GOOD DESCRIPTION OF ME
    4. DESCRIBES ME PERFECTLY

Please read the following questions and indicate whether or not they apply to you by circling T for TRUE or F for FALSE.

	TRUE	FALSE
23. Dieting is so hard for me because I just get too hungary.	T	F
24. Life is to short to worry about dieting.	T	F
25. I often feel so hungry that I just have to eat something.	T	F
26. At certain times of the day I get so hungry because I have gotten use to eating then.	T	F
27. When I feel blue, I often overeat.	T	F
28. I get so hungry that my stomach often feels like a bottomless pit.	T	F
29. When I feel sad, I console myself by eating.	T	F
30. I consciously hold back at meals in order not to gain weight.	T	F
31. I eat anything I want, any time I want.	T	F
32. Without even thinking about it, I take a long time to eat.	T	F
33. I count calories as a conscious means of controlling my weight.	T	F
34. I do not eat some foods because they make me fat.	T	F

In the next section we will be asking questions about your height, weight, and weight history. Please write in the appropriate answer or circle the answer that most closely represents your situation.

35. Do you ever diet?

    1. NO - SKIP TO QUESTION 44
    2. YES - CONTINUE WITH QUESTION 36

Now think about how much weight you have lost from dieting alone, and how many times you have done so.

36. What was the greatest amount of weight you have lost from dieting alone?

    _____POUNDS

37. How many times have you lost this amount of weight?

1. 1 TIME; From _____lbs to _____lbs
2. 2 TIMES; From _____lbs to _____lbs
   From _____lbs to _____lbs
3. 3 TIMES; From _____lbs to _____lbs
   From _____lbs to _____lbs
   From _____lbs to _____lbs
4. 4 TIMES; From _____lbs to _____lbs
   From _____lbs to _____lbs
   From _____lbs to _____lbs
   From _____lbs to _____lbs

38. Have you ever lost weight again from dieting alone?

1. NO - SKIP TO QUESTION 44
2. YES - CONTINUE WITH QUESTION 39

39. What was the second greatest amount of weight you have lost from dieting alone?

_____POUNDS

40. How many times have you lost this amount of weight?

1. 1 TIME; From _____lbs to _____lbs
2. 2 TIMES; From _____lbs to _____lbs
   From _____lbs to _____lbs
3. 3 TIMES; From _____lbs to _____lbs
   From _____lbs to _____lbs
   From _____lbs to _____lbs
4. 4 TIMES; From _____lbs to _____lbs
   From _____lbs to _____lbs
   From _____lbs to _____lbs
   From _____lbs to _____lbs

41. Have you ever lost weight again from dieting alone?

1. NO - SKIP TO QUESTION 44
2. YES - CONTINUE WITH QUESTION 42.

42. What was the third greatest amount of weight you have lost from dieting alone?

_____POUNDS

43. How many times have you lost this amount of weight?

1. 1 TIME; From _____lbs to _____lbs
2. 2 TIMES; From _____lbs to _____lbs
   From _____lbs to _____lbs
3. 3 TIMES; From _____lbs to _____lbs
   From _____lbs to _____lbs
   From _____lbs to _____lbs
4. 4 TIMES; From _____lbs to _____lbs
   From _____lbs to _____lbs
   From _____lbs to _____lbs
   From _____lbs to _____lbs

44. What is your height?

_____FEET _____INCHES

45. What is your current body weight?

_____POUNDS

46. What is your usual adult weight?

_____POUNDS

47. What was your highest adult weight?

_____POUNDS

48. What was your lowest adult weight?

_____POUNDS

Next we would like to know a little about your daily physical activity. Please circle the number below that best describes your physical activity for the <u>previous year.</u> **Light Exercise** includes activities such as office work, light house work, bowling, and softball **Moderate Exercise** and **Vigorous Exercise** include such activities such as jogging, running, swimming, tennis, heavy housecleaning, bicycling, and chopping woods.

49. 1 = NO PHYSICAL ACTIVITY

2 = LIGHT EXERCISE 1-3 TIMES/WEEK FOR AT LEAST 20 MINUTES.

3 = LIGHT EXERCISE 4-7 TIMES/WEEK FOR AT LEAST 20 MINUTES.

4 = MODERATE TO VIGOROUS EXERCISE 1-2 TIMES/WEEK FOR AT LEAST 20 MINUTES.

5 = MODERATE TO VIGOROUS EXERCISE 3-4 TIMES/WEEK FOR AT LEAST 20 MINUTES.

6 = MODERATE TO VIGOROUS EXERCISE 5-7 TIMES/WEEK FOR AT LEAST 20 MINUTES.

The remainder of the questionnaire addresses how you feel about food, and the way you eat. Again, please circle the answer that most closely represents your situation.

50. Do you have a regular eating pattern?

1. NO
2. YES

51. Do you ever fast for a whole day?

1. NO - SKIP TO QUESTION 53
2. YES- CONTINUE WITH QUESTION 52

52. How often is this?

1. EVERYDAY
2. 2-3 TIMES A WEEK
3. ONCE A WEEK
4. NOW AND THEN
5. HAVE ONE TIME

53. Do you do any of the following to help you lose weight?

	NEVER	OCCASIONALLY	A WEEK	DAILY	2-3 TIMES A DAY	3+ TIMES A DAY
Take Diet Pills	1	2	3	4	5	6
Take Diuretics	1	2	3	4	5	6
Take Laxatives	1	2	3	4	5	6
Make yourself vomit	1	2	3	4	5	6
Exercise Excessively	1	2	3	4	5	6

54. Does your pattern of eating severely disrupt your life?

1. NO
2. YES

55. Do you ever eat until you are stopped by physical discomfort?

1. NO
2. YES

56. Are there times when all you can think of is food?

1. NO
2. YES

57. Do you eat sensible in front of others and make up in private?

1. NO
2. YES

58. Can you always stop eating when you want to?

1. NO
2. YES

59. Do you ever experience overpowering urges to eat and eat; even though you are not hungry?

1. NO
2. YES

60. Do you ever eat large amounts of food very rapidly excluding a meal?

1. NO
2. YES

61. Are you ashamed of your eating habits?

1. NO
2. YES

62. Do you deceive other people about how much you eat?

1. NO
2. YES

63. Do you ever binge on large amounts of food? A binge is defined as an overeating episode over which you feel a loss of control.

1. NO - SKIP TO QUESTION 68
2. YES - CONTINUE WITH QUESTION 64

64. Do such binges leave you feeling miserable?

1. NO
2. YES

65. Do you only binge when you are alone?

1. NO
2. YES

66. How often do you binge?

1. HARDLY EVER
2. ONCE A MONTH
3. ONCE A WEEK
4. 2-3 TIMES A WEEK
5. DAILY
6. 2-3 TIMES DAILY

67. Would you go to great lengths to satisfy a binge?

1. NO
2. YES

68. If you overeat do you feel very guilty?

1. NO
2. YES

69. Do you ever eat in secret?

1. NO
2. YES

70. How old are you?

_____YEARS

71. What race are you?

1. CAUCASIAN
2. AFRO AMERICAN
3. HISPANIC, PLEASE SPECIFY _____
4. ORIENTAL, PLEASE SPECIFY _____
5. OTHER, PLEASE SPECIFY _____

Thank you for completing the survey! If you have any additional comments please write them in the space below. Also if you would like a copy of the results, please indicate in the space below. When you have finished with you comments please seal the questionnaire in the envelope provided and place it in inter-campus mail.

APPENDIX B

Virginia Tech
VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Department of Human Nutrition and Foods
College of Human Resources
Blacksburg, Virginia 24061-0430
(703) 231-4672 Fax: (703) 231-7157

June 22, 1993

Dear Virginia Tech Employee,

In today's society, dieting and weight loss have become a national obsession. You cannot open a magazine or turn on the T.V. without being bombarded about the latest dieting craze or weight loss gimmick. Despite the enormous amount publicity devoted to dieting, little research concerning the influences of eating behavior and attitudes on dieting has been conducted. Thus, you are invited to participate in a survey study which is looking at the relationship between eating behaviors, weight loss, and weight gain in middle aged females working for Virginia Tech.

The time required to complete the questionnaire is approximately 15-20 minutes. In addition, your participation in the study should pose no physical or psychological risk; however, there are questions concerning your weight and weight history.

Your participation in the study will help provide important information that health care workers can use in targeting and treating eating behaviors which increase the likelihood of losing weight and regaining weight periodically throughout an individual's lifetime.

Your responses to the questionnaire will be kept strictly confidential. On your questionnaire, you will notice an I.D. number. This number is used only for mailing purposes, so that we can keep track of the surveys that have been returned. When the mailing period has been completed, the list containing the names of the respondents and their I.D numbers will be destroyed. At no time will your name ever appear on the questionnaire.

This research study has been approved by the Research Council of Virginia Tech and the Department of Human Nutrition and Foods. If you have any questions concerning the study or the questionnaire, feel free to call me collect at (703) 569-1785 or Dr. Mary Ann Novascone at (703) 231-5778. When you have completed the questionnaire, please seal it in the envelope provided and place the envelope in inter-campus mail.

Sincerely,

Susan Sedlazek, R.D.

June 30, 1993

Dear Virginia Tech Employee,

This is just a brief reminder note regarding the questionnaire you received about a week and half ago entitled **Attitudes and Behaviors About Food and Weight.**

If you have already completed the questionnaire and mailed it back, we Thank You. If you have not, we would greatly appreciate it if you would and place the sealed questionnaire in inter-campus mail.

Thank you for your time.

Sincerely,

Susan Sedlazek, RD

Virginia Tech
VIRGINIA POLYTECHNIC INSTITUTE
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(703) 231-4672 Fax: (703) 231-7157

July 19, 1993

Dear Virginia Tech Employee,

I am writing to you about our study concerning eating behaviors and weight fluctuations. We have not yet received your completed questionnaire.

The large number of questionnaires that have already been returned is encouraging. But, whether we will be able to describe accurately how different eating behaviors influence weight loss and weight gain depends on you and others who have not yet responded. This is because our past experiences suggest that those of you who have not yet sent in your questionnaire may hold very different views and have had very different experiences than those who have responded.

It is for these reasons that I am sending you a replacement questionnaire. May I urge you to complete and return it as quickly as possible.

I will also be able to send you a copy of the results if you want one. Simply put "copy of results requested" at the end of the questionnaire. We expect to have them ready in early fall.

Your contribution to the success of the study will be appreciated greatly.

Sincerely,

Susan Sedlazek, RD

VITA

Susan Ellen Sedlazek was born in Fairfax, Virginia on August 8, 1967. She received a Bachelor of Science in Human Nutrition Foods from Virginia Tech in 1989. In the winter of 1990, Susan began work on her Master of Science degree in Human Nutrition from Virginia Tech. She completed her course work for her M. S. in the fall of 1991. She then enrolled into a dietetic internship at the Lehigh Valley Hospital Center in Allentown, Pennsylvania so that she could become a Registered Dietitian. Susan completed the internship in December of 1992 and began work as a clinical dietitian. In January of 1993, Susan resumed working on her thesis so that she could complete the requirements for M. S. in Human Nutrition. In October of 1993, Susan began working as sales and marketing specialist for SHS which specializes in clinical nutrition products.