1994

Disinhibition of restraint: a comparison of the Restraint Scale and the Three Factor Eating Questionnaire

Pamela S. Ridgway

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DISINHIBITION OF RESTRAINT: A COMPARISON OF THE RESTRAINT SCALE AND THE THREE FACTOR EATING QUESTIONNAIRE

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Presented in partial fulfillment of the requirements for the degree of Master of Arts UNIVERSITY OF MONTANA 1994

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12-1-94
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ABSTRACT

Ridgway, Pamela S., October 1994

Disinhibition of restraint: a comparison of the Restraint Scale and the Three Factor Eating Questionnaire

Director: D. Balfour Jeffrey, Ph.D.

Recent evidence has suggested that there are important differences between the measurement scales used to assess dietary restraint. The present study compared the Revised Restraint Scale (RRS) and the Cognitive Restraint Scale of the Three Factor Eating Questionnaire (TFEQ-CR) in their ability to predict negative affect eating (disinhibition of restraint) in the laboratory. Subjects (104 college women) were classified as either high or low on both scales, resulting in 4 separate groups. Using a 2x2x2 (RRSxTFEQ-CRxMood) design, it was hypothesized that the RRS would be a better predictor of disinhibited eating in the laboratory. Contrary to expectation, no significant differences in laboratory food consumption were found between groups. Evidence was provided, however, which suggests that individuals identified as restrained on the two scales differ, and that the scales may be assessing different constructs. Screening subjects from one group were found to be more overweight than the others, while another group consisted of low to normal weight women who had endorsed questions indicating that they were currently engaged in efforts to lose weight. A growing number of studies with findings contrary to traditional restraint theory suggests that restraint may not be a homogeneous construct, and that restraint theory may be too narrow to account for the diversity encountered in dieting behavior. The current study offers some support for Lowe's (1993) recently developed three factor model of dieting behavior. First, when results were reinterpreted using this model, it was found that individuals hypothesized as having a history of frequent dieting and overeating showed a tendency to be more overweight. Second, in one group of individuals considered by Lowe to be current dieters, the dysphoric subjects consumed less food than did their nondysphoric counterparts. Although these differences were nonsignificant, they are similar to the findings of Eldredge (1993) which suggest that current dieters and restrained eaters may behave differently. Possibilities for future research involving measures of restraint and Lowe's three factor model are also presented.
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ACKNOWLEDGEMENTS

I wish to thank my committee members, Dr. Sharon Uhlig and Dr. David Schuldberg for their suggestions and guidance. A special thanks goes to my committee chairman, Dr. D. Balfour Jeffrey, whose continued encouragement and pragmatic approach were an invaluable asset throughout this project. I am also gratefully indebted to Dr. James Walsh for his assistance and patience with statistical procedures. Finally, I would like to thank the following research assistants for their dedicated work in data collection: Tammy Bachmeir, Dixie Mead, Sacha Panarella, Terri Sudol, and Georgann Zackary.
CHAPTER ONE

Disinhibition of Restraint: A Comparison of the Restraint Scale with the Three Factor Eating Questionnaire

The construct of dietary restraint originally grew out of a body of research concerning obesity and the differences in eating behavior between obese and normal weight individuals. In her review, Ruderman (1986) traced the historical development of the restraint literature. The two predominant theories of obesity in the 1970's were Schachter’s internal-external theory (1968, 1971), and Nisbett’s set-point theory (1972).

Schachter proposed that obese individuals are more responsive to external cues such as the sight, smell, and taste of food. This was contrasted to the eating behavior of normal weight individuals who were believed to be more influenced by internal physiological cues such as gastric contractions and hunger. Although many researchers have attempted to test Schachter’s theory, no clear-cut picture has emerged. Ruderman cites definitional and methodological problems as explanations for the equivocal results in this area, and points out that researchers have generally concluded that the internal-external dichotomy seems too simplistic to account for the processes underlying eating behavior.

In 1972 Nisbett proposed a "set point" model of
obesity. He suggested that each person has an individually determined ideal weight, or "set point," and that obese people have higher set points than those of normal weight. Due to society's emphasis on slimness, these people try to suppress their weight below that of their natural set point. Nisbett suggested that dieting results in biological deprivation which in turn is responsible for behavioral consequences such as external responsiveness. This theory also proved difficult to test, and has yielded equivocal research findings. It did, however, draw attention to the role of dieting as an influence on eating behavior, and thus provided much of the impetus for subsequent research and theorizing (see Ruderman, 1986 for review).

**Dietary Restraint**

Recognizing that dieting plays a major role in food regulation, Herman and Mack developed the construct of dietary restraint in the mid-1970's. They proposed the Restraint Scale (RS) in 1975 as a relatively straightforward self-report device to identify chronic dieters. It was originally thought that identification of such dieters would permit tests (in normal-weight people as well as the obese) of hypotheses derived from Nisbett's 1972 article on the effects of long-term hunger (Heatherton, Herman, Polivy, King & McGee, 1988).

Since that time the concept of dietary restraint has grown extensively. Restraint theory has generated a large
body of research concerning the differences between restrained and unrestrained eaters, as well as the relationships between restraint and eating disorders in general. Herman and Polivy (1980) suggested that eating patterns are influenced by the balance between physiological factors prompting the desire for food and efforts to resist that desire. The cognitively mediated attempt to resist the urge to eat is termed "restraint". They proposed a continuum in which restrained eaters who continually monitor what they eat and struggle to diet are at one end, and free eating unrestrained eaters are at the other end of the continuum.

Disinhibition

Early on, many interesting and robust findings were observed in the eating behaviors of restrained eaters. It became clear that dieters identified as restrained by the Restraint Scale were also notable for their lapses of restraint (termed disinhibition of restraint) in certain situations. In fact, most of the research regarding the eating behavior of restrained eaters has focused on the questions of when, why and how disinhibition occurs.

The common experimental paradigm used by Herman and Mack in 1975 involved classifying college student subjects as either restrained or unrestrained on the basis of a median split of the restraint scores. The subjects' consumption of ice cream was measured during a bogus taste
test. Prior to the taste test, one-half of the subjects received a milk shake pre-load (one or two milk shakes). Restrained eaters were found to consume more after a preload than without one, while unrestrained eaters consumed less after a preload. These paradoxical patterns were later described as "counterregulatory" and "regulatory", respectively. Additional studies (Hibscher and Herman, 1977; Ruderman and Christensen, 1983) supported the findings that restrained and unrestrained eaters respond differently to preloads, with restrained eaters eating more, and unrestrained eaters eating less after preloads. It was also noted that the Restraint X Preload interaction varied from sample to sample, and seemed to depend of the proportion of obese individuals in the sample.

Emotional states were also found to result in disinhibition of restraint. According to Ruderman (1986) the idea that affect may be related to eating can be traced back to the obesity literature. Both Schachter's externality theory and psychosomatic theory had proposed that obese people would increase their consumption when anxious. The original hypotheses regarding restraint (Herman & Polivy, 1980) also suggested that strong affect would be expected to disinhibit restrained eaters. Ruderman cites two studies involving clinically depressed patients (Polivy & Herman, 1976a; Zielinski, 1978) which found that restrained eaters reported weight gain after the onset of
depression. Other researchers have utilized mood induction procedures to examine the influence of dysphoria on eating behavior (Baucom & Aiken, 1981; Frost, Goolkasian, Ely, & Blanchard, 1982; Ruderman, 1985). Each of these studies demonstrated that restrained eaters ate more when in dysphoric moods than when in nondysphoric moods, while unrestrained eaters showed a tendency to eat less when dysphoric. In a more recent study, Smith and Jeffrey (1990) investigated the effects of a variety of moods on the eating behavior of restrained and unrestrained individuals as identified by the Revised Restraint Scale. The Velten mood induction procedure was used to create dysphoric, neutral or elated mood conditions. As hypothesized, restrained dysphoric subjects ate significantly more crackers than did the unrestrained subjects. Since an elated mood was not significantly induced, it was not possible to test the effect of strong positive emotion on eating behavior of restrained and unrestrained subjects. Other studies have also shown that anxiety, as well as depression, has a similar disinhibiting effect on restrained eaters (Herman, Polivy, Lank & Heatherton, 1987).

The "disinhibition hypothesis" was proposed by Herman and Polivy (1980) to account for this seemingly paradoxical behavior. This hypothesis suggests that certain events (disinhibitors) disrupt the self-control of restrained eaters, and overeating ensues. Such disinhibitors may be
cognitive, emotional, or pharmacological. Cognitive disinhibitors include thoughts which may follow a dietary violation, such as "I've blown my diet, so I may as well keep eating." This all-or-nothing thinking is believed to be a factor in restrained eaters' tendency to counterregulate after a preload. Emotional disinhibitors include strong emotional states such as anxiety and depression. It has been suggested that intense affect overwhelms the dieter and reduces his or her motivation to diet. Pharmacologic disinhibitors include sedatives and relaxants, such as alcohol, which interfere with self-control (Ruderman, 1986).

Herman and Polivy (1984) integrated their hypotheses about restrained eating into the "boundary model". This model attempts to take into consideration the physiological and nonphysiological determinants of eating. They assert that the aversive qualities of hunger and satiety work to keep consumption above and below (respectively) certain boundaries. The area between these boundaries is called the range of "biological indifference". The regulatory factors controlling consumption for restrained and unrestrained eaters are believed to differ in two respects. First, dieters are thought to have a wider zone of biological indifference, resulting in lower hunger boundaries and higher satiety boundaries than nondieters. Second, dieters have a third self-imposed "diet" boundary which marks their maximum desired consumption. The boundary
model has been used to describe the eating behavior of bulimics and anorexics, as well as that of restrained and unrestrained eaters.

**Restraint and Binging**

The disinhibited eating of restrained eaters closely resembles the eating patterns of binge eaters, and relationships between the two have been found. Polivy and Herman (1985) have proposed a causal relationship between dieting and binging. According to their hypothesis, the adoption of a cognitively regulated eating style supplants physiological regulatory controls with cognitive ones, and thus dieting makes the dieter vulnerable to disinhibition and consequent overeating.

The causal model of dieting and binging has been supported by the findings of path analytic studies. Greenberg and Harvey (1986) found that the coexistence of high levels of depression and dietary restraint were significant predictors of binge eating over time. Binge eating, however, did not cause depression and dietary restraint. Their 1987 study examined the interaction of dietary restraint and lability of affect, particularly with respect to shifts between elated and depressed moods. Lability of mood was found to be an even better predictor of the severity of binge eating, accounting for all of the variance in the relationship of dietary restraint, depression, and binge eating (Greenberg & Harvey, 1987).
In light of the similarities which have been demonstrated between restrained eaters and bulimics, Striegel-Moore, Silberstein, & Rodin (1986) have suggested that eating disorders may not represent distinct syndromal entities, but rather may exist along a continuum. This would range from normal eating, to restrained eating, and extending to bulimia nervosa at the extreme. Obviously, the concept and measurement of dietary restraint play an important part in our attempt to determine the etiologies and treatments of eating disorders.

The Revised Restraint Scale

Originally, Herman and Mack (1975) divided the Restraint Scale into two subscales based on the items' face validity. Five questions detailed "diet and weight history", and the other five addressed "attitudes toward food and eating". Herman and Polivy (1975) used a similar 11 item scale and reported an internal consistency coefficient of $\alpha = .75$. The two subscales had coefficient alphas of .68 and .62 respectively, and the correlation between the subscales was found to be .48. The most recent version of this instrument is called the Revised Restraint Scale (RRS). It differs from the previous scale only in that it contains 10 items, and utilizes a forced-choice format (Herman, Polivy, Pliner, & Munic, 1978).

Many studies have examined the psychometric properties of the Revised Restraint Scale. The most comprehensive
psychometric investigation of restraint measures to date was performed by Allison, Kalinsky & Gorman (1992). This study involved over 900 undergraduate subjects, and examined internal consistency, temporal stability, factor structure, discriminant validity with respect to social desirability and susceptibility to dissimulation. It also included, on a smaller scale, samples of both men and women, as well as obese and nonobese subjects. Among normal populations, previous studies had found the internal consistency of the RRS to be fairly high, with coefficient alphas ranging from .78 to .86. Among certain subgroups (such as bulimic or overweight populations) the internal consistency has been lower (.50 to .68). Allison and colleagues reported alpha coefficients of .827 and .716 for the nonobese and obese samples, respectively.

Temporal stability reported in three previous studies, was found to be between $r = .91$ and $r = .93$ for periods ranging from one week to "a few weeks". Allison et al. examined temporal stability with a subsample of 34 subjects, and reported $r = .95$ for a period of two weeks.

Numerous factor analyses have retained the original two factors which are typically referred to as Weight Fluctuation (WF) and Concern for Dieting (CD). Items 1, 5, 6, 7, 8, and 9 correspond to a subjective concern for dieting (CD), while items 2, 3, 4, and 10 correspond to weight fluctuation (WF). The same bifactorial nature of the RRS was
confirmed by Allison and colleagues (1992). When the subject population consists mainly of obese individuals, however, factor analysis has been found to extract more than two factors. Heatherton, et al. (1988) point out that because an obese population tends to be more restrained, their scores are not normally distributed. They assert that when the sampling method introduces substantial skew into the distribution of scores, the correlations among items may be lowered, thus increasing the probability that additional factors will be extracted.

When the separate factors of the RRS have been examined as predictors of disinhibited eating, the results have been contradictory. Ruderman (1985) found that the CD scores were the best predictors of the amount eaten by dysphoric individuals, total scores were slightly less powerful, and WF scores were not related to the amount eaten. However, Frost and his colleagues (1982) found the WF factor to be a better predictor of food intake after a dysphoric mood induction. Heatherton et al. (1988) point out that there is no consensus as to which factor is paramount, and suggest it seems more prudent to use the whole scale which has never been shown to be inferior to either subscale alone. Ruderman (1985) recommended that future studies of restraint examine the predictive validities of the WF and CD subscales, as well as the total score.

Consistent significant correlations between percentage
overweight and restraint have been reported in several studies. This indicates that obese individuals do obtain higher restraint scores than normal weight individuals (Heatherton, et al., 1988). Ruderman and Christensen (1983) hypothesized that for overweight groups the scale might not be as valid a measure as for normal weight groups, and/or that it might systematically overestimate restraint for overweight groups due to an increase in the weight fluctuation factor. Ruderman (1983) advised other researchers to use only normal weight restrained subject unless overweight was a variable of interest. Heatherton, et al. (1988) pointed out that the findings regarding the correlation between overweight and the two factors of the RRS are contradictory. While some studies have found a higher correlation between being overweight and the WF factor, others have found the CD factor to be more highly correlated. Heatherton and his colleagues concluded that there is as yet no clear evidence that the high total restraint scores of the obese are simply a matter of greater weight fluctuation. They noted that while heavier individuals may experience greater absolute weight fluctuations, it may also be that heavier individuals are more likely to engage in active dieting.

Another important difference between obese and restrained eaters has been noted. Evidence has shown that overweight restrained eaters do not counterregulate
following preloading as do normal weight restrained eaters (Ruderman, 1986; Stunkard & Messick, 1985). This has raised additional concerns that either the RRS does not accurately identify dieters among the obese, and/or that restraint theory’s predictions about counterregulation are not applicable with this population. Heatherton et al. (1988) refer to the boundary model as one explanation of this finding. They suggest that counterregulation is a function of both preload size and the diet boundaries, and that obese and normal-weight dieters may have different diet boundaries.

In response to concerns about the psychometric adequacy of the Revised Restraint Scale, two other scales which include a measure of dietary restraint have been developed: the Three Factor Eating Questionnaire (Stunkard and Messick, 1985) and the Dutch Eating Behavior Questionnaire (Van Strien, Frijters, Bergers, & Defares, 1986).

**The Three Factor Eating Questionnaire (TFEQ)**

Stunkard and Messick (1985) cited two main problems with the Revised Restraint Scale. The first was the failure of the RRS to predict the counterregulatory behavior of obese persons, and the second was the construct validity of the RRS which they viewed as confounded by weight fluctuation and social desirability. They concluded that a new instrument to measure restrained eating and related issues was called for. The TFEQ was developed factor
analytically using scores from groups of known dieters and non-dieters. The TFEQ contains 51 items, and as the name implies, it contains three subscales derived from factor loadings. Factor I contains 21 items, and is associated with conscious mechanisms for restraining food intake. Factor II involves a variety of disinhibitors, and Factor III reflected feelings of hunger and its behavioral consequences. (In this paper these will be referred to as Cognitive Restraint (CR), Disinhibition (DI), and Hunger Sensitivity (HS) respectively). The authors maintain that such a scale makes it possible to separate the measurement of restraint from the measurement of disinhibition.

Stunkard and Messick (1985) found that subscales I and II discriminated significantly between dieters and free eaters, while the difference between the two groups on subscale III was nonsignificant. The correlational pattern for dieters indicated that strong restrainers on Factor I tend to exhibit less disinhibition, while restrainers susceptible to feelings of hunger display more disinhibition. For free eaters, Factors II and III were highly correlated. Among dieters Stunkard and Messick reported coefficient alphas of .79, .84, and .83 for Factors I, II and III respectively. Among non-dieters the coefficient alphas for the same factors were .92, .84 and .87. The study by Allison et al. (1992) examined the cognitive restraint factor of the TFEQ-CR (Factor I) and reported alpha coefficients of .906 for
the nonobese group and .880 for the obese sample. They found the temporal stability for Factor I to be .91 (for a period of two weeks). The factor structure of the TFEQ-CR was also studied by Allison and his colleagues (1992). Interestingly, they found it to split into two factors, Cognitive Restraint, and Behavioral Restraint. However, the authors concluded that given the high LISREL indices for a single-factor solution, it could be said that the TFEQ-CR contains "two primary factors nested within a broader secondary factor".

The Dutch Eating Behavior Questionnaire (DEBQ)

Van Strien and her colleagues developed the DEBQ to provide a homogeneous scale to test the three primary theories of overeating and obesity (psychosomatic, externality, and restraint). Thus the scale was factorially derived to obtain information about the extent of emotional, external, and restrained eating (Heatherton, et al., 1988). The DEBQ is made up of 31 items, which include a 10 item restraint subscale. Allison et al. (1992) found the restraint subscale to have alpha coefficients of .949 and .912 for nonobese and obese samples. The two week temporal stability was .92, and it was found to contain a single factor.

Studies using the TFEQ

The cognitive restraint factor of the Three Factor Eating Questionnaire (TFEQ-CR) has been used with
increasingly frequency as a means of identifying restrained eaters. Many studies have utilized the TFEQ-CR to make comparisons between restrained eaters, unrestrained eaters, and bulimics. In two tests of the continuum theory, restrained and unrestrained eaters were identified with the TFEQ-CR and compared to bulimics on several measures (Rossiter, Wilson & Goldstein, 1989; Laessle, Tuschl, Waadt, & Pirke, 1989).

Lowe and Kleifield (1988) used the TFEQ-CR to identify restrained and unrestrained eaters, and also added a measure of weight suppression. Contrary to predictions, they found that the level of cognitive restraint was unrelated to the amount of food eaten after a milkshake preload. Weight suppression, however, was associated with a significant reduction in eating following the preload. Heatherton (1986) also showed failure to find counterregulation after preload when subjects were classified on the basis of the TFEQ total scores and each of its separate factors. Classification by the RRS, however, did predict counterregulation by the restrained group. He reported correlations of $r = .68$ between the TFEQ-CR and the Restraint Scale, and $r = .48$ between the TFEQ-DI and the RS.

Laessle, Tuschl, Kotthaus, & Pirke (1989a) found that TFEQ-CR restrained eaters consumed around 400 kcal less per day than the unrestrained group. The restrained eaters also ate more protein, but avoided carbohydrates and fat. Huon,
Wootton, & Brown (1991) undertook a complex study involving subjects with varying combinations of high and low restraint and disinhibition scores as measured by the TFEQ. The proportion of carbohydrate in a prepared meal, as well as the knowledge provided about the meal was varied. Measures of willingness to eat, desire for food, total intake, and type of food eaten were taken at an ad libitum test meal four hours later. Results were contrary to the predictions on restraint theory, with high restraint subjects eating less when they knew that they had previously consumed a high carbohydrate breakfast.

Cooper & Bowskill (1986) conducted three naturalistic studies in which subjects were instructed to record food intake and mood for a period of one week. It was found that depressed mood preceded overeating in bulimics and in actively dieting restrained eaters, but that the associations was much weaker in non-dieting restrained eaters (as identified by the TFEQ-CR). Lowe and Maycock (1988) identified restrained and unrestrained eaters with the TFEQ and induced depressed mood with the Velten mood induction. Contrary to the predictions of restraint theory, they found no significant effects on consumption with the Cognitive Restraint or the Disinhibition factors of the TFEQ; only the Hunger Sensitivity factor showed a significant main effect.

Studies using the DEBQ
Wardle and Beales (1987) investigated food intake in restrained and unrestrained eaters during normal life, and in a laboratory taste test. The Restrained Eating Scale of the Dutch Eating Behavior Questionnaire (DEBQ-RE) was used to assess levels of restraint. They found that restraint was associated with a lower food intake during everyday life, but with a slightly higher intake in the laboratory. A milkshake preload did not, however, have a significant effect upon food intake in the laboratory, which is contrary to the predictions of restraint theory.

Differences between scales

It is obvious at this point that more questions have been raised than answered since the introduction of alternative measures of dietary restraint. As the restraint literature continues to expand, the picture has become increasingly confused. Previous assumptions about restraint have been contradicted by results obtained with the new scales. In an attempt to dispel the growing controversy and confusion regarding the assessment of restrained eating, Heatherton et al. (1988) addressed the conceptual and psychometric problems of the Restraint Scale as compared to the alternative scales. According to the authors, restraint should be characterized as a multifaceted syndrome involving both a propensity to restrict food intake as well as a tendency to splurge. They remind us that soon after the original Restraint Scale experiments were conducted, it was
acknowledged that most dieters identified by the scale are not successful in maintaining uninterrupted restriction of food intake. The average dieter is more likely to exhibit periods of restraint which are punctuated by episodes of overeating, and as a result does not achieve significant weight loss. In addition, they suggest that the TFEQ-CR and the DEBQ-CR, by attempting to isolate successful caloric restriction, do not appear to measure the same behavior tendencies as does the RRS. The authors propose that the TFEQ-CR and the DEBQ-CR measure successful dieting, whereas the RS is designed to identify the more typical dieters (who are not usually successful).

It should be pointed out that these differences between the RRS and the TFEQ-CR are not all that surprising when we are reminded of Stunkard and Messick's (1985) original intention when designing the TFEQ. They defined Factor I as reflecting "conscious mechanisms for restraining food intake", and Factor II as involving a variety of disinhibitors. Factor III reflected feelings of hunger and its behavioral consequences. Among dieters they found that "strong restrainers on Factor I tend to exhibit less disinhibition, while restrainers susceptible to feelings of hunger display more disinhibition". They also reported that weight change during depression was predicted by Factor II, and that Factor II was highly correlated with the total score on the RRS. Heatherton, et al. (1988) argue, however,
that it is difficult to imagine disinhibition without previous inhibition of restraint, and they suggest that the TFEQ may also confound restraint and disinhibition as does the RRS.

Laessle, Tuschl, Kotthaus, & Pirke (1989b) compared the three measures of restraint, and found the correlations to be $r = .35$ between the RRS and the TFEQ-CR, $r = .59$ between the RRS and the DEBQ-CR, and $r = .66$ between the TFEQ-CR and the DEBQ-CR. Their findings supported the hypothesis that different components of the restraint construct are being assessed by the three measures. Their subjects were 60 women (predominantly college students) with a mean age of 23.8 years. Scores from each of the scales were related to measures associated with disordered eating and figure consciousness, as well as self-reported mean caloric intake. A factor analysis showed that a high score on the Restraint Scale was closely related to consequences of mostly unsuccessful dieting, such as disinhibited eating and weight fluctuations, but not to successful overall caloric restriction in everyday life. High scores on the TFEQ-CR and the DEBQ-CR represented the more successful dieting behavior component of restraint. All three scales shared the motivational component of restrained eating, including concerns about shape and weight, and desire for thinness. The authors concluded that it may be most appropriate to conceptualize restraint as one construct make up of three
separate components which are represented differently by the three scales. They propose that all three scales seem to be appropriate measurement tools for studying subjects in whom the motivational variables (e.g., concerns about shape and weight, and desire for thinness) are of most importance. If disinhibition of restraint in the laboratory is used as a model for bulimic attacks, the restraint construct as measured by the RRS seems to be most appropriate for the investigation of conditions under which overeating may occur. And finally, when investigating the biological or psychobiological consequences of restricted food intake and altered eating patterns in everyday life, the authors suggest that the TFEQ-CR or the DEBQ-CR seem to be most appropriate for identifying subjects.

Allison, et al. (1992) called for continued investigation of the scales’ construct validity. They note that to date predictive validity with regards to disinhibition has been shown only by the RRS. It was also suggested that to hold prediction of disinhibition as a criterion for restraint simply because it was previously predicted by another measure may be somewhat tautological. The authors do conclude however, that the issue warrants further investigation.

Certainly, current evidence does suggest that there may be differences between the scales with regards to the prediction of counterregulation and disinhibition. A
fundamental question to be addressed here is whether or not the three scales used to measure dietary restraint are identifying the same population of interest. It may seem elementary, although critical nonetheless, to remind readers of restraint literature that conclusions drawn from studies about "restrained eaters" are not necessarily comparable when different scales have been used in the initial assessment. Few studies have examined the different scales using the same sample. This will be an important point to address in future studies since any differences observed could be a function of either the samples and methodologies used, or a function of the scales themselves.

**Purpose and Hypothesis**

The purpose of this study was to compare the predictive validity of the TFEQ-CR and the RRS during a laboratory induction of dysphoric disinhibition. As discussed earlier, laboratory studies have generally failed to find the typical disinhibitory patterns when using the TFEQ-CR to identify restrained eaters. (The TFEQ rather than the DEBQ was chosen for comparison in this study since it appears to be the more commonly used alternative to the RRS.) Heatherton (1986) found the typical counterregulatory eating after a preload when subjects were classified using the RRS. However, this pattern failed to emerge when the same subjects were reclassified using the TFEQ-total scores. The inability of the TFEQ to predict disinhibition was also
evident when subjects were classified using each of its subfactor scores. Lowe and Maycock (1988) used a dysphoric mood induction and found that neither the TFEQ-CR, nor the TFEQ-DI were predictive of eating behavior. The current study is believed to be the first to examine the predictive ability of the two scales with subjects classified simultaneously across both dimensions. Subjects were selected according to their levels of restraint on both the RRS and the TFEQ-CR. This resulted in four groups of subjects whose scores were either high on both measures, low on both measures, or high on one and low on the other. The subjects' eating behavior in response to either a dysphoric or neutral mood induction was then analyzed. It was hypothesized that the RRS and the TFEQ-CR would not be equivalent in predicting disinhibition in restrained eaters, and that the restrained eaters identified by the RRS would eat more after a dysphoric mood induction than would the restrained eaters identified by the TFEQ-CR. Such findings would provide further support to a growing body of evidence which suggests that the two scales are measuring different components of the restraint construct, and that the RRS is a better predictor of disinhibited eating in the laboratory. It was also anticipated that this study would provide a means of testing Stunkard’s premise that the restraint and disinhibition are measured separately by the CR and DI subscales of the TFEQ. As such, it was hypothesized that
the DI subscale should be a better predictor of disinhibition than the CR subscale. Independent variables in this study included the classification of restraint by the RRS, classification of restraint by the TFEQ-CR, and mood induction (negative and neutral). Dependent variables were the number of grams and calories consumed after the mood manipulation in a bogus taste-test using crackers.

A pilot study was performed by the author during the summer of 1992 to determine the distribution of scores and correlations between the two scales (RRS and TFEQ) among subjects at the University of Montana. Students in the Introductory Psychology class received experimental credit for completing both questionnaires. Among the 31 female subjects surveyed, the distribution of scores on each of the scales was found to be relatively normal. The medians were 13 and 10 for the RRS and the TFEQ-CR, respectively. Approximately 10% of the subjects fell into each of the HL and LH categories. The correlation between the RRS and the TFEQ-CR was found to be $r = .68$, while the correlation between the RRS and the TFEQ-DI was $r = .75$. 

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CHAPTER TWO

Method

Subjects

Female students enrolled in introductory psychology were administered the RRS (Appendix A) and the TFEQ (Appendix B) during the screening sessions which were held early in the semester. In order to obtain a sufficient number of subjects, data collection was conducted for two consecutive semesters. Because most of the research regarding restraint has been limited to females, only female subjects were included in this study. Information regarding self-reported height and weight was also collected during the initial screening (Appendix C).

Only subjects whose body mass index (BMI) fell between 19 and 25 were recruited for the manipulation portion of the study. The body mass index, rather than percentage over ideal weight, was selected as the measure of weight status for this study in light of recent literature supporting its use (Bray, 1992; Burton & Foster, 1985; Jeffrey, Dawson & Wilson, 1988; Wilson and Jeffrey, 1988). A major difficulty encountered in the assessment of ideal weight is the necessity to estimate frame size. The BMI (defined as weight in kg/height in m^2) offers an alternative method by employing ratios of weight relative to specific powers of height. A BMI nomograph developed by Thomas, McKay, and Cutlip (1976) may be used to determine the range of
acceptable weights. Bray (1992) has defined 19-25 kg/m as the range of "good weight" for men and women between 19 and 34 years of age, and this was the range utilized in the current study. A BMI range of 19-25 is approximately equivalent to a range extending from 9% below ideal weight to 19% over ideal weight according to the 1959 Metropolitan Life Insurance norms.

Design

Using scores from the RRS and TFEQ-CR scales, subjects were classified as either restrained or unrestrained based on the split-half median procedure. The medians were 14 and 10 respectively, for the RRS and the TFEQ-CR. 26 subjects were selected for each of the following four groups: low TFEQ-CR and high RRS = LH; high TFEQ-CR and low RRS = HL; low on both scales = LL; high on both scales = HH. One half of the subjects from each group were then randomly assigned to either a neutral or negative mood induction, resulting in a final separation into eight groups. The 2x2x2 design is presented in Figure 1.

Procedure

The manipulation procedure of this study closely followed that used by Smith and Jeffrey (1990) with the exception that subjects were assigned to only negative or
neutral mood inductions (no positive mood induction was introduced). Also, only the depression subscale of the MAACL was used to access mood change. Subjects were contacted by telephone and invited to participate in a bogus test examining the "effects of mood on taste". They were also asked if they have any known food allergies, and only one subject was excluded for this reason. Students received experimental credits for their participation in this study. Subjects were instructed that they should not eat for two hours before their participation in the study, since prior eating might have an affect on their ability to distinguish between tastes. All experimenters remained blind to the subjects' restraint condition.

Upon arriving at the laboratory, each subject worked individually with a female experimenter. All subjects were asked to read and sign an informed consent form (Appendix D). (See also Institutional Review Board Proposal, Appendix M). Subjects were then administered a brief questionnaire which asked when and what they had last eaten, and had them rate their current hunger level on a 7-point Likert scale (Appendix E). The experimenter then explained the ostensible goal of the study: to obtain prospective consumers' opinions, under varying mood conditions, in a setting where they would not be influenced by marketing gimmicks such as advertisements, packaging, etc. Subjects were told that mood can affect subjective ratings of taste,
and that this information is valuable in market research since advertising often involves the manipulation of people's emotions.

Subjects were then asked to complete the depression subscale of the Multiple Affect Adjective Checklist (MAACL) which appears in Appendix F (Zuckerman, Lubin, Vogel & Valerius, 1964). 45 negative or neutral affect statements from the Velten (1968) mood induction (Appendix G) were then presented to the subjects on 5" X 7" cards. Negative affect statements are associated with lethargy, fatigue and sleepiness, such as "I can feel my body sagging when I walk". Neutral affect statements are benign sentences such as "Many states provide milk for grammar school children". The experimenter instructed the subjects to concentrate carefully upon each statement, feeling it as intensely as possible and trying to remember past events in their lives when they felt similar emotions. The experimenter then left the room, and a tape recorder directed subjects to go on to the next card every 15 seconds. Immediately after the mood induction was completed, the tape recording instructed subjects to complete the second MAACL questionnaire which had been left on the desk. The subjects then notified the experimenter that they were ready to participate in the "taste test".

This study used three types of commercially available crackers made by the Sunshine Company. 85 grams of HiHos,
100 grams of Heart Wheats, and 100 grams of Cheezits were measured into each of three bowls labeled A, B, and C. These amounts were used in order to present an approximately equal caloric content for each bowl. The experimenter asked subjects to taste each type of cracker, and rate them on the Cracker Taste Rating Form (Appendix I). Each subject was told that she had ten minutes to taste and rate the crackers, and that she should taste the crackers in a specified order, ostensibly to control for the effects of one taste on another. The experimenter explained that after the questionnaires were completed, the subject could feel free to help herself to any remaining crackers, but that she should not change her initial ratings. This ten minute period gave the subjects more than enough time to complete the taste test, and presumably eat additional crackers if they so desired.

After the ten minute period had passed, the experimenter returned to the room and removed the crackers from the desk. For those subjects who had received a negative mood induction, a positive mood induction of 20 statements was presented to counteract any lingering effects of depressed mood (Appendix H). Subjects were then told that because manufacturers often try to target certain types of potential customers, it was necessary to take their height and weight. After weighing and measuring the subjects, the experimenter provided the preliminary
debriefing (Appendix J). Subjects were told that they would receive additional information about the study when data collection had been completed. After subjects had been dismissed, the experimenter weighed each bowl of crackers and calculated the number of grams and calories which had been consumed (Appendix K). These values were then used as the dependent variables in the analysis. Upon completion of the data collection, a debriefing letter was mailed to each subject (Appendix L).
CHAPTER THREE

Results

A total of 497 subjects from the introductory psychology subject pool at the University of Montana were screened. 52 of these subjects were eliminated because their TFEQ-CR or RRS scores fell on the medians (10 and 14 respectively). An additional 21 subjects were eliminated because they had supplied incomplete information on their questionnaires. Of the remaining 424 subjects, 95 were screened out because their BMI (calculated from reported height and weight) fell outside the range of 19-25. Of these 95 subjects, 53 had a BMI greater than 25, while 42 had a BMI less than 19. As can be seen in Table 1, there was considerable variation in the percentage of subjects eliminated from each group due to high or low BMIs. Of the individuals in the LH group, 40.7% had BMIs greater than 25, compared to an average of only 6.9% for the other three groups. Correlation coefficients were also calculated from the screening population for all RRS and TFEQ factors and BMI scores. The correlation matrix is displayed in Table 2.

Insert Table 1 about here

Insert Table 2 about here

From the remaining 329 subjects, 110 were contacted by
telephone and ultimately participated in the study. Five of these individuals were dropped because their actual body weights were higher than reported, resulting in BMIs which exceeded the upper limit of 25. One additional subject was eliminated because she expressed considerable suspicion about the study. Data analysis was performed on data collected from the remaining 104 subjects, with 13 subjects in each of the eight conditions.

**Subject characteristics**

The participant subjects ranged in age from 17 to 43, with a mean age of 21.39, and a standard deviation of 5.79. A one-way analysis of variance (ANOVA) on age revealed no significant differences between groups with respect to age ($F(3,100) = 1.56, p > .05$). The mean BMI was 21.44 with a standard deviation of 1.72. A one-way analysis of variance on BMI revealed significant differences between groups with respect to BMI ($F(3,100) = 6.47, p < .01$). The Student-Newman-Keuls procedure showed that subjects classified as highly restrained according to the RRS had significantly higher body mass indexes than those who were classified as low in restraint on the RRS.

On average, subjects were found to under-report their weight by 5.6 percent of their actual weight. This value was calculated by first determining the difference between the subject’s actual weight and reported weight; this difference was then reported as a percentage of their actual
weight. One-way analysis of variance procedures revealed no differences between groups in subjects' tendency to under-report their weights ($F(3,100) = 0.01, p > .05$), nor in their hunger ratings ($F(3,100) = 0.11, p > .05$).

RRS scores ranged from 1 to 33, with a mean of 14.18 and a standard deviation of 6.30. TFEQ-CR scores ranged from 0 to 20 with a mean of 10.15 and a standard deviation of 4.99. As expected, one-way analysis of variance procedures revealed significant differences between groups with respect to RRS scores ($F(3,100) = 123.00, p < .01$) and TFEQ-CR scores ($F(3,100) = 138.47, p < .01$). Student-Newman-Keuls procedures for multiple comparisons indicated that all four group means differed from one another with respect to both RRS and TFEQ-CR scores.

Scores on the CD factor of the RRS ranges from 0 to 18, with a mean of 8.28 and a standard deviation of 4.04. Scores on the WF factor of the RRS ranged from 0 to 16, with a mean of 6.00 and a standard deviation of 3.62. One-way analysis of variance procedures revealed significant differences between groups with respect to both CD factor scores ($F(3,100) = 49.77, p < .01$) and WF factor scores ($F(3,100) = 38.61, p < .01$). Student Newman-Keuls procedures indicated that all four groups differed from one another with respect to the CD factor. When considering the WF factor, it was seen that those groups classified as highly restrained according to the RRS had significantly
higher WF scores than those who were classified as low in restraint on the RRS (LH & HH > HL & LL).

Scores on the TFEQ-DI ranged from 0 to 15, with a mean of 6.04 and a standard deviation of 3.79. TFEQ-HS scores ranged from 0 to 15, with a mean of 5.44 and a standard deviation of 3.16. One-way analysis of variance procedures revealed significant differences between groups with respect to TFEQ-DI scores ($F(3,100) = 22.94, p < .01$) and TFEQ-HS scores ($F(3,100) = 6.36, p < .01$). Student Newman-Keuls procedures indicated that groups which were highly restrained according to the RRS had significantly higher TFEQ-DI and TFEQ-HS scores than those groups which were low in restraint according to the RRS. Participant subject characteristics are summarized in Table 3.

---

**Manipulation check**

To determine the effectiveness of the mood manipulation, a repeated measures ANOVA (Mood X Time) was conducted on the pre- and post-manipulation scores from the MAACL. Mean MAACL scores for the two mood conditions appear in Table 4.
Significant main effects were found for mood condition ($F(1,102) = 19.94, p < .01$), and time ($F(1,102) = 90.11, p < .01$) indicating that MAACL scores varied as a result of mood condition as well as time. In addition, there was a significant Mood condition X time interaction ($F(1,102) = 76.09, p < .01$) with subjects in the negative mood condition obtaining much higher (more depressed) MAACL scores than those in the neutral mood condition at the post-manipulation measurement. The analysis of variance table appears in Table 5. Figure 2 depicts the change in MAACL depression scores for the two mood conditions as a function of time.

---

**Insert Table 5 about here**

---

**Insert Figure 2 about here**

---

**Food Consumption**

The mean number of grams consumed by each group is displayed in Table 6. In both the neutral and negative mood conditions, the greatest amount of crackers was consumed by the HH group (an mean of 45.69 grams and 40.31 grams, respectively). However, a 2x2x2 analysis of variance (RRS x TFEQ-CR x Mood) using grams as the dependent variable demonstrated no significant main effects or interactions. The analysis of variance table appears in Table 7.
A separate 2x2x2 analysis of variance (RRS x TFEQ-CR x Mood) was performed using calories of crackers consumed as the dependent variable, and no significant main effects or interactions were revealed. This analysis of variance table appears in Table 8.

Stepwise regression analyses were performed on the grams of crackers consumed to determine which variables were the best predictors of consumption. Irrespective of mood condition, cracker consumption was best predicted by the subjects' subjective level of hunger (R Squared = 14.52%, $F(1,102) = 17.32, p < .01$). Although not entered in the first equation, the CD factor from the RRS was very nearly significant, and when CD was added to the equation, R-Square was increased by 3% ($R^2 = 17.57\%$, $F(2,101) = 10.76, p < .01$).

Additional stepwise regression analyses were performed on data from each of the two mood conditions. In the neutral mood condition, cracker consumption was not
predicted at a significant level by any of the predictor variables. In the negative mood condition, cracker consumption was again predicted by subjective level of hunger ($R^2 = 24.3\%$, $F(1,50) = 16.05$, $p < .01$).

Stepwise regression analyses were also performed using calories consumed as the dependent variable. Only the subjects' subjective level of hunger was a significant predictor of calorie consumption ($R^2 = 13.93\%$, $F(1,102) = 16.51$, $p < .01$).
Table 1

Screening Subjects Body Mass Index (BMI) Characteristics by Group

<table>
<thead>
<tr>
<th>Group</th>
<th>LH</th>
<th>HL</th>
<th>LL</th>
<th>HH</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number in group</td>
<td>59</td>
<td>45</td>
<td>154</td>
<td>166</td>
<td>424</td>
</tr>
<tr>
<td>% BMI too high</td>
<td>40.7%</td>
<td>4.0%</td>
<td>6.5%</td>
<td>10.2%</td>
<td>12.5%</td>
</tr>
<tr>
<td>% BMI too low</td>
<td>3.4%</td>
<td>13.0%</td>
<td>14.9%</td>
<td>6.6%</td>
<td>9.9%</td>
</tr>
<tr>
<td>BMI Mean SD</td>
<td>24.22 ± 4.95</td>
<td>20.92 ± 2.60</td>
<td>20.76 ± 2.36</td>
<td>22.03 ± 2.82</td>
<td>22.01 ± 3.45</td>
</tr>
</tbody>
</table>

Note: LH = low restraint on TFEQ-CR, high restraint on RRS
HL = high restraint on TFEQ-CR, low restraint on RRS
LL = low restraint on TFEQ-CR, low restraint on RRS
HH = high restraint on TFEQ-CR, high restraint on RRS

Table 2

Correlation Matrix between RRS factors, TFEQ factors, and BMI from Screening Subjects

<table>
<thead>
<tr>
<th></th>
<th>F1</th>
<th>F2</th>
<th>F3</th>
<th>CD</th>
<th>WF</th>
<th>RRS</th>
<th>BMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>1.00</td>
<td>.229**</td>
<td>.031</td>
<td>.703**</td>
<td>.240**</td>
<td>.590**</td>
<td>-.008</td>
</tr>
<tr>
<td>F2</td>
<td>.229**</td>
<td>1.00</td>
<td>.539**</td>
<td>.541**</td>
<td>.472**</td>
<td>.606**</td>
<td>.231**</td>
</tr>
<tr>
<td>F3</td>
<td>.031</td>
<td>.539**</td>
<td>1.00</td>
<td>.301**</td>
<td>.162**</td>
<td>.281**</td>
<td>.033</td>
</tr>
<tr>
<td>CD</td>
<td>.703**</td>
<td>.541**</td>
<td>.301**</td>
<td>1.00</td>
<td>.395**</td>
<td>.870**</td>
<td>.151*</td>
</tr>
<tr>
<td>WF</td>
<td>.240**</td>
<td>.472**</td>
<td>.162**</td>
<td>.395**</td>
<td>1.00</td>
<td>.790**</td>
<td>.388**</td>
</tr>
<tr>
<td>RRS</td>
<td>.590**</td>
<td>.606**</td>
<td>.281**</td>
<td>.870**</td>
<td>.790**</td>
<td>1.00</td>
<td>.306**</td>
</tr>
<tr>
<td>BMI</td>
<td>-.008</td>
<td>.231**</td>
<td>.033</td>
<td>.151</td>
<td>.388**</td>
<td>.306**</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Note: F1=TFEQ-CR, F2=TFEQ-DI, F3=TFEQ-HS, RRS=Revised Restraint Scale, CD=Concern for Dieting factor of RRS, WF=Weight Fluctuation factor of RRS, BMI=Body Mass Index.
*p < .05, **p < .01 (two-tailed)
<table>
<thead>
<tr>
<th>Group</th>
<th>LH</th>
<th>HL</th>
<th>LL</th>
<th>HH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>22.88(a)</td>
<td>19.85(a)</td>
<td>22.23(a)</td>
<td>20.62(a)</td>
</tr>
<tr>
<td>Mean</td>
<td>22.16(a)</td>
<td>20.85(b)</td>
<td>20.66(b)</td>
<td>22.09(a)</td>
</tr>
<tr>
<td>SD</td>
<td>7.32</td>
<td>3.11</td>
<td>6.08</td>
<td>5.62</td>
</tr>
<tr>
<td>BMI</td>
<td>2.05</td>
<td>1.21</td>
<td>1.40</td>
<td>1.60</td>
</tr>
<tr>
<td>Percent of actual weight</td>
<td>5.53(a)</td>
<td>5.54(a)</td>
<td>5.58(a)</td>
<td>5.75(a)</td>
</tr>
<tr>
<td>under-reported</td>
<td>5.63</td>
<td>4.11</td>
<td>5.41</td>
<td>5.33</td>
</tr>
<tr>
<td>Hunger rating</td>
<td>3.77(a)</td>
<td>3.96(a)</td>
<td>3.81(a)</td>
<td>3.73(a)</td>
</tr>
<tr>
<td>Mean</td>
<td>1.40</td>
<td>1.68</td>
<td>1.44</td>
<td>1.77</td>
</tr>
<tr>
<td>RRS total score</td>
<td>17.92(a)</td>
<td>10.35(b)</td>
<td>7.35(c)</td>
<td>21.11(d)</td>
</tr>
<tr>
<td>Mean</td>
<td>2.40</td>
<td>2.30</td>
<td>2.62</td>
<td>4.11</td>
</tr>
<tr>
<td>CD factor</td>
<td>8.92(a)</td>
<td>6.81(b)</td>
<td>4.46(c)</td>
<td>12.92(d)</td>
</tr>
<tr>
<td>Mean</td>
<td>2.80</td>
<td>1.79</td>
<td>2.86</td>
<td>2.78</td>
</tr>
<tr>
<td>WF factor</td>
<td>9.00(a)</td>
<td>3.92(b)</td>
<td>2.88(b)</td>
<td>8.19(a)</td>
</tr>
<tr>
<td>Mean</td>
<td>2.00</td>
<td>3.17</td>
<td>1.86</td>
<td>2.73</td>
</tr>
<tr>
<td>TFEQ-CR</td>
<td>6.92(a)</td>
<td>13.42(b)</td>
<td>4.73(c)</td>
<td>15.54(d)</td>
</tr>
<tr>
<td>Mean</td>
<td>2.19</td>
<td>2.21</td>
<td>2.55</td>
<td>1.92</td>
</tr>
<tr>
<td>TFEQ-DI</td>
<td>8.88(a)</td>
<td>3.23(b)</td>
<td>4.11(b)</td>
<td>7.92(a)</td>
</tr>
<tr>
<td>Mean</td>
<td>3.72</td>
<td>1.75</td>
<td>2.67</td>
<td>3.32</td>
</tr>
<tr>
<td>TFEQ-HS</td>
<td>6.12(a)</td>
<td>3.69(b)</td>
<td>4.92(b)</td>
<td>7.04(a)</td>
</tr>
<tr>
<td>Mean</td>
<td>3.26</td>
<td>2.05</td>
<td>2.67</td>
<td>3.54</td>
</tr>
</tbody>
</table>

Note: Groups are denoted as either low or high as classified by TFEQ-CR/RRS scores; for example, LH=low TFEQ-CR/high RRS. Different subscripts within each subscale indicate means which differ significantly from each other.
Table 4

Mean MAACL scores for each mood condition before and after mood induction

<table>
<thead>
<tr>
<th>Mood Condition</th>
<th>Pre-manipulation</th>
<th>Post-manipulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative</td>
<td>Mean 10.98</td>
<td>Mean 24.64</td>
</tr>
<tr>
<td></td>
<td>SD 5.49</td>
<td>SD 6.66</td>
</tr>
<tr>
<td>Neutral</td>
<td>Mean 12.90</td>
<td>Mean 13.48</td>
</tr>
<tr>
<td></td>
<td>SD 7.26</td>
<td>SD 6.50</td>
</tr>
</tbody>
</table>

Table 5

Analysis of variance table for 2 x 2 (Mood Condition X Time) ANOVA

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>MS</th>
<th>DF</th>
<th>Error term</th>
<th>F ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mood</td>
<td>1107.69</td>
<td>1107.69</td>
<td>1</td>
<td>1</td>
<td>19.94 ***</td>
</tr>
<tr>
<td>Time</td>
<td>2632.69</td>
<td>2632.69</td>
<td>1</td>
<td>2</td>
<td>90.11 ***</td>
</tr>
<tr>
<td>M X T</td>
<td>2223.08</td>
<td>2223.08</td>
<td>1</td>
<td>2</td>
<td>76.09 ***</td>
</tr>
<tr>
<td>Error 1</td>
<td>5666.31</td>
<td>55.55</td>
<td>102</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Error 2</td>
<td>2980.23</td>
<td>29.22</td>
<td>102</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*** p < .001
### Table 6

Mean grams crackers consumed as a function of mood condition

<table>
<thead>
<tr>
<th>MOOD CONDITION</th>
<th>GROUP</th>
<th>LH</th>
<th>HL</th>
<th>LL</th>
<th>HH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neutral mood</td>
<td>Mean</td>
<td>30.08</td>
<td>37.38</td>
<td>33.92</td>
<td>45.69</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>12.53</td>
<td>27.13</td>
<td>20.75</td>
<td>22.09</td>
</tr>
<tr>
<td>Negative mood</td>
<td>Mean</td>
<td>36.54</td>
<td>39.85</td>
<td>35.62</td>
<td>40.31</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>23.09</td>
<td>25.99</td>
<td>21.74</td>
<td>23.87</td>
</tr>
</tbody>
</table>

Note: LH = low restraint on TFEQ-CR, high restraint on RRS
HL = high restraint on TFEQ-CR, low restraint on RRS
LL = low restraint on TFEQ-CR, low restraint on RRS
HH = high restraint on TFEQ-CR, high restraint on RRS

### Table 7

Analysis of variance table for 2x2x2 (RRS X TFEQ-CR X MOOD) ANOVA using grams as the dependent variable

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>MS</th>
<th>DF</th>
<th>F ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>RRS</td>
<td>55.54</td>
<td>55.54</td>
<td>1</td>
<td>.109</td>
</tr>
<tr>
<td>F1 (TFEQ)</td>
<td>1191.39</td>
<td>1191.39</td>
<td>1</td>
<td>2.346</td>
</tr>
<tr>
<td>MOOD</td>
<td>44.46</td>
<td>44.46</td>
<td>1</td>
<td>.088</td>
</tr>
<tr>
<td>RRS X F1</td>
<td>222.15</td>
<td>222.15</td>
<td>1</td>
<td>.438</td>
</tr>
<tr>
<td>RRS X MOOD</td>
<td>15.39</td>
<td>15.39</td>
<td>1</td>
<td>.030</td>
</tr>
<tr>
<td>F1 X MOOD</td>
<td>199.39</td>
<td>199.39</td>
<td>1</td>
<td>.393</td>
</tr>
<tr>
<td>RRS X F1 X MOOD</td>
<td>258.62</td>
<td>258.62</td>
<td>1</td>
<td>.509</td>
</tr>
<tr>
<td>Error</td>
<td>48746.42</td>
<td>507.78</td>
<td>96</td>
<td></td>
</tr>
</tbody>
</table>
Table 8
Analysis of variance table for 2x2x2 (RRS X TFEQ-CR X MOOD) ANOVA using calories as the dependent variable

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>MS</th>
<th>DF</th>
<th>F ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>RRS</td>
<td>1929.85</td>
<td>1929.85</td>
<td>1</td>
<td>.141</td>
</tr>
<tr>
<td>F1</td>
<td>27332.65</td>
<td>27332.65</td>
<td>1</td>
<td>2.002</td>
</tr>
<tr>
<td>MOOD</td>
<td>2233.89</td>
<td>2233.89</td>
<td>1</td>
<td>.164</td>
</tr>
<tr>
<td>RRS X F1</td>
<td>3256.96</td>
<td>3256.96</td>
<td>1</td>
<td>.239</td>
</tr>
<tr>
<td>RRS X MOOD</td>
<td>4.65</td>
<td>4.65</td>
<td>1</td>
<td>.000</td>
</tr>
<tr>
<td>F1 X MOOD</td>
<td>7045.54</td>
<td>7045.54</td>
<td>1</td>
<td>.516</td>
</tr>
<tr>
<td>RRSXF1XMOOD</td>
<td>9769.85</td>
<td>9768.85</td>
<td>1</td>
<td>.716</td>
</tr>
<tr>
<td>Error</td>
<td>1310385.07</td>
<td>13649.84</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
**Figure 1.** 2x2x2 Factorial design (RRS x TFEQ-CR x Mood).

Note: n = 13 subjects per cell

RRS - Revised Restraint Scale

TFEQ-CR - Three Factor Eating Questionnaire-Cognitive Restraint

H - High Restraint

L - Low Restraint

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Figure 2. MAACL depression scale scores pre and post mood manipulation.
CHAPTER FOUR
Discussion

Conflicting results have been obtained regarding the disinhibition of restrained subjects identified with the Revised Restraint Scale (RRS) and those identified with the Cognitive Restraint scale of the Three Factor Eating Questionnaire (TFEQ-CR). In light of this, it has been suggested by Heatherton, et al. (1988) that the RRS may identify "typical dieters" (who are not usually successful), while the TFEQ-CR may identify subjects who are successful in caloric restriction (and are therefore not "typical dieters"). The present study hypothesized that those subjects identified as restrained by the RRS would experience disinhibition of restraint following a dysphoric mood induction, while subjects identified as restrained by the TFEQ-CR would not. To test this hypothesis, subjects were classified into four groups according to their restraint scores after a median split: high on both scales (HH); low on both scales (LL); low on the TFEQ-CR and high on the RRS (LH); or high on the TFEQ-CR and low on the RRS (HL). It was expected that following a dysphoric mood induction those subjects in the LH group would eat more than those in the HL group. Subjects in the LH negative mood group were also expected to eat more than their LH neutral mood counterparts.

Quite contrary to expectations, the analysis of
variance (RRS X TFEQ-CR X MOOD) was nonsignificant for all main effects and interactions. These results indicate that there were no significant differences between groups in the amount of crackers consumed, regardless of the subjects' restraint or mood status. This was somewhat surprising since a similar study performed at the same institution did find disinhibition of restrained subjects as identified by the RRS following a negative mood induction (Smith and Jeffrey, 1990). Also contrary to expectation, the stepwise regression analysis revealed that neither of the scales used to measure restraint, nor any of their subscales was a predictor of eating behavior. The subjects' subjective level of hunger appears to have been the best predictor of eating behavior in this study.

There are many possible explanations, both methodological and theoretical, which could account for these unexpected findings. The following discussion will first present several possible methodological explanations for the results obtained. Recent theoretical concerns regarding the construct of restraint will be examined, and a new three-factor theory of dieting behavior will be presented. Finally, the results from the current study will be re-evaluated in light of this new theory.

Methodological issues

One possible explanation for lack of disinhibition would be an inadequate mood manipulation. Obviously, if no
dysphoria was induced, restrained subjects would not be expected to disinhibit according to restraint theory. A check on the manipulation in this study revealed, however, that the mood induction was quite successful. Subjects in the negative mood group were found to be significantly more depressed that those in the neutral group following the manipulation.

Other methodological issues involve the palatability and freshness of the crackers, the amount of crackers made available, and the time of day during which the study occurred. Ruderman (1986) also reviews some of the factors found to account for restrained eaters appropriate regulation (eg. eating less) under some conditions. These include self-monitoring, social influence, and situational demands. Each of these factors will be addressed below.

The types of crackers selected for this study were three brands which could be purchased in bulk at a local discount store. Because previous studies did not identify the specific types of crackers used, it is not known how closely the food items in this study matched those of previous research. While it is possible that the types of crackers used in this investigation were simply not as appealing as those used in previous studies, this is not believed to be a likely explanation. Subjects were presented with three bowls each containing a different type of cracker, so that even if they did not care for one
particular type, there were others to choose from.

Another possibility is that some of the crackers could have become stale over time, and therefore less desirable. Efforts were made, however, to guard against this. Bags containing the crackers were kept tightly sealed, and the experimenters, who were asked to periodically sample the crackers to monitor their freshness, consistently reported that the food was sufficiently fresh and appealing.

Weber et al. (1988) conducted a study using the RRS in which subjects received a milkshake preload and then participated in a potato chip "taste test". Contrary to expectation, all subjects in the preload condition regulated their eating by consuming fewer potato chips. This is one of the few studies using the RRS in which the typical counterregulatory pattern was not observed. Two of the possible explanation cited by the authors were the possible reluctance of individuals to eat potato chips in the morning, and the limited amount of the target food.

In the current study, appointments to meet subjects are the laboratory were made during the morning hours as well as in the afternoon in order to accommodate the number of subjects involved. As Weber et al. (1988) pointed out, the reluctance of the subjects to eat snack foods such as crackers or potato chips in the morning is one possible explanation for reduced food consumption. However, even if this was a factor, it would have affected all subjects from
the morning, across all groups, and therefore should not have had a differential effect on only restrained subjects. A conscious effort was also made in this study to present subjects with a generous amount of crackers so that the supply would appear plentiful and overeating would not appear obvious to the experimenters. This should have helped to reduce or eliminate any effects of self-monitoring or social influence on the subjects eating behavior.

Research which examines eating behavior requires some type of cover-story paradigm such as the one used in this study so that the subjects are not aware of the variables being measured. Because of this, there is always the possibility that the cover-story was not adequate, or that subjects somehow developed suspicions about the true purpose of the study. Lack of adequate deception in the study would be very likely to have an effect of eating behavior, as subjects would be likely to curtail their eating due to self-monitoring and/or social influences. In the current study great care was taken to provide a believable cover-story, as well as to limit the amount of information divulged to subjects until data collection was complete. At the end of each manipulation, the subject was given a preliminary debriefing, and told that she would be provided with additional information at a later date. This should have eliminated the possibility that subjects would talk among themselves, sometimes revealing the true purpose of
the study to potential subjects. However, because similar studies have been undertaken at the same institution in the recent past, there is always the possibility (although quite unlikely) that some individuals were aware of variables of interest.

Specifically to avoid creating an atmosphere of deception, subjects were not asked if they had heard anything about the study, or if they had any suspicions about its true purpose. As a result, no data are available to assess whether or not subjects believed the cover-story. One subject did overtly ask the experimenter if the research involved eating disorders, and as a result her data was excluded from the analysis.

While the possibilities cited above cannot be completely ruled out, it appears that none of them are very likely explanations for the subjects' eating behavior. Attention will be turned now towards other considerations which may have accounted for these results.

The current research was modelled very closely after a similar study by Smith and Jeffrey (1990) at the same institution. The main difference between these two studies occurred in the way that subjects were assigned to groups. Smith and Jeffrey (1990) identified subjects as either high or low in restraint using the traditional median split method with the RRS. The current study utilized both the RRS and the TFEQ-CR to identify subjects' level of
restraint. This resulted in four groups of subjects: high on both scales (HH); low on both scales (LL); low on the TFEQ-CR and high on the RRS (LH); or high on the TFEQ-CR and low on the RRS (HL). As discussed earlier, the RRS and the TFEQ-CR were correlated at $r = .59$ in this study. This resulted in a greater number of screening subjects who fell at either end of the distribution, as either LL or HH (154 and 166 individuals, respectively). Far fewer subjects fell into the cells which were crossed as LH and HL (59 and 45 individuals, respectively). This distribution of subjects also resulted in lower "high" restraint scores for those persons who were in the LH and HL groups. This finding was clearly illustrated in the analyses of variance performed on RRS and TFEQ-CR scores (see Table 3). Mean scores for both scales were found to be significantly different for all four groups, and subjects in the LH and HL groups had lower "high" restraint scores than those subjects classified as HH. Smith and Jeffrey (1990) reported a mean RRS score of 19.61 for restrained subjects, and a mean RRS score of 9.63 for unrestrained individuals. When comparing these scores to those from the current study, it is seen that subjects in the LH group had a lower "high" RRS score (17.92). Likewise, subjects in the HL group also had a higher "low" RRS score (10.35) than that reported by Smith et al. (1990).

To summarize this last point, it appears that subjects in the LH and HL groups had restraint scores on both scales.
which fell closer to the median than did those subjects in the LL or HH groups. This occurred as a natural result of the distribution of these two correlated scales. It is possible then, that because these subjects were not as high nor as low in restraint as their LL and HH counterparts, the disinhibitory effect of the mood manipulation was attenuated for these two groups. As for the remaining two groups, subjects in the LL group were not expected to eat more after the mood induction, as they were considered low in restraint by both scales. Expected results for the HH group were rather dubious, since these subjects are highly restrained according to the RRS, but could also be considered "successful dieters" who limit their intake according to the TFEQ-CR. Therefore it was suggested that these individuals might not experience disinhibition due to a "cancellation effect" of the two scales. Taken together, these considerations could account for the fact that none of the groups exhibited disinhibited eating behavior regardless of restraint status or mood condition.

Stepwise regression analysis also indicated that none of the restraint or disinhibition factors were successful predictors of eating behavior in the laboratory. Only the subjects' subjective level of hunger emerged as a significant predictor of eating behavior; thus it simply appears that subjects ate slightly more if they were hungry, and ate slightly less if they were not hungry. The analysis
of variance on subjects' subjective hunger ratings revealed no differences in hunger ratings across groups, and since hunger rating was the only significant predictor of eating behavior, it follows logically that there would be no significant differences between groups in the amount eaten.

One additional finding, which may ultimately be the most relevant to this study, remains to be discussed. As can be seen in Table 1, a striking difference between groups was noticed early on, as screening subjects were assigned on the basis of RRS and TFEQ-CR scores. When compared to the other three groups, a far greater percentage of screening subjects in the LH group had BMIs of over 25, and were therefore excluded from participating in the study. (Recall that to avoid including overweight subjects, for which the validity of the RRS has been questioned, only those subjects with a BMI between 19 and 25 were included as participants.) When the BMI restrictions were applied, over 40 percent of subjects in the LH groups were excluded because of high BMIs; in the other three groups, only between four and ten percent were excluded for this reason. This provides evidence that those subjects who are classified as low in restraint by the TFEQ-CR and high in restraint by the RRS are typically more overweight (have higher BMIs) than other subjects. While the LH group did not show a tendency to eat more in the laboratory after a negative mood induction, their higher BMIs suggest that these individuals may eat
more in naturalistic settings. This finding supports the suggestion made by Heatherton et al. (1988) that the TFEQ-CR identifies successful dieters, while the RRS identifies the more typical dieters who are not successful. If we can assume from this that an individual scoring low on the TFEQ-CR but high on the RRS is a typical "unsuccessful dieter", then it follows that this group would be more overweight, just as was found in screening subjects for this study.

A related consideration, and a concern raised by many researchers, is that restraint may be confounded with percent overweight and weight fluctuation in the RRS. A review of Table 3 reveals that significant differences were found between groups with respect to BMI, RRS-WF, TFEQ-DI, and TFEQ-HS when groups were divided according to total RRS score. However, these differences did not appear to be dependent on TFEQ-CR classification. In other words, those groups consisting of high scorers on the RRS were also significantly higher on measures of BMI, RRS-WF, TFEQ-DI and TFEQ-HS, regardless of their TFEQ-CR status. Additionally, as seen in Table 2, BMI was positively correlated with RRS and WF (.306 and .388 respectively), but was negatively correlated (-.008) with the TFEQ-CR. Other researchers have also consistently noted that the RRS tends to select more overweight individuals as restrained (Klem, Klesges, Bene & Mellon, 1990; Ruderman, 1986; Smith & Jeffrey, 1990). These findings suggest that restraint, weight fluctuation,
disinhibition, and percent overweight may be confounded within the RRS, but not within the TFEQ-CR.

Theoretical issues

The previous discussion has focused primarily on several methodological explanations which could account for the lack of disinhibited eating among restrained eaters in the laboratory. Such disinhibited eating was predicted according to the classic restraint theory of Herman and Polivy (1980). In recent years a growing number of studies have produced results which are not congruent with this model, and researchers have begun to ask if restraint theory, although useful for over a decade, may be too global to account for the varying degrees of control and disinhibition in eating. Some of these considerations will now be presented.

In spite of the possible causal link between restrained eating and the development of eating disordered behavior, there is some evidence that a subgroup of restrained eaters manages to be successful dieters without the development of problematic eating behavior. Lowe and Kleifield (1988) identified a group of restrained eaters who maintained their body weight at a level under their previous weight. These "weight suppressors" appear to be successful dieters, and they did not counter-regulate after a preload in a laboratory experiment. Westenhoefer et al. (1990) cited a previous study in which they compared frequency of dieting
behavior and the percentage of women reporting problems in eating behavior in a representative sample of 1000 West German women. They found that a lower percentage of women with a more permanent dieting behavior experienced eating related problems than those women who dieted intermittently. The problem behaviors reported by intermittent dieters included craving for sweets, binge eating, and eating under conditions of stress. Westenhoefer et al. (1990) also examined restrained eaters as identified by the TFEQ and found that even in highly restrained groups there were a substantial number of subjects with very low as well as very high scores on the disinhibition scale.

An initial hypothesis of the current study was that different restraint scales may be measuring different components of the restraint construct, and that certain scales were better predictors of disinhibited eating than others. The recent findings of Westenhoefer et al. (1990) expand this even further by demonstrating that even within a single restraint scale, levels of disinhibition may vary widely. Westenhoefer et al. (1990) conclude that restrained eaters are not a homogeneous group, and restraint does not appear to be a sufficient condition for the development of disturbed eating behavior, even if it is a necessary condition.

Westenhoefer (1991) went on to propose that different types of behavioral strategies may be employed by restrained
eaters in their attempt to restrict food intake, and that these differing strategies may vary in their effectiveness and in their potential for promoting problem eating behaviors. To investigate this hypothesis he conducted a study with 54,525 participants in a training program for weight reduction. The TFEQ was used to examine whether there are distinct types of restrained eating behavior, one associated with low disinhibition (successful restriction of food intake) and one associated with high disinhibition (unsuccessful restriction of food intake). Using subjects with a moderately high score on the TFEQ-CR scale, a discriminant analysis was computed with low vs. high disinhibition as criterion variable, and the restraint items as discriminating variables. There was one significant discriminant function which correctly classified 81.98% of the participants as having low or high disinhibition. (This high discriminating power was also replicated in a validation sample.) The results showed the following variables to be associated with high disinhibition: frequent dieting, counting calories, avoidance of tempting food, the use of low calorie foods, feelings of guilt about overeating, and an exaggerated importance attached to weight fluctuations. Low disinhibition was associated with a more flexible control of eating which included stopping eating, holding back at meals, eating slowly, compensating for "unallowed foods", general consciousness about food and
figure, and taking small helpings. Westenhoefer (1991) then used this information to construct to ad hoc scales called "rigid control" and "flexible control" which he applied to the whole sample. He found that increasing rigid control is associated with increasing disinhibition while increasing flexible control is associated with decreasing disinhibition. He concluded that these results clearly indicate that restraint is not a homogeneous construct, at least with regard to disinhibition of control, and suggested that restraint should be divided into at least two different sets of behaviors and cognitions which account for the differing constructs of rigid versus flexible control. Finally, the author called for future research to view the construct of restraint in a much more differentiated and sophisticated way.

This call appears to have been recently answered in a contemporary article by Lowe (1993). In an extensive review and critique of restraint theory, this author goes on to present a new "three-factor model" of dieting behavior. The three factors - frequency of dieting and overeating, current dieting, and weight suppression - are then embedded within a three-dimensional grid that also takes into account the influence of weight status and the mechanisms mediating the effects of dieting. Lowe uses the three-factor model to reinterpret findings consistent with traditional restraint theory, as well as to explain many findings which are
inconsistent with restraint theory. A brief review of the three-factor model will be presented, and the ways in which this new theory relates to findings from the current study will be discussed.

In his initial critique, Lowe (1993) discusses some of the research findings which are inconsistent with traditional restraint theory. One of these is the cognitive component described in Herman and Polivy’s (1984) boundary model. According to this theory, restrained eaters are thought to impose a "diet boundary" which consists of cognitive rules for limiting caloric intake. Questions arise, however, when the other measures of restraint are considered. Studies using the TFEQ and the DEBQ have shown that restrained eaters identified by these scales are also concerned about their weight and caloric intake (i.e. are cognitively restrained) yet they do not appear to be susceptible to the anomalies in eating shown by restrained eaters as identified on the Restraint Scale.

Lowe (1993) cites a study by Jansen, Merckelbach, Oosteriaan, Tuiten, and van den Hout (1988) which attempted a more direct test of the boundary model’s cognitive theory. In this study, restrained and unrestrained subjects were asked to verbalize their "self-talk" as they ate ice cream, and then rate the frequency of 25 disinhibitory thoughts after the taste test was over. Although the typical Restraint X Preload interaction was found for ice cream
consumption, no significant Restraint X Preload interactions were found for any of the 26 measures of disinhibitory thinking. These findings suggest that cognitive restraint alone cannot adequately explain the eating behavior of restrained eaters.

Other questions regarding restraint theory were raised in a study by Lowe, Whitlow, and Bellwoar (1991) which examined the common assumption that "restrained eating" and "dieting" are synonymous terms. By asking subjects if they were "currently on a diet to lose weight", three groups were formed: unrestrained nondieters, restrained nondieters, and restrained dieters. As in previous studies, it was found that restrained nondieters tended to eat more after a preload. However, restrained dieters showed the opposite pattern; they ate significantly more than restrained nondieters in the no-preload condition and sharply reduced their intake in the preload condition. This finding was also later replicated at a different university setting.

Lowe (1993) also mentions other studies that have supported the conclusion that restraint and dieting are not synonymous. Most relevant to the current discussion is the research by Eldredge (1993) which examined food consumption of dieters and nondieters following negative affect manipulation. A significant Dieting X Mood interaction was found. Nondieters ate the same amount regardless of their mood, but the dysphoric dieters ate significantly less than
did nondysphoric dieters. This provides evidence that dieters may exhibit eating behaviors which are quite different from those of restrained eaters.

Lowe (1993) describes traditional restraint theory as a unifactorial model of dieting behavior which has assumed that the behavioral effects associated with dieting could be captured by studying restrained eaters. He goes on to assert that the difficulties encountered by restraint theory have occurred because it has not clearly distinguished between chronic and acute dieting. For example, Heatherton et al. (1988) emphasized the chronic pattern of dieting exhibited by the restrained eater; that is, restrained eaters have dieted and failed many times. Herman and Polivy's (1984) boundary model, however, describes restrained eaters as being in a state of "intense caloric restriction". Lowe (1993) contends that the fundamental disjunction in restraint theory stems from the fact that researchers have been conducting studies which actually assess chronic dieting, but the effects of such behavior are attributed to the restrained eaters' current dieting. He points out that if a distinction is made between dieting frequently in the past and current dieting, then dieting behavior could affect eating either because of the accumulated effects of past cycles, and/or because of the current impact of a diet in progress. This distinction provides the basis for the first two factors of Lowe's
three-factor model. He asserts that past dieting and current dieting are functionally different, (i.e., they have different effects on eating behavior), and then goes on to cites what he calls a "critical mass" of research to support this contention.

Attention will now be turned to the specific components of Lowe's three-factor model of dieting behavior. The first factor, frequency of dieting and overeating, is defined as the extent of past cycles of dieting and subsequent overeating. Such cycles might involve actual changes in weight loss and weight gain, or might be more of a chaotic eating pattern which occurs without meaningful weight changes. According to the three-factor model, the counterregulatory and disinhibited overeating shown by the restrained eaters of the RRS are the same phenomena to be explained by the frequency of dieting and overeating factor. (Note that in this section "restrained eaters" will refer only to those identified by the RRS.) Lowe (1993) also asserts that frequent dieting and overeating play a causal role in disinhibition. In this point he is in agreement with Herman and Polivy and many other investigators who have suggested that dieting causes overeating. The difference is that Lowe (1993) asserts that the restrained eaters' vulnerability to overeating is directly related to their history of dieting and overeating rather than their current state of cognitive or dietary restraint. Lowe (1993)
accounts for the counterregulatory eating typical of restrained eaters by noting Herman and Polivy's observation that these subjects appear to be much more sensitive to external guides suggesting whether or how much to eat. He proposes that because restrained eaters are more sensitive to external cues, and because the preloads convey information about the kind of eating deemed appropriate, the restrained eater is more likely to overeat in these situations. He goes on to suggest that this postulate could replace the notion of a cognitive diet boundary to account for counterregulatory eating.

Lowe (1993) also proposes that frequent dieting and overeating could account for restrained eaters' susceptibility to negative-affect eating, or disinhibition. Restrained eaters, who have repeatedly dieted and failed at dieting, have acquired an extensive history of associating negative affect with overeating. For restrained eaters, this association between emotional upset and overeating is actually opposite to the typical response seen with nondieters. That is, the normal response to distress is actually one of reduced eating, presumably because of the innate effects of stress on the autonomic nervous system. However, in chronic dieters, the frequent past pairings of emotional distress and overeating could result in a classically conditioned response in which negative affect is transformed from an unconditioned stimulus for reduced eating.
eating into conditioned stimulons for increased eating in these individuals.

The second factor in the model, current dieting, refers to a current effort to reduce caloric intake to lose weight. Measurable weight loss is not necessarily a part of this definition; the eating behavior of individuals who are dieting to lose weight could be caused by cognitive aspects of dieting, biological aspects, or both. Most dieters have tried and failed in the past, and therefore would be classified as restrained on the Restraint Scale. However, the opposite is not always true; restrained eaters are not necessarily current dieters. Lowe et al. (1991) found that only 37% of normal-weight restrained eaters reported that they were currently dieting to lose weight, and other researchers have reported even lower percentages. Lowe cites several studies illustrating the distinction in the effects of eating behaviors between restrained eating and current dieting. These include differing effects on salivation, sweetness preference, and food intake. Research also suggests that dieters may eat more under conditions in which eating control is not challenged (such as food simply made available), but will eat less when control is challenged (such as after a preload). The previously cited studies by Lowe et al. (1991) and Eldredge (1993) in which preloaded or dysphoric dieters reduced their food intake are two examples of this evidence. Lowe (1993) concludes that
the control of eating exhibited by dieters can be most plausibly attributed to the cognitive effects of such situations. In other words, the current dieters appear to be on guard against clear threats to their eating restrictions. An external dietary threat may have the specific effect of "focusing the dieter's attention" on his or her weight-loss goals and the need to resist the temptation to eat.

This model also assumes that current dieters become more vulnerable to negative-affect eating as the diet progresses. Lowe (1993) cites a study by LaPorte (1990) in support of this. LaPorte studied the relation between mood and eating among 68 individuals put on a liquid diet. Measurements were taken weekly to assess mood and any food eaten, and correlations between the two were calculated. During the first 7 weeks of the diet only 4 of the 21 correlations were significant (14%), however, 7 of 9 correlations were significant during the final 3 weeks (78%). This was attributed to a "fatiguing effect" of dieting, that is, an increase in vulnerability to the disrupting effects of anxiety and emotion-related events.

The third factor in Lowe's three factor model, weight suppression, refers to a significant diet-induced weight loss that is sustained for a lengthy period of time (e.g., one year or more). Evidence has accumulated over the past few years that weight suppression is associated with eating
behaviors which are different from those associated with frequent dieting and overeating or with current dieting. Two studies mentioned earlier (Lowe and Kleifield, 1988; Westenhoefer, et al., 1990) as well as others are cited by Lowe (1993) in support of this distinction. The overall results of these studies suggest that weight suppression is associated with appetitive reactions that enhance weight control. These include reduced eating, lack of hunger, and sweetness aversion.

The interactions between the frequency of dieting and overeating (Factor 1) and current dieting (Factor 2) are a vital part of Lowe's model. As he notes, at first impression it may appear that the two factors involve assumptions that are contradictory. The first assumption is that repeated bouts of dieting and overeating result in the eating irregularities associated with restrained eating. The second assumption is that a discrete, ongoing diet effects eating in a much different manner. This means that dieting is responsible for one set of behaviors when it has occurred often in the past but is no longer occurring, and an entirely different set of behaviors if it has occurred in the past and is currently taking place. Lowe (1993) illustrates the interaction graphically by showing the hypothetical relation between discrete diets and cumulative diets (both on the x-axis), and vulnerability to disinhibition (on the y-axis). This results in a positively
sloped undulating function which hypothetically tracks the progress of the on-again-off-again dieter.

At the early stages of the diet the dieter’s commitment and self-efficacy are presumed high, and they are able to withstand most challenges to their dietary control. As dieting continues, internal and external factors may make it increasingly difficult to cope with threats to control, and eventually the dieter becomes vulnerable to disinhibition. The effects of a single dieting-overeating cycle will then leave failed dieter at greater risk for disinhibitory eating than before they started their diet. This occurs because of decreased responsiveness to hunger and satiety cues, a greater reliance on external cues, and an increased susceptibility to overeating when emotionally distressed. The pattern is then repeated during the next dieting phase, with each failed diet leaving the individual more vulnerable to disinhibition than before.

This interaction illustrates the difference between the two possible definitions of "dieter". One is someone who has dieted frequently in the past, but is not currently dieting. The other is someone who is currently dieting, and has dieted frequently in the past. It can be seen that dieting will be associated with quite different effects on an individual’s eating behavior depending on what stage they are at in this cycle. Lowe postulates that the nondieting restrained eater has dieted and failed at dieting many times.
in the past, but they are currently not dieting. This means that their susceptibility to counterregulatory eating, and negative-affect eating (among other things) stems not from current dieting, but from their history of past dieting behavior. When the individual becomes motivated to begin dieting again, they become "restrained dieters", that is, current dieters who have tried and failed many times. Lowe (1993) summarizes this section by noting that "restrained eaters are resisting the temptation to eat more than they need, whereas current dieters are resisting the temptation to eat what they need."

The distinction between frequency of dieting and overeating and current dieting has direct application to the issues related to measurement of dietary restraint. First, the opposing eating patterns of the two types of dieters could help to explain the high degree of variability that researchers have observed in the eating behavior of restrained eaters. Most important to this study, the distinction between past and current may help to explain some of the differences found in measurements of restraint. Lowe (1993) notes that it is likely that restrained eaters identified by the RRS represent a mix of past and current dieters; the same is probably true for the TFEQ Cognitive Restriction scale (TFEQ-CR) and the DEBQ Restrained Eating scale (DEBQ-RE) as well. However, because the TFEQ and the DEBQ scales describe actual dieting behaviors more that the
RRS, it is likely that they select a higher proportion of current dieters than does the RRS. Moreover, because the two types of dieting have opposing effects on eating behavior, it follows that even a small difference in the proportion of current dieters selected could make a sizable difference in their average food intake. This differs somewhat from the explanation given by Heatherton et al. (1988) in which they suggested that the restrained eaters identified by the RRS were "unsuccessful dieters", and the restrained eaters selected by the TFEQ and DEBQ were "successful dieters". Lowe’s model does not consider the latter to be successful dieters, but rather current dieters who have not yet failed.

The same explanation would also apply for the varying proportions of weight suppressors identified by the different restraint scales. Weight suppressors are individuals who have achieved a permanent reduction in caloric intake and weight, presumably by adopting a more realistic and flexible weight control strategies (Westenhoefer, 1991). Lowe notes that if the TFEQ-CR and DEBQ-RE scales select a greater proportion of weight suppressors, this could also help to explain why the scales do not predict the same eating patterns as the RRS.

To summarize then, Lowe proposes that the first factor of his model, frequency of dieting and overeating is most closely associated with the behavior of individuals
identified as restrained by the RRS. The other two factors, current dieting and weight suppression, are most likely associated with the eating behaviors of individuals scoring high on the TFEQ-CR and the DEBQ-RE. This new formulation will now be applied to the findings obtained from the current study.

Utilizing the three-factor model, subjects in the LH group (low TFEQ-CR; high RRS) would be redefined as individuals who were not currently dieting, but who had frequently engaged in dieting and overeating in the past. According to Lowe's model, this group is composed of predominantly "restrained eaters" as identified by the RRS, and should be susceptible to the eating anomalies typically associated with restrained eaters. This group of individuals would be expected to be somewhat overweight, with the effects of cumulative diets rendering them more susceptible to overeating when emotionally distressed.

The results of the current study do offer some support for this hypothesis. Table 1 illustrates the relative BMIs of the various groups before elimination of overweight subjects. As was noted earlier, the LH group not only had the highest mean BMI (24.22), but over 40% of the potential subjects for this group were eliminated because their BMIs exceeded 25. When compared to the other three groups in which only between 4%-10% of the subjects were eliminated because of high BMIs, the LH classification appears by far
to have selected the most overweight group of individuals. Additionally, in terms of eating behavior measured in the laboratory, this group did eat slightly more in the negative mood condition as would be expected. Recall, however, that because group differences in eating behavior (grams of crackers consumed) were found to be non-significant, these findings must be interpreted cautiously.

Attention will now be turned to the HH group. According to Lowe's model these individuals would be redefined as current dieters who are also frequent dieters and overeaters. This would result in a group of individuals who are currently attempting to lose weight, but because of their frequent dieting and overeating history they will have a greater vulnerability to disinhibiting factors as the diet wears on. In the current study screening subjects from this group were of moderate weight (mean BMI = 22.03), and only 10 percent of this group were eliminated because of BMIs exceeding 25. According to Lowe's model, both the HH and LH groups would have a history of frequent dieting and overeating, but only the HH group would be currently attempting to lose weight. This difference in current dieting status may account for the fact that the HH screening subjects had a lower mean BMI and fewer overweight subjects than did the LH group.

The laboratory eating behavior of the HH group also lends some support for Lowe's theory. Recall that a study
by Eldredge (1993) found that dysphoric (current) dieters ate less than did nondysphoric dieters. Because these results are opposite of what would be predicted by restraint theory, they provided support for Lowe's suggestion that dieters differ from restrained eaters. The current study noted a similar, although nonsignificant, pattern in consumption; dysphoric subjects in the HH group consumed less than did their nondysphoric counterparts. According to Lowe's theory (1993), it appears that one of the critical variables for this group is the length of time they have been on their current diet. These individuals are thought to be initially committed to their weight-loss programs, and become more vulnerable to disinhibition as time goes on. One possible explanation for the current findings is that these dieters had begun their weight-loss programs fairly recently, and were therefore not yet experiencing the "fatiguing effect" of dieting mentioned earlier. Because the current study made no attempt to determine how long subjects had been dieting, no post hoc analysis of this variable is possible. Another explanation for these findings might be that the laboratory induced negative-affect was salient enough to be recognized as a "threat" to their diet, and the subjects were therefore able to resist eating.

Next to be appraised according to the three-factor model will be members of the HL group, redefined as current
dieters who have not been frequent dieters and overeaters. According to Lowe, these individuals have not yet experienced the repeating cycle of frequent dieting and overeating, and should therefore have a better chance at succeeding in their diet. This group should also be less likely to experience negative-affect induced disinhibition. In fact, according to the findings of Eldredge (1993) cited earlier, HL individuals in the dysphoric mood condition would be expected to eat less than their nondysphoric counterparts.

In the current study, screening subjects classified into the HL group had a mean BMI of 20.92 (lower than the LH or HH groups). In addition, only 4% of these individuals were eliminated because of BMIs exceeding 25, while 13% were eliminated due to BMI of less than 19. This group presents a very different picture than the two discussed previously, in that these individuals tend to have lower weights, and more of them were eliminated for being underweight than overweight. (In the LH and HH groups only 3.4% and 6.6% respectively were eliminated due to low BMIs.) The laboratory eating behavior of this group did not support Lowe's theory, as dysphoric subjects ate a slightly greater (although nonsignificant) amount than did the nondysphoric subjects.

Perhaps the most interesting finding regarding this group is the fact that although these subjects are
predominantly normal to lower weight individuals, they are high scoring on the TFEQ-CR and therefore hypothesized to be current dieters by Lowe. In addition, the low RRS scores of these subjects would suggest that they do not have a history of frequent dieting and overeating. One hypothesis to account for this would be that this group may be comprised of those college-age women who are experiencing weight-gain associated with their new college environment, and they are subsequently engaged in their first attempts at dieting. A alternative, and more alarming possibility is that the current dieting behavior reported by these low to normal weight subjects may be an indication that these individuals are at a higher risk of developing eating disorders.

The final category to be considered is the LL group. These subjects would be defined as individuals who are not current dieters, nor are they frequent dieters and overeaters. This group would be expected to be a relatively normal-weight group of individuals who are not likely to exhibit eating disturbances. The current study found that the screening subjects assigned to this group had a mean BMI of 20.76. Only 6.6% of these individuals were eliminated due to BMI exceeding 25; however, 14.9% were eliminated because their BMIs were less than 19. This pattern of weight distribution is very similar to that seen in the HL group in that these individuals tend to be in the low-normal weight range. A finding which may be more positive for this
group, however, is that since they are hypothesized as not currently dieting and not having a high frequency of past dieting behavior, they would appear be at a much lower risk for the development of eating related problems.

Recommendations for future research

Certainly, Lowe's (1993) three-factor model will raise many new questions and provide numerous hypothesis to be tested. Research will be needed to further investigate and differentiate the three factors of dieting which he has proposed. Based on the findings from this study and Lowe's three factor model, the following areas for investigation are proposed.

First, the constructs of frequency of dieting and overeating, current dieting, and weight suppression should be investigated, and researchers must determine how these factors are related to the measures of restraint currently being used. Lowe has proposed that the RRS is likely to be associated with frequent dieting and overeating, while the TFEQ-CR is probably more closely linked with current dieting status. To test the accuracy of this proposal, studies will need to ask subjects specifically about these eating behaviors, and then determine their correlation with different restraint measures.

Second, as Lowe (1993) points out, his graphic illustration of the interrelationship between Factor 1 and Factor 2 is a hypothetical one, not based on actual data,
but rather a synthesis of studies on restraint and dieting. He notes that longitudinal studies will ultimately be needed to investigate its accuracy. An important variable in the model appears to involve the amount of time that an individual has been dieting. It was proposed that dieters are initially committed to their weight-loss programs, but may become more vulnerable to disinhibition as time goes on. Future studies could assess the importance of the time factor by determining how long the dieter is typically able to remain successful, and by examining the external and/or internal factors involved with diet "fatiguing". This information could potentially have direct clinical application by combining it with strategies aimed at helping the dieters maintain control during this "critical period" when they are most vulnerable to disinhibition.

A third potential area for future research involves the effect of affective manipulations on current dieters. Eldredge (1993) found that dysphoric dieters ate significantly less than nondysphoric dieters, and that these results are contrary to those typically found with restrained eaters as identified with the RRS. The current study also found that dysphoric subjects in the HH group ate slightly less than their nondysphoric counterparts, although the differences were nonsignificant. Additional studies are needed to further investigate the effects of affective manipulations on current dieters. If the findings of
Eldredge (1993) can be replicated, this will contribute to evidence supporting the distinction between current dieters and restrained eaters.

A related area for investigation would examine Lowe's hypothesis that the control exhibited by current dieters is most plausibly attributed to the cognitive effects of certain situations. Specifically, he asserts that dieters may eat less when control is challenged, and eat more when control is not challenged. A study which placed dieters in environments of either high or low "challenge of control" and then assessed the frequency of (dis)inhibitory thoughts would be one way of attempting to identify the validity and effectiveness of this cognitive component.

Finally, more studies need to examine the relationship between body mass index and level of restraint as measured by the TFEQ-CR. Presumably because of the previous concerns regarding the validity of the RRS with overweight subjects, many studies using the TFEQ-CR have also limited their subjects to only normal weight individuals. Moreover, these studies have rarely commented on the potential weight differences between restrained and unrestrained subjects. One study using the TFEQ-CR (Laessle, Tuschl, Waadt & Pirke, 1989) did include an analysis of BMI and found no differences between groups of bulimic, restrained and unrestrained subjects. These findings are very different from most studies using the RRS, in which individuals
identified as restrained are typically more overweight than their unrestrained counterparts. Therefore, it appears that a more thorough investigation of the correlation between BMI and TFEQ-CR scores will be fundamental in attempting to delineate the differences between these two measures of restraint.

Summary

The present study hypothesized that the RRS would be a better predictor of negative-affect eating than the TFEQ. In fact, no significant differences in laboratory eating behavior were observed, and this hypothesis was not directly supported. A replication of the study would be needed to determine whether methodological or theoretical factors responsible for these results. Some evidence was provided, however, to support the more general hypothesis which suggested that the different scales used to measure dietary restraint may be identifying different components of the restraint construct. Among the screening subjects, differences were noted between groups with respect to their mean body mass index, and the number of subjects excluded from each group due to their overweight status. In addition, BMI was more highly correlated with the RRS than with the TFEQ-CR.

An accumulation of recent studies inconsistent with restraint theory has raised additional questions about the homogeneity of the restraint construct, and it appears clear
that there is a great deal of variability with respect to disinhibition. The three-factor model of dieting by Lowe (1993) presents restraint as a multi-dimensional phenomenon. He redefines restraint as frequency of dieting and overeating, and distinguishes it from current dieting and weight suppression. The three-factor model is able to explain many of the previous inconsistencies, including the divergent findings obtained with the TFEQ and the RRS. The RRS may identify individuals who have a history of frequent dieting and overeating, while the TFEQ may identify those persons who are currently dieting. The current study provides some support for Lowe's theory. It was found that the LH group of screening subjects had a higher mean BMI and a greater percentage of overweight individuals than did the other three groups. The HH group was the only one in which dysphoric subjects ate less than their nondysphoric counterparts, although differences were nonsignificant. In addition, the HL group was comprised of predominantly normal to lower weight individuals who endorsed questions reflecting high cognitive restraint according to the TFEQ-CR.

While traditional restraint theory has been extremely useful and appealing in its simplicity, it has not addressed the diversity embedded within the restraint construct. Considering the complexity of human behavior, it is most plausible that many factors are involved in dieting. Lowe's
model provides a framework for the continued exploration of these factors and their interactions. Restraint theory and its contemporary reformulation, the three-factor model of dieting, will continue to provide fertile ground for future research.
References


APPENDIX A

REVISED RESTRAINT SCALE

1. How often are you dieting?
   Never rarely sometimes often always
   (Scored 0-4)

2. What is the maximum amount of weight (in pounds) that you have ever lost within one month?
   0-4 5-9 10-14 15-19 20+
   (Scored 0-4)

3. What is your maximum weight gain within a week?
   0-1 1.1-2 2.1-3 3.1-5 5.1+
   (Scored 0-4)

4. In a typical week, how much does your weight fluctuate?
   0-1 1.1-2 2.1-3 3.1-5 5.1+
   (Scored 0-4)

5. Would a weight fluctuation of 5 pounds affect the way you live your life?
   Not at all slightly moderately very much
   (Scored 0-3)

6. Do you eat sensibly in front of others and splurge alone?
   Never rarely often always
   (Scored 0-3)

7. Do you give too much time and thought to food?
   Never rarely often always
   (Scored 0-3)

8. Do you have feelings of guilt after overeating?
   Never rarely often always
   (Scored 0-3)

9. How conscious are you of what you are eating?
   Not at all slightly moderately extremely
   (Scored 0-3)

10. How many pounds over your desired weight were you at your maximum weight?
    0-1 1-5 6-10 11-20 21+
    (Scored 0-4)
APPENDIX B

THE THREE-FACTOR EATING QUESTIONNAIRE

One point is given for each item in Part I and for each item (numbered question) in Part II. The correct answer for the true/false items is underlined and beside it is the number of the factor that it measures. The direction of the question in Part II is determined by splitting the responses at the middle. If the item is labelled ‘+’, those responses above the middle are given a zero. Vice versa for those with a ‘−’. For example, anyone scoring 3 or 4 on the first item in Part II (item No. 37) would receive one point. Anyone scoring 1 or 2 would receive a zero. (Note: this means "above" is interpreted as meaning a smaller number, as if listed vertically; eg. 1 and 2 are "above", and 3 and 4 are "below".)

Part One

1. When I smell a sizzling steak or see a juicy piece of meat, I find it very difficult to keep from eating, even if I have just finished a meal. T F 2

2. I usually eat too much at social occasions, like parties and picnics. T F 2

3. I am usually so hungry that I eat more than three times a day. T F 3

4. When I have eaten my quota of calories, I am usually good about not eating any more. T F 1

5. Dieting is so hard for me because I just get too hungry. T F 3

6. I deliberately take small helpings as a means of controlling my weight. T F 1

7. Sometimes things just taste so good that I keep on eating even when I am no longer hungry. T F 2

8. Since I am often hungry, I sometimes wish that while I am eating, an expert would tell me that I have had enough or that I can have something more to eat. T F 3

9. When I feel anxious, I find myself eating. T F 2
10. Life is too short to worry about dieting. T F 1
11. Since my weight goes up and down, I have gone on reducing diets more than once. T F 2
12. I often feel so hungry that I just have to eat something. T F 3
13. When I am with someone who is overeating, I usually overeat too. T F 2
14. I have a pretty good idea of the number of calories in common food. T F 1
15. Sometimes when I start eating, I just can't seem to stop. T F 2
16. It is not difficult for me to leave something on my plate. T F 2
17. At certain times of the day, I get hungry because I have gotten used to eating then. T F 3
18. While on a diet, if I eat food that is not allowed, I consciously eat less for a period of time to make up for it. T F 1
19. Being with someone who is eating often makes me hungry enough to eat also. T F 3
20. When I feel blue, I often overeat. T F 2
21. I enjoy eating too much to spoil it by counting calories or watching my weight. T F 1
22. When I see a real delicacy, I often get so hungry that I have to eat right away. T F 3
23. I often stop eating when I am not really full as a conscious means of limiting the amount that I eat. T F 1
24. I get so hungry that my stomach often seems like a bottomless pit. T F 3
25. My weight has hardly changed at all in the last ten years. T F 2
26. I am always hungry so it is hard for me to stop eating before I finish the food on my plate. T F 3
27. When I feel lonely, I console myself by eating. T F 2
28. I consciously hold back at meals in order not to gain weight. T F 1
29. I sometimes get very hungry late in the evening or at night. T F 3
30. I eat anything I want, any time I want. T F 1
31. Without even thinking about it, I take a long time to eat. T F 2
32. I count calories as a conscious means of controlling my weight. T F 1
33. I do not eat some foods because they make me fat. T F 1
34. I am always hungry enough to eat at any time. T F 3
35. I pay a great deal of attention to changes in my figure. T F 1
36. While on a diet, if I eat a food that is not allowed, I often then splurge and eat other high calorie foods. T F 2

Part Two
Directions: Please answer the following questions by circling the number above the response that is appropriate to you. Factor #

37. How often are you dieting in a conscious effort to control your weight?
   1 rarely  2 sometimes  3 usually  4 always

38. Would a weight fluctuation of 5 pounds affect the way you live your life?
   1 not at all  2 slightly  3 moderately  4 very much

39. How often do you feel hungry?
   1 only at mealtimes  2 sometimes between meals  3 often between meals  4 almost always
40. Do your feelings of guilt about overeating help you to control your food intake?
1 never  2 rarely  3 often  4 always +1

41. How difficult would it be for you to stop eating halfway through dinner and not eat for the next four hours?
1 easy  2 slightly  3 moderately  4 very difficult +3
difficult  difficult  difficult

42. How conscious are you of what you are eating?
1 not at all  2 slightly  3 moderately  4 extremely +1

43. How frequently do you avoid "stocking up" on tempting foods?
1 almost  2 seldom  3 usually  4 always +1
never

44. How likely are you to shop for low calorie foods?
1 unlikely  2 slightly  3 moderately  4 very likely +1
unlikely
likely
likely

45. Do you eat sensibly in front of others and splurge alone?
1 never  2 rarely  3 often  4 always +2

46. How likely are you to consciously eat slowly in order to cut down on how much you eat?
1 unlikely  2 slightly  3 moderately  4 very likely +1
likely
likely
likely

47. How frequently do you skip dessert because you are no longer hungry?
1 almost never  2 seldom  3 at least  4 almost once a week every day -3
<table>
<thead>
<tr>
<th>Question</th>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>48. How likely are you to consciously eat less than you want?</td>
<td>1 unlikely, 2 slightly likely, 3 moderately likely, 4 very likely</td>
</tr>
<tr>
<td>49. Do you go on eating binges though you are not hungry?</td>
<td>1 never, 2 rarely, 3 sometimes, 4 at least once a week</td>
</tr>
<tr>
<td>50. On a scale of 0 to 5, where 0 means no restraint in eating</td>
<td>0 eat whatever you want, whenever you want it, 1 usually eat</td>
</tr>
<tr>
<td>(eating whatever you want, whenever you want it) and 5 means total</td>
<td>whatever you want, whenever you want it</td>
</tr>
<tr>
<td>restraint in eating (constantly limiting food intake and never &quot;give</td>
<td>2 often eat whatever you want, whenever you want it</td>
</tr>
<tr>
<td>in&quot;), what number would you give yourself?</td>
<td>3 often limit food intake, but often &quot;give in&quot;</td>
</tr>
<tr>
<td></td>
<td>4 usually limit food intake, rarely &quot;giving in&quot;</td>
</tr>
<tr>
<td></td>
<td>5 constantly limiting food intake, never &quot;giving in&quot;</td>
</tr>
<tr>
<td>51. To what extent does this statement describe your eating behavior?</td>
<td>1 not like me, 2 little like me, 3 pretty good describes me, 4</td>
</tr>
<tr>
<td>&quot;I start dieting in the morning, but because of any number of things</td>
<td>perfectly describes me</td>
</tr>
<tr>
<td>that happen during the day, by evening I have given up and eat what I</td>
<td></td>
</tr>
<tr>
<td>want, promising myself to start dieting again tomorrow.&quot;</td>
<td></td>
</tr>
</tbody>
</table>

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APPENDIX C
Demographic Questionnaire

Name: ________________________________ Age: _____
Section Number: ________________________________
Telephone: ________________________________
Sex: Male _____ Female _____
Year in School: (Check one)
    Freshman_____ Sophomore_____ 
    Junior_____ Senior_____ 
Height____
Weight____
APPENDIX D

INFORMED CONSENT FORM  Subject #___
"The Effect of Mood on Taste Sensations"
Principal Investigator: Pamela S. Ridgway
Under the direction of D.B. Jeffrey, Ph.D.
University of Montana

I understand that by signing my name below, I give my informed consent to participate in this study.

1. The procedures to be followed include completion of several short questionnaires, reading and reflecting on statements, and participating in a taste test. The total time commitment for participating in this study is between 45 minutes and one hour. After collection of the data has been completed, a description of the study will be posted near the Psychology 100 sign-up sheets. The researcher will also announce a meeting to inform the participants about the details of the study. If data collection has not been completed by the end of spring 1993 semester, individual mailings will be sent out to inform the participants about the details of the study. (Please be sure to include a permanent mailing address below.)

2. All information provided by you will be kept strictly confidential. Your name will not be associated with any of the data collected. Only a subject number will be associated with your data.

3. The only side effect you might experience is a transient change in mood.

4. You will receive two experimental credits for participation in the study.

5. You may refuse to participate or discontinue participation at any time, without prejudice to you, and without jeopardy to any credits you are entitled to.

6. After the study is completed, you may obtain a report of the results and have any questions answered. You may contact the Principal Investigator, Pamela Ridgway at 243-4523. Because of confidentiality, no information can be provided about you or any other participating individual.

I HAVE READ AND UNDERSTOOD THE ABOVE, AND AGREE TO PARTICIPATE IN THIS STUDY.

Participant ___________________________ Date ____________

Experimenter ___________________________ Date ____________

Address ________________________________

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APPENDIX E

HUNGER SCALE

1. How many hours has it been since you last had something to eat?

2. What did you eat last?

3. How hungry are you at this time:

   :________:________:________:________:________:________:
   1       2       3       4       5       6       7

Not hungry at all  Very hungry
APPENDIX F
Multiple Affect Adjective Checklist (MAACL)

DIRECTIONS: On this sheet you will find words which describe different kinds of moods and feelings. Mark an X in the boxes beside the words which describe how you feel right now. Some of the words may sound alike, but we want you to check all the words that describe your feelings. Work quickly.

1 __ active 21 __ interested
2 __ alive 22 __ lonely
3 __ alone 23 __ lost
4 __ awful 24 __ low
5 __ blue 25 __ lucky
6 __ clean 26 __ merry
7 __ destroyed 27 __ miserable
8 __ discouraged 28 __ peaceful
9 __ enthusiastic 29 __ rejected
10 __ fine 30 __ sad
11 __ fit 31 __ safe
12 __ forlorn 32 __ strong
13 __ free 33 __ suffering
14 __ gay 34 __ sunk
15 __ glad 35 __ terrible
16 __ good 36 __ tormented
17 __ gloomy 37 __ unhappy
18 __ healthy 38 __ whole
19 __ hopeless 39 __ wilted
20 __ inspired 40 __ young
APPENDIX G

Mood Induction Statements

Negative Statements

1. I can feel my body sagging when I walk.
2. I can feel my body sinking into the chair.
3. My body feels weak and drained of energy.
4. I feel tired and sleepy.
5. My eyelids feel heavy.
6. I don’t feel like I have enough energy to make it through the day.
7. I feel as though I am carrying a great weight.
8. I feel lethargic and slow-moving right now.
9. My legs feel very heavy.
10. It seems to be too much effort to lift my arms.
11. I feel rather sluggish now.
12. Today I feel so tired and gloomy that I’d rather just sit than do anything.
13. I feel rather light-headed and faint right now.
14. There is a fuzzy feeling in my head.
15. I feel so tired and apathetic that I’m having trouble thinking clearly.
16. When I feel this lackluster, the day somehow seems quite dreary.
17. I feel as though I’m going to have trouble getting out of this chair.
18. Everything seems to take too much energy for me today.
19. I feel drained, unable to do hardly anything.
20. It takes too much effort to walk very quickly today.
21. It seems to take an extraordinary effort to walk today.
22. My neck feels hardly able to hold my head up.
23. I wish I had the energy to get things done.
24. I feel as though even lifting my hand would take a great deal of energy.
25. Everything seems hopeless when I'm this down-hearted and drained.
26. It's difficult to move quickly when I feel this sluggish and worn out.
27. I feel as though I'm shouldering a big burden today.
28. My energy is drained today.
29. It takes a lot of effort to move today.
30. I feel as though I don't even have the energy to think.
31. I feel a sense of fatigue today.
32. When I feel this sluggish, I start thinking I'm a lazy person.
33. I'm not worth anything when I feel this worn out.
34. I feel sleepy and weak today.
35. My head feels too heavy to hold up today.
36. I certainly lack confidence when I feel this muddled and worn out.
37. My eyelids are beginning to droop.
38. I can barely write I feel so weak.
39. My legs feel as though they can barely support me.
40. I feel as though my neck is too weak to support my head.
41. My self-esteem falters when I feel this drained.
42. I feel down-hearted and slow today.
43. It takes all my energy just to get through the day.
44. My breathing seems shallow and labored right now.
45. I feel the energy being drained out of me.

Neutral Statements

1. Many states provide milk for school children.
2. Tomatoes are actually fruit.
3. It is quite cold/warm today.
4. The work of a policeman must be interesting.
5. Utah is the Beehive state.
6. This book or any part thereof must not be reproduced in any form.
7. Austin is the capital of Texas.
8. Wheat is the primary crop of Kansas.
9. The average person needs 7 to 8 hours of sleep per night.
10. Monopoly is a board game where one buys and sells property.
11. Many television programs are about private detectives.
12. Researchers are getting closer to finding a cure for cancer.
13. School lunches are often given away to the needy.
14. Movies are more expensive than they used to be.
15. Florida is the Sunshine state.
16. The earth's land masses consist of 7 continents.
17. Oranges are high in Vitamin C.
18. Columbus discovered America in 1492.
19. Chlorophyll is the substance in plants responsible for their growth.
20. Daffodils are one of the first flowers of spring.
21. There are 48 contiguous states in the United States.
22. John F. Kennedy was assassinated in 1963.
23. Paris is the capital of France.
24. Food, water, and shelter are necessary for life.
25. Labor day falls in the month of September.
26. The boiling point of water is 212 degrees Fahrenheit.
27. George Washington was the first president of the U.S.
28. An economic depression occurred in the United States in the 1930’s.
29. Sacramento is the capital of California.
30. New Year’s day is January 1st.
31. Chicago is often called "the windy city".
32. There are five oceans in the world.
33. The American flag is red, white, and blue.
34. It is a good idea to have auto insurance.
35. Public schools usually start their academic year after Labor day.
36. Rhode Island is the smallest state in the U.S.
37. Land in the city usually costs more than land in the country.
38. California experienced a gold rush in the 1800’s.
39. Budgets help you keep track of your spending.
40. Red, blue and yellow are primary colors.
41. The Kentucky Derby is held at Churchill Downs.
42. Editorials often contain people’s opinions about political issues.
43. Defensive driving is a good way to avoid accidents.
44. The most common favorite color is blue.
45. Nurses must know how to take a person’s blood pressure.
APPENDIX H

Positive Mood Induction Statements

1. I feel full of energy.
2. I feel a great surge of vitality welling up inside of me.
3. I feel fully alive and energized.
4. My entire body feels energized.
5. I feel ready to do almost anything.
6. I feel a sense of invigoration throughout my body.
7. I have a feeling of well-being.
8. There is a great surge of energy running through me.
9. I can almost feel the invigorating flow of blood through my limbs.
10. I feel fully awake and invigorated.
11. I feel strong enough to tackle anything today.
12. I feel refreshed and alert.
13. My body seems to be functioning perfectly today.
14. My arms and legs feel strong and perfectly coordinated right now.
15. I can feel a rush of invigoration go through me.
16. I feel like dancing for joy.
17. My sense of being alive is particularly strong and vivid today.
18. I feel as though I have the strength of 2 people today.
19. When I have this much energy, I feel entirely self-confident.
20. I feel overcome with elated and happy feelings.
APPENDIX I

Cracker Taste Rating Form

Instructions: Please rate the crackers on the following dimensions by circling your answers to the following questions.

1. Which cracker was most salty?
   Cracker A   Cracker B   Cracker C

2. Which cracker was sweetest?
   Cracker A   Cracker B   Cracker C

3. Which cracker was most spicy?
   Cracker A   Cracker B   Cracker C

4. Which cracker was most buttery-tasting?
   Cracker A   Cracker B   Cracker C

5. Which cracker did you like the most?
   Cracker A   Cracker B   Cracker C

6. Which cracker did you like the least?
   Cracker A   Cracker B   Cracker C

7. Which cracker would you be most likely to buy in the future?
   Cracker A   Cracker B   Cracker C
APPENDIX J
Debriefing Outline

Thank you very much for participating in this study. We have been investigating the effects of different moods on tasting food. After this project is completed, a description of the study and its findings will be summarized and posted near the psychology experiment sign-up sheets. Also, near the end of the semester the researcher will announce a meeting to inform any of the participants who are interested in learning more about the details and results of the study. Alternatively, in the event that the data collection is not complete by the end of the semester, individual mailings will be sent to each of the participants to inform them about the study. Do you have any questions about the debriefing?
Subject #____

CONSUMPTION FORM

BOWL A BOWL B BOWL C

GRAMS CONSUMED

initial gms__ initial gms__ initial gms__

- final gms__ - final gms__ - final gms__

TOTALS
EATEN =

CALORIES CONSUMED

_____gms eaten _____gms eaten _____gms eaten

X 5.64 cal/gram X 4.93 cal/gram X 4.93 cal/gram

TOTALS
EATEN =

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Dear Research Subject:

Thank you for participating in the research study titled Taste Perception and Mood. Data collection for this study has been completed, and the purpose of this letter is to provide you with a debriefing of the project.

The goal of this study was to compare two questionnaires which are often used in research to differentiate restrained and unrestrained eaters. The term "restraint" refers to the tendency to limit one's food intake, and thus restrained eaters are those individuals who frequently diet. In this study, the subjects' eating behavior under different mood conditions was analyzed to determine which variables were the best predictors of eating behavior. Although no significant differences between groups were found with respect to the subjects' eating behavior as measured in the laboratory, the groups did differ in terms of the subjects' Body Mass Index.

For those of you who may be interested in learning more about this study, a complete discussion of the results will appear in my thesis which will be available in the Mansfield Library during the Fall 1994 semester.

Thank you once again for your participation as a Psychology 100 research subject. If you have any further questions regarding my research, you may contact me at 543-8112.

Sincerely,

Pamela S. Ridgway
APPENDIX M

Institutional Review Board Proposal

A COMPARISON OF THE RESTRAINT SCALE AND THE THREE-FACTOR EATING QUESTIONNAIRE

Investigator: Pamela Ridgway

1. **Description of Research**

The proposed research project is designed to compare two questionnaires which are used to identify restrained eaters (chronic dieters). A 2x2x2 (questionnaire #1 x questionnaire #2 x mood condition) factorial design will be used.

2. **Benefits of the Research**

The literature regarding dietary restraint has suggested that restrained eating behavior may be a precursor to clinical eating disorders. Certain variables have been shown to disinhibit restraint, resulting in dietary transgression. One disinhibiting factor is dysphoric mood. The Revised Restraint Scale was developed in the mid-1970’s. It is a 10 item questionnaire which has been used to classify individuals as either restrained or unrestrained in their eating behavior. In the typical paradigm, restrained eaters typically eat more than the unrestrained eaters following a dysphoric mood induction. This is referred to as "disinhibition of restraint". An alternative instrument for assessing restraint status was developed in 1985. This questionnaire is called the Three Factor Eating
Questionnaire (TFEQ). Studies have shown that subjects who are classified as restrained according to the TFEQ do not experience disinhibition of restraint as expected. These findings have suggested that the two instruments are not equivalent, and may not be identifying the same population. The TFEQ may identify subjects who are successful dieters, while the RRS may identify subjects who are more prone to dietary transgressions (disinhibition). The proposed study will classify subjects according to the two questionnaires, and compare their eating behavior (consumption of crackers) following a dysphoric mood induction. This will provide information regarding the two scales' ability to predict eating behavior in response to experimentally induced dysphoric mood.

3. Use of Subjects

Early in the semester female subjects will complete both measures of dietary restraint along with a brief demographic questionnaire during the screening session in introductory psychology. Subjects will be classified according to their restraint scores as either high on both measures, low on both measures, or high on one and low on the other. 26 subjects from each of these four groups will be contacted by telephone and invited to participate in a study ostensibly investigating "the effects of mood on taste sensations". Subjects will receive 2 experimental credits for their introductory psychology class requirement. They
will be asked if they have any known food allergies, and anyone reporting an allergy to any of the ingredients in the crackers will be dismissed. Subjects will be instructed not to eat for two hours prior to the experiment. The subject will be greeted by the experimenter, and asked to complete the informed consent form. The subject will then fill out a brief questionnaire to determine her level of hunger and when she had last eaten. Subjects will be told that they are participating in a market research study which is investigating the effects of mood on taste perception. They will complete a Multiple Adjective Affect Checklist (MAACL) to assess their initial mood. Next they will receive either a negative or neutral mood induction presented on 5" x 7" cards. The Velten mood induction procedure involves reading and reflecting upon 45 self-referent statements for 15 seconds each. The negative statements focus on the somatic concomitants of dysphoric feelings, emphasizing lethargy and fatigue. An example is "My body feels weak and drained of energy". The neutral statements involve benign information such as "Utah is the Beehive state". After completing the mood induction, the subject will fill out a second MAACL. Next the experimenter will present three bowls of commercially available crackers labeled A, B, and C. The subject will be asked to rate the crackers on a variety of dimension, completing a questionnaire for each type. She will be told that she may help herself to as many crackers
as she likes after completing the ratings, but she should not change her initial ratings. The experimenter will then leave the room for ten minutes. Upon returning, the experimenter will weigh and measure the subject, and present the debriefing outline. Subjects who received the negative mood induction will be presented with 20 positive statements on 5" x 7" cards to counteract any lingering feelings of dysphoria.

4. **Description of Subjects**

All subjects will be female introductory psychology students who are 18 years of age or older. The 104 total subjects will be recruited on the basis of their restraint status according to two measures of restraint.

5. **Risks and Discomforts**

The primary risk or discomfort would involve those subjects who receive the negative mood induction. This procedure is typically effective in producing some feelings of dysphoria. A relatively rare risk would involve food allergies to the crackers.

6. **Correction of Undesirable Consequences to Subjects**

Subjects will receive 20 positive mood induction statements to counteract any lingering effects of the negative mood induction procedure. Upon their initial telephone contact, subjects will be asked if they have any known food allergies, and will be dismissed if they report an allergy to any of the ingredients in the crackers.
7. **Protection of Confidentiality**

   After the initial screening process each subject will be assigned a number by the primary researcher, and the demographic questionnaire will be removed from the restraint questionnaires. The subjects' restraint status, height, and weight will not be known to the research assistants.

8. **Informed Consent**
   
   See attached

9. **Waiver of Informed Consent**
   
   Not applicable.

10. **Other information pertaining to ethical responsibility**
    
    None.

I HAVE READ THE ABOVE AND AGREE THAT IT IS AN ACCURATE REPRESENTATION OF THE PROCEDURES TO BE USED IN THIS STUDY.

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D. Balfour Jeffrey, Ph.D.
Professor Psychology
Chairperson of Thesis Committee