Development and Validation of a Multidimensional Measure of Eating Behavior and Exercise.

Cheryl Funsch Smith
Louisiana State University and Agricultural & Mechanical College

Follow this and additional works at: https://digitalcommons.lsu.edu/gradschool_disstheses

Recommended Citation
https://digitalcommons.lsu.edu/gradschool_disstheses/6525

This Dissertation is brought to you for free and open access by the Graduate School at LSU Digital Commons. It has been accepted for inclusion in LSU Historical Dissertations and Theses by an authorized administrator of LSU Digital Commons. For more information, please contact gradetd@lsu.edu.
INFORMATION TO USERS

This manuscript has been reproduced from the microfilm master. UMI films the text directly from the original or copy submitted. Thus, some thesis and dissertation copies are in typewriter face, while others may be from any type of computer printer.

The quality of this reproduction is dependent upon the quality of the copy submitted. Broken or indistinct print, colored or poor quality illustrations and photographs, print bleedthrough, substandard margins, and improper alignment can adversely affect reproduction.

In the unlikely event that the author did not send UMI a complete manuscript and there are missing pages, these will be noted. Also, if unauthorized copyright material had to be removed, a note will indicate the deletion.

Oversize materials (e.g., maps, drawings, charts) are reproduced by sectioning the original, beginning at the upper left-hand corner and continuing from left to right in equal sections with small overlaps. Each original is also photographed in one exposure and is included in reduced form at the back of the book.

Photographs included in the original manuscript have been reproduced xerographically in this copy. Higher quality 6" x 9" black and white photographic prints are available for any photographs or illustrations appearing in this copy for an additional charge. Contact UMI directly to order.

UMI
A Bell & Howell Information Company
300 North Zeeb Road, Ann Arbor MI 48106-1346 USA
313/761-4700  800/521-0600
DEVELOPMENT AND VALIDATION OF A MULTIDIMENSIONAL MEASURE OF EATING BEHAVIOR AND EXERCISE

A Dissertation
Submitted to the Graduate Faculty of the Louisiana State University and Agricultural and Mechanical College in partial fulfillment of the requirements for the degree of Doctor of Philosophy in The Department of Psychology

by
Cheryl Funsch Smith
B.A., Purdue University
M.A., Louisiana State University
August, 1997
Acknowledgments

I would like to express my appreciation to several people for helping me with this project and throughout my five years of graduate school at LSU. First of all, I would like to thank my dissertation committee members, Drs. Geiselman, Gouvier, and Waters for their insightful suggestions relating to this study and for their guidance and supervision during the years which I had the pleasure to work with them in academic, clinical, and research settings. I would especially like to express my sincere gratitude to my major professor and dissertation chairperson, Donald A. Williamson, for countless hours of expert advice and direction concerning my research and clinical endeavors. It has truly been a privilege to have a mentor who is such a well-respected professor and an outstanding role-model of a scientist/practitioner. I would also like to thank my family and friends for supporting me through all the triumphs and tribulations of graduate school. It would have been difficult to achieve my goals without them. I am particularly indebted to Leslie Womble for helping with data collection and the logistics of this project. Finally, and most importantly, I would like to express my utmost appreciation to my husband, Brad, who has made many personal sacrifices to help me to reach my goals. His love, support, and selflessness have been invaluable assets to me throughout graduate school. I only hope that I will have the opportunity to return the favor one day in the future.
## Table of Contents

Acknowledgments ................................................................. ii

List of Tables ........................................................................................ v

Abstract .......................................................................................... vi

Introduction ...................................................................................... 1

   Obesity ............................................................................................. 2

   Dieting ............................................................................................. 5

   Dieting and Exercise ...................................................................... 6

   Dieting and Overeating ................................................................. 8

   Dieting and Weight Cycling ......................................................... 9

   Dieting and Eating Disorders ..................................................... 10

   Dieting and Negative Mood ......................................................... 11

   Dieting and Body Image ............................................................... 12

   Dieting and Nutrition .................................................................. 13

   Dieting Strategies ........................................................................ 13

Review of Existing Measures ......................................................... 17

   Measures of Dietary Restraint and Dieting .................................. 17

   Measures of Exercise and Physical Activity ................................ 20

   Measures of Overeating ............................................................... 22

   Measures of Pathological Eating ................................................. 23

   Measures of Emotional Eating ................................................... 25

   Measures of Body Dissatisfaction .............................................. 26

   Measures of Dieting Self-Efficacy ................................................. 27

   Drawbacks of Existing Measures ................................................. 29

   Other Methods of Evaluating Dieting and Overeating ................. 32

   Predicted Behavioral Domains of the Current Measure ............. 33

      Dietary strategies ...................................................................... 33

      Overeating ................................................................................. 34

      Exercise ..................................................................................... 34

      Pathological eating ................................................................... 34

      Emotional Eating ....................................................................... 35

   Specific Aim .................................................................................. 35

Study 1: Item Construction and Factor Analysis ............................. 37

   Phase 1: Method .............................................................................. 37

      Participants .................................................................................. 37

      Materials ...................................................................................... 37

      Procedure ..................................................................................... 38
List of Tables

1. Stepwise Multiple Regression of Factor 1: Overconcern with Body Size and Eating ......................... 44
2. Stepwise Multiple Regression of Factor 2: Exercise ................................................................. 44
3. Stepwise Multiple Regression of Factor 3: Overeating ............................................................ 45
4. Stepwise Multiple Regression of Factor 4: Avoidance of Fattening Foods and Sweets .................. 45
5. Stepwise Multiple Regression of Factor 5: Emotional Eating ...................................................... 46
6. Stepwise Multiple Regression of Factor 6: Extreme Weight Control .............................................. 46
7. Rotated Factor Matrix of the MMEBE ....................................................................................... 47
8. Internal Consistency of the MMEBE’s Total Score and Factors Before the Second Study ................. 50
9. Internal Consistency of the MMEBE’s Total Score and Factors After the Second Study .................. 57
10. Correlation Matrix of MMEBE’s Factors ................................................................................ 59
11. Correlation Matrix of the MMEBE’s Factors and Selected Measures ............................................ 60
Abstract

The specific aim of the current investigation was to develop and validate a multidimensional self-report inventory of a wide range of eating behaviors and weight control practices including overeating, emotional eating, and exercise to be used with overweight and obese populations for evaluation and treatment purposes. Based on recent research findings concerning dieting strategies, factors evaluating healthy versus unhealthy weight control practices were expected to emerge from factor analysis of the original item pool of 131 items. However, these specific factors were not found. Instead, the factor analytic study found the Multidimensional Measure of Eating Behavior and Exercise (MMEBE) to contain six factors: Overconcern with Body Size and Eating, Exercise, Overeating, Avoidance of Fattening Foods and Sweets, Emotional Eating, and Extreme Weight Control. Five of the six factors were found to have adequate reliability and validity. The final version of the MMEBE contained 40 items. Results of these preliminary studies suggest that further investigations of the MMEBE are warranted.
**Introduction**

As a result of the increasing prevalence of obesity and dieting in the United States, the weight loss industry has become a multi-million dollar market (Brownell, 1991; Stern & Thomas, 1995). Dieting is becoming the social norm, particularly among young women in higher socioeconomic groups (Polivy & Herman, 1987). However, the association of many adverse events with dieting such as overeating, weight cycling, lowered metabolic rate, and eating disorders has lead some researchers to contemplate the overall benefits of dieting (Brownell & Rodin, 1994; French & Jeffery, 1994).

Over the past 20 years, Herman and colleagues have espoused dietary restraint theory which posits that when dietary restraint is disrupted overeating occurs (Herman & Mack, 1975; Herman & Polivy, 1975; Polivy & Herman, 1993). Dietary restraint is conceptualized as the intentional control of one’s body weight through restrictive eating. Although some support for this theory has been found (e.g., Heatherton & Baumeister, 1991; Knight & Boland, 1989; Schotte, Cools, & McNally, 1990), a substantial number of studies have produced inconsistent findings (e.g., Duchmann, Williamson, & Stricker, 1989; French, 1992; Rudermen & Christensen, 1983). Overall, these results suggest that dietary restraint (or dieting) does not always lead to overeating as restraint theory predicts (Herman & Polivy, 1984). Supporting this, recent research findings have indicated that certain dieting strategies are associated with overeating, obesity, and negative mood, whereas other weight control practices are not (French, Perry, Leon, &
Fulkerson, 1995; Westenhoefer, 1991; Smith, Williamson, Bray, & Ryan, in press). While there are a number of measures that assess dieting, physical activity, and disordered eating behavior, a self-report inventory of specific weight control strategies has not been developed (French & Jeffery, 1994). Researchers have argued that the lack of a clear definition of the construct of dieting is a major obstacle in trying to determine the cost versus benefits of dieting (French, Jeffrey, & Wing, 1994a). There appears to be a need for a standardized measure that evaluates multiple weight control practices and related domains such as negative affect and overeating.

**Obesity**

Obesity is the most common nutritional problem in the United States. Approximately 35% of adults are considered medically obese which is defined as a body mass index (BMI) value ≥ 27.3 for females and ≥ 27.8 for males (Kuczmarski, Flegal, Campbell, & Johnson, 1994). According to the most recent National Health and Nutrition Examination Study III (NHANES III), the prevalence of obesity has dramatically increased over the past 35 years with a mean weight increase since 1980 of 3.6 kg (Kuczmarski et al., 1994).

The economic costs of obesity-related illnesses are enormous (Colditz, 1992). Subsequently, the federal government has targeted obesity in their Healthy People 2000 objective which has the goal of reducing the prevalence of obesity to 20% of adults by the year 2000 (U.S. Department of Health and Human Services, 1991). It is widely known that obesity is associated with increased
morbidity and mortality (Bray, 1976). Specifically, obesity has been found to be associated with an increased prevalence of cardiovascular disease, hypertension, non-insulin dependent diabetes mellitus, osteoarthritis, gallbladder disease, respiratory disease, and some cancers (Manson et al., 1990; Pi-Sunyer, 1993; Van Itallie, 1985). There are also significant psychological and social consequences of obesity (Wadden & Stunkard, 1985). For example, a prospective study found that obese individuals are less educated, less likely to marry, and have lower salaries compared to normal weight individuals (Gortmaker, Must, Perrin, Sobol, & Dietz, 1993).

Many weight loss treatments have been successful among obese individuals (Brownell & O'Neil, 1993; Brownell & Wadden, 1991; Wilson, 1993). Unfortunately, weight loss programs have not achieved consistent long-term success (Stalonas, Perri, & Kerzner, 1984; Wadden & Bell, 1990; Wadden & Stunkard, 1988; Wilson, 1994). Foreyt and Goodrick (1993) reported that among individuals who lose weight through dieting, 90% regain a majority of the weight within three years. Some researchers have suggested that teaching rigid dieting behaviors, i.e., very low calorie diet (VLCD) practices, could play a role in the high incidence of relapse (Tuschi, 1990; Wilson, 1993). However, a recent investigation of long-term effects of VLCD does not support this hypothesis (Wing, Shiffman, Drapkin, Grilo, & McDermott, 1995), indicating a need for more research to understand the relationship between effective diets and relapse.
Although the etiology of obesity is recognized as being multifaceted (Brownell & Wadden, 1992), obesity sometimes results from recurrent overeating. Research findings have not indicated a strong association between obesity and emotional disturbance (Faith & Allison, 1996), although a relationship between negative mood and overeating/binge eating has been consistently reported (e.g., Arnow, Kenardy, & Agras, 1992; Van Strien, 1996; Wilson, Rossiter, Kleifield, & Lindholm, 1986; Yanovski, Nelson, Dubbert, & Spitzer, 1993). Researchers have found that binge eaters exhibit more psychopathology than normal eaters (Williamson, Prather, McKenzie, & Blouin, 1990; Yanovski et al., 1993). Furthermore, studies have reported higher rates of psychopathology for obese binge eaters than for nonobese binge eaters (e.g., Marcus, Wing, & Hopkins, 1988). In a recent study, Telch and Agras (1994) found a positive relationship between psychopathology and the severity of binge eating and concluded that obese subjects seeking weight loss treatment exhibit more psychopathology than nonclinical overweight individuals.

Stress and negative affect are the most frequently cited antecedents of overeating and binge eating (Grilo, Shiffman, & Wing, 1989; Heatherton & Baumeister, 1991; Polivy & Herman, 1985; Schlundt & Johnson, 1990; Schotte et al., 1990). Recently, Eldredge and Agras (1996) found that binge eaters report overeating during negative affective states more frequently than control subjects. Binge eaters reported experiencing a negative affective state during 84% of binge eating episodes in another study (Grilo, Shiffman, & Carter-Campbell, 1994).
Thus, the relationship between binge eating and negative mood has been consistently reported.

Negative mood is often conceptualized as an epiphenomenon of dietary restraint (Amow, Kenardy, & Agras, 1995). Some researchers have suggested that overeating or binge eating is a means of affect regulation or anxiety reduction (Johnson & Conners, 1987; Schlundt & Johnson, 1990). Support for this hypothesis is found in studies that report anxiety increases before a binge eating episode and decreases after a binge or after purging (e.g., Elmore & De Castro, 1990; Rosen & Leitenberg, 1982). In summary, there appears to be a complex relationship among obesity, binge eating, and negative affect that has received minimal empirical attention (Faith & Allison, 1996).

Dieting

As both the prevalence of obesity and the awareness of weight-related illnesses increases, so does the incidence of dieting. The main impetus of individuals wanting to lose weight stems from sociocultural pressures to be thin (Stice, 1994; Striegel-Moore, Silberstein, & Rodin, 1986). In Western culture, being thin has become synonymous with being successful (Brownell, 1991). The ideal body image in the United States is shrinking as evidenced by increasingly thinner beauty pageant winners and models, whereas the average weight of females is increasing (Stice, 1994). Chronic dieting often follows a pressure to be thin (Polivy & Herman, 1993). Individuals are seeking solutions to weight problems at a variety of places from health clubs and health food stores to weight...
loss clinics. It is estimated that 40% of women and 20% of men are currently trying to lose weight (Wadden, Barlett, Letizia, Foster, Stunkard, & Conill, 1992). Furthermore, 44% of adolescents are self-reported dieters and 26% are trying not to gain weight (Serdula et al., 1993). One study found that 82% of a sample of college females were dieting to lose or maintain weight (Jakobovits, Halstead, Kelley, Roe, & Young, 1977). Levy and Heaton (1993) reported that studies have found that as many as 50% of current dieters are not overweight. In addition, other researchers have found that 72% of overweight men and 52% of overweight women were not dieting to lose weight (Forman, Trowbridge, Gentry, Marks, & Hogelin, 1986). Thus, obesity and dieting are common, yet obese individuals are not necessarily the only persons who are trying to regulate body weight via restricted food intake.

**Dieting and Exercise**

There is a negative relationship between exercise and body weight (Grilo, 1994). In one study, lower levels of activity were found to be predictors of weight gain in women (Klesges, Klesges, Haddock, & Eck, 1992). In a recent review, Brownell (1995) concluded that inactivity is both a cause and a consequence of obesity. Research findings have suggested that regular exercise can reduce morbidity and mortality (e.g., Bouchard, Depres, & Tremblay, 1993; Blair, Goodyear, Gibbons, & Cooper, 1984; Paffenbarger, Hyde, Wing, & Hsieh, 1986), increase self-esteem and decrease depression and anxiety (Martin & Dubbert,
Thus, it is not surprising that increased exercise is often a major component of many weight loss programs (Brownell, 1995).

An investigation of physical activity in restrained eaters found that dietary restraint was not related to physical activity level, but that among the most physically active, restrained eaters ate 13.3% less fat than unrestrained eaters (Tepper, Trail, & Shaffer, 1996). These authors suggested that physical activity as well as food intake should be assessed when studying restrained eaters. A recent randomized, controlled study reported that individuals on a low-fat diet lost more weight (and more lean mass) than individuals who participated in an aerobic exercise weight loss program (Pritchard, Nowson, & Wark, 1997).

A study of weight control practices among adult dieters found that in addition to changing dietary habits 71% of females and 62% of males were exercising to lose weight (Levy & Heaton, 1993). According to this study, frequent self-weighing (71% of women and 70% of men), skipping meals (21% and 20%), and counting calories (25% and 17%) were the most common dieting practices, while walking was the most common form of exercise (58% of women and 44% of men). Levy and Heaton (1993) noted that exercise was the only weight control strategy that decreased as body mass increased. Research findings have also indicated that exercise is a consistent predictor of weight loss maintenance (Epstein, Wing, Thompson, & Griffin, 1980; Kayman, Bruvold, & Stern, 1990; Pavlou, Krey, & Steffee, 1989).
Serdula and colleagues (1993) found that over 51% of females and 57% of males were exercising at least three times per week to regulate their weight. Among these exercisers, 5.2% of females and 8.7% of males were exercising more than twice per day. It is well known that excessive exercise is sometimes used as a purgative method (Schlundt & Johnson, 1990) usually by individuals with eating disorders. Future research is needed to investigate effects of specific exercise behaviors that may be associated with positive or negative health outcomes.

**Dieting and Overeating**

Dietary restraint theory posits a causal relationship between dieting and overeating (Herman & Mack, 1975; Herman & Polivy, 1984) and has received equivocal support (Lowe, 1993; Ruderman, 1986). Dietary restraint theory argues that when conscious caloric restriction is broken overeating occurs. However, not all highly restrained eaters have been found to overeat following a disinhibiting stimulus, i.e., dietary preload and alcohol, especially when subjects are identified as restrained eaters using the Three Factor Eating Questionnaire (Stunkard & Messick, 1985) or the Dutch Eating Behavior Questionnaire (Van Strien, Frijters, Bergers, & Defares, 1986) as opposed to the Restraint Scale (Herman & Polivy, 1975; Lowe, 1993). In addition, the identification of weight suppressors or successful dieters (individuals who maintain a lower body weight than their highest weight or subjects scoring high on restraint scales and low on measures of overeating) is contrary to the predictions of dietary restraint theory (Duchmann et
The most consistent finding that can be concluded from this line of research is that a relationship between dieting and overeating exists (Polivy & Herman, 1993). Thus, dieting has been linked to overeating and the onset of binge eating, but the specific types of dieting strategies have not been identified (Wilson, 1993). Prospective studies in this area of research are needed.

Dieting and Weight Cycling

Additional negative health consequences associated with dieting have been identified such as lowered metabolic rate (Blair, Shaten, Brownell, Collins, & Lissner, 1993; Tuschl, Platke, Laessle, Stichler, & Pirke, 1990) and increased mortality as a result of weight cycling (Higgins, D'Agostino, Kannel, & Cobb, 1993). It has been argued that weight cycling, sometimes referred to as "yo-yo dieting", is associated with physiological and psychological dangers (e.g., Blair et al., 1989). Venditti, Wing, Jakicic, Butler, and Marcus (1996) recently found an association between the severity of binge eating and weight cycling. The results of this study suggested that binge eating may mediate the relationship between weight cycling and psychological problems.

After reviewing 43 studies investigating weight cycling and weight fluctuation, the National Task Force on the Prevention and Treatment of Obesity (1994) concluded that there is insufficient evidence to support the recommendation that overweight individuals should not diet because of adverse events related to weight loss. Moreover, maintaining a stable weight is considered
to be ideal for nonobese individuals (National Task Force, 1994). It was also recommended that obese individuals commit to lifelong changes to lose weight and ultimately, strive to maintain a healthy weight to ensure good health (Higgins et al., 1993).

**Dieting and Eating Disorders**

There are many similarities between dieters and individuals with eating disorders such as the presence of low self-esteem, negative affect, and binge eating episodes (French & Jeffery, 1994; Heatherton & Baumeister, 1991). Several researchers have argued that dieting predisposes individuals to develop eating disorders (Agras & Kirkley, 1986; Brownell, 1991; Polivy & Herman, 1985, 1987; Schwartz, Thompson, & Johnson, 1982; Stice, 1994; Striegel-Moore et al., 1986; Williamson, 1990). A prospective study which provided strong support for this hypothesis found that dieters were eight times more likely to develop an eating disorder than nondieters (Patton, Johnson-Sabine, Wood, Mann, & Wakeling, 1990). Heatherton and Polivy (1992) proposed a spiral model that theoretically explains the causal link between dieting and eating disorders. They hypothesized that eating disorders are the result of chronic dieting and weight loss failures which have damaged an individual's self-esteem, causing increased dysphoria and negative affect. Further support for this model is needed before drawing firm conclusions.

There is a paucity of research investigating why individuals initially begin to diet (Heatherton & Polivy, 1992). Since the ideal female body size is decreasing
in size, and the rates of eating disorders are increasing, some researchers have hypothesized that the thin-ideal body image plays an etiological role in the initiation of dieting and the development of eating disorders (Stice, 1994). Some indirect support for this hypothesis is found in the strong association between body dissatisfaction and dieting which has consistently been reported (Miller, Coffman, & Linke, 1980; Rosen, Gross, & Vara, 1987). Additionally, populations with higher rates of weight concerns also have a higher incidence of eating disorders (Wadden & Bell, 1990). However, a direct causal relationship has not been supported, since the majority of dieters never develop eating disorders (Heatherton & Polivy, 1992). A recent study concluded that it is the interaction of dieting and overeating that is most strongly associated with symptoms of anorexia and bulimia nervosa (Williamson, Lawson, et al., 1995), indicating a more complex relationship between dieting and the eating disorders. The relationship of dieting with specific pathological eating behaviors such as vomiting, fasting, tasting, and binge eating also deserves more attention from researchers.

**Dieting and Negative Mood**

Some researchers have argued that dieting is hazardous to an individual's psychological well-being (Brownell, 1991; Brownell & Rodin, 1994; French et al., 1994; Striegel-Moore et al., 1986; Williamson, 1990). Results of studies investigating the relationship between dieting and negative psychological outcomes have been mixed (French & Jeffrey, 1994). Restrained eaters have been shown to be more depressed and anxious than unrestrained eaters (Herman...
& Polivy, 1975; Rosen et al., 1987). Low-calorie dieting has been found to be associated with low-self-esteem, depression, anxiety, and nervousness (Polivy, Heatherton, & Herman, 1988; Rosen et al., 1987; Wadden & Stunkard, 1985). Furthermore, a prospective study conducted by Rosen, Tacy, and Howell (1990) concluded that dieting appears to worsen psychological functioning and to increase stress. Conversely, other studies report positive psychological events associated with dieting and weight loss such as increased self-esteem (e.g., O'Neil & Jarrell, 1992; Wing, Epstein, Marcus, & Kupfer, 1984). Variations in weight loss interventions and premorbid psychological functioning could account for these discrepancies. Some studies suggest that decreased levels of depression are associated with weight loss interventions that include behavior therapy (Wadden & Stunkard, 1988; Wing et al., 1984). Studies that investigate the relationship between specific dieting behaviors, i.e., counting calories and eating slowly, and negative affective states are needed to further elucidate the relationship between dieting and negative mood.

**Dieting and Body Image**

Investigations have suggested that dieting and body dissatisfaction are commonplace among non-eating disordered females (Polivy & Herman, 1987). With regard to the relationship between obesity and body image, overweight individuals have been found to overestimate body size (e.g., Collins, 1987). However, the relationship between general body dissatisfaction and actual body mass is unclear (Brodie & Slade, 1988; Faith & Allison, 1996). It appears that
body dissatisfaction is related to binge eating among overweight individuals (Cash, 1991). Recently, it has been reported that weight loss is associated with improvements in body satisfaction (Rosen, Orosan, & Reiter, 1995). It appears that further investigations of the relationships among obesity, dieting, and body dissatisfaction are warranted.

**Dieting and Nutrition**

The relationship between dieting and specific alterations in one's diet has been study empirically. A recent study reported that dietary fat avoidance was most prevalent in women of higher socio-economic statuses (Devine & Sandstrom, 1996). Another study found that restrained eaters reported eating less fats and oils, more fat-free dairy products, less red meat, and more vegetables and fruits than unrestrained eaters (Tepper et al., 1996). However, this study did not find a difference in overall energy intake between the groups. Gibson (1996) reported that intake of high sugar foods was inversely related to body mass index in men. It was suggested that diets high in sugar are not associated with obesity. Further investigations of the relationship among specific foods, dieting, and obesity are needed to clarify such findings.

**Dieting Strategies**

Recently, some studies have indicated that not all dieting behaviors are associated with negative outcomes (French et al., 1995; Lawson et al., 1995; Smith et al., in press; Westenhoefer, 1991; Westenhoefer, Pudel, & Maus, 1990; Williamson, Lawson, et al., 1995). Westenhoefer (1991) conducted the first study
evaluating the association of different dieting behaviors with overeating. Results indicated that individuals who engage in strict dieting behaviors were more likely to report overeating than individuals who endorsed more flexible dieting strategies such as limiting portion sizes and being conscious of food intake. Items of the Dietary Restraint scale of the Three Factor Eating Questionnaire (TFEQ-R; Stunkard & Messick, 1985) were utilized to predict scores on the Disinhibition scale of the same measure (TFEQ-D) which evaluates overeating. Two sets of dieting strategies representing distinct behavioral domains were found. One subscale, Flexible Control (FC), contained items describing dietary consciousness and eating less after breaking a diet. The other subscale, Rigid Control (RC), was comprised of items indicating strict dieting and calorie counting. The FC scale was negatively correlated with the TFEQ-D whereas the RC scale positively correlated with overeating. The results of this study suggested that certain dieting strategies are not be associated with overeating. A recent study by Shearin, Russ, Hull, Clarkin, and Smith (1994) found that the FC scale predicted symptoms of anorexia nervosa and was negatively correlated with body mass index (BMI). In contrast, they found the RC scale was correlated with symptoms of bulimia nervosa and weight fluctuation. Similarly, Williamson, Lawson, et al. (1995) found that both the FC and RC scales mediated the relationship between BMI and overeating.

The relationship between overeating, dietary restraint, body mass, and mood was recently investigated (Smith et al., in press). These authors found that certain dieting behaviors were associated with overeating, dysphoric mood, and
body mass while others were not. Canonical correlation was performed using the items of the TFEQ-R as one set of variables and the items of the TFEQ-D scale along with body mass index (BMI), Beck Depression Inventory (BDI) score, and State-Trait Anxiety Inventory-Trait scale (STAI-T) score as the other set of variables. Three significant canonical correlations were found. The strongest correlation was the relationship between flexible dieting and a) lower levels of depression and anxiety, b) lower body mass, and c) a low incidence of overeating. The second correlation was the relationship between calorie counting and extreme dietary restriction with increased body mass and overeating primarily when alone. The third correlation associated low dietary restriction with binge eating. Similar to the Westenhoefer (1991) study, the results of this study suggested that overeating may be associated with some dieting strategies and not others.

The two studies aforementioned independently identified a set of rigid, restrictive, dieting strategies that were associated with overeating and increased body mass. In addition, both studies found a set of flexible, less restrictive dieting behaviors that were associated with a low frequency of overeating and lower body mass (Smith et al., in press; Westenhoefer, 1991). Furthermore, both investigations utilized the Dietary Restraint and Disinhibition scales of the TFEQ to derive these sets of dieting behaviors. It is notable, however, that although the sets of behaviors found in each study were conceptually related, they did not contain the same questions of the TFEQ. Only four of Westenhoefer's (1991) seven FC scale items were moderately correlated with the first canonical
correlation in the Smith et al. (in press) study which represented successful dieting behavior. Furthermore, only three of the seven items of the RC scale were correlated with the second canonical variate which described unsuccessful dieting. Although a conceptual similarity was evident, it appears that the TFEQ is not designed to adequately assess the wide range of dieting strategies and their relationships with overeating and obesity.

Recently, French et al. (1995) studied the dieting behaviors of a large sample of adolescent females. Binge eating and weight fluctuation were reported more frequently by participants who used unhealthy dieting practices (i.e., fasting and vomiting) or who attended clinic weight loss programs than by participants who engaged in healthy dieting behaviors such as decreasing fat intake and exercising. Additionally, healthy weight control behaviors were much more prevalent than unhealthy behaviors (i.e., exercise = 32.4% and lowered fat intake = 26.0% vs. fasting = 8.1% and vomiting = 4.4%).

Given the concern surrounding the advantages and disadvantages of dieting, it appears there is a need for a measure capable of evaluating a wide range of weight control practices (French & Jeffery, 1994; French et al., 1994). The relationships of dieting strategies with exercise, overeating, eating disorder symptoms, and negative mood, have not been given adequate empirical attention. A measure that assesses all these domains would be practical and useful in clinical and research settings.
Review of Existing Measures

There are many self-report measures that evaluate dietary restraint (and dieting), exercise, body dissatisfaction, emotional eating, overeating, and pathological eating. The following sections review relevant inventories assessing these constructs.

Measures of Dietary Restraint and Dieting

There are three main self-report measures that assess the presence and severity of dietary restraint in clinical and nonclinical populations. These include: the Restraint Scale (RS; Herman & Polivy, 1975), the Three Factor Eating Questionnaire’s Dietary Restraint Scale (TFEQ-R; Stunkard & Messick, 1985), and the Restraint scale of the Dutch Eating Behavior Questionnaire (DEBQ-R; Van Strien et al., 1986). Two additional measures, the Eating Behavior Inventory (EBI; O’Neil et al., 1979) and the Cognitive Behavioral Dieting Scale (CBDS; Martz, Sturgis, & Gustafson, 1996), evaluate weight control practices and current dieting, respectively.

The Restraint Scale (RS) was developed by Herman and Polivy (1975) to measure dietary restraint which was defined as the intent to restrict caloric intake. The current RS contains 10 items (Herman & Polivy, 1980). While internal consistency of the RS has been found to be adequate for normal weight subjects (r = .72 -.86) (Allison, Kalinsky, & Gorman, 1992; Johnson, Lake, & Mahan, 1983; Ruderman, 1983), it was found to be less reliable for obese populations (r = .51) (Ruderman & Christensen, 1983). The RS has two factors: weight fluctuation
(WF) and subjective concern for dieting (CD) (Herman & Polivy, 1975). The factor structure of the RS varies across obese and normal weight samples (Ruderman, 1986). The results of several studies that have investigated the construct validity of the RS are conflicting (Gorman & Allison, 1995). Drewnowski, Riskey, and Deser (1982) found that obese subjects scored higher than normal weight subjects on the total RS and WF subscale whereas overweight individuals scored lower on the CD subscale. Other researchers found a negative correlation between the RS score and caloric intake (Laessle, Tuschl, Kotthaus, & Pirke, 1989). Gorman and Allison (1995) concluded that the RS scale is best described as a multiple-factor measure since it was intended to reflect eating patterns of dieters who periodically lose control and overeat. Overall, the RS does not appear to be a good predictor of dieting and eating behavior.

In response to some of the psychometric problems of the RS, Stunkard and Messick (1985) developed the Three Factor Eating Questionnaire (TFEQ). This 51-item questionnaire was constructed by revising the items from the RS and adding new items generated by eating behavior experts. Factor analysis found three stable factors: Dietary Restraint, Disinhibition, and Perceived Hunger. Good test-retest reliability and high internal consistency has been reported for the TFEQ-R ($r = .91 - .93$) (Allison et al., 1992; Stunkard & Messick, 1985; Van Strien et al., 1986). Laessle et al. (1989) found that high TFEQ-R scores correlated with lower caloric intake. The relationship between high restraint scores and obesity is not strong (Gorman & Allison, 1995). However, recent research findings suggest that
high TFEQ-R scores may moderate the effects of overeating, i.e., increased body mass and obesity (Williamson, Lawson, et al., 1995). Westenhoefer (1991) found that the TFEQ-R scale contains Flexible Control (FC) and Rigid Control (RC) subscales which have negative and positive correlations with the TFEQ's Disinhibition scale, respectively. Overall, the TFEQ-R scale has been found to be a valid measure of dieting behavior and intent to diet (Allison et al., 1992; Laessle et al., 1989); however, it does not evaluate the full spectrum of weight control practices, i.e., exercising and vomiting after eating.

The third inventory specifically designed for evaluating dietary restraint is the Dutch Eating Behavior Questionnaire (DEBQ: Van Strien et al., 1986). The DEBQ is a 33-item questionnaire that evaluates three factors: restrained eating, emotional eating, and external eating. Although not as widely studied as the RS and the TFEQ-R, the DEBQ-R has also been validated as a measure of dietary restraint (Laessle et al., 1989). Test-retest reliability has been found to be high (Allison et al., 1992). A recent study suggests that high scores on the DEBQ-R are associated with dieters who report more failures at dieting than successes (Ogden, 1993). This study also found that the DEBQ-R represents two components of dieting: dieting intention and actual dieting, indicating that dietary restraint ranges from cognitions about restricting eating to overt restrictive behaviors (Gorman & Allison, 1995).

The Eating Behavior Inventory (EBI; O'Neil et al., 1979) is a 26-item self-report questionnaire that evaluates weight control practices and general eating
behavior. Three factors were ultimately derived from factor analysis of the EBI: control of eating, attention to weight, and stimulus control (Currey, O'Neil, Malcolm, & Riddle, 1983). Good internal consistency and test-retest reliability was reported.

A fairly new measure of dieting, the Cognitive Behavioral Dieting Scale (CBDS; Martz et al., 1996), was developed to separate the construct of dieting from the construct of dietary restraint, based on the literature suggesting that these two constructs are independent from one another (Lowe, 1993). Preliminary investigations suggest that the 14-item CBDS has satisfactory reliability (alpha = .95 and test-retest \( r = .95 \)) and validity as a measure of current dieting.

**Measures of Exercise and Physical Activity**

Individuals usually engage in exercise to obtain physical fitness, i.e., weight loss or cardiovascular fitness. Exercise is considered a subcomponent of physical activity which is any activity that involves muscle movement such as working or cleaning. Both exercise and physical activity have been found to be associated with health benefits (Paffenbarger et al., 1986). Several questionnaires of physical activity have been developed including the Activity Survey (Paffenbarger, Wing, & Hyde, 1978), Minnesota Leisure-Time Physical Activity Questionnaire (Taylor, Jacobs, Schucker, Knudsen, Leon, & DeBacker, 1978), the Baecke (Baecke, Burema, & Fritjers, 1982), the Seven-Day Physical Activity Questionnaire (Blair, 1984), and the Commitment to Exercise Scale (Davis, Brewer, & Ratusny, 1993).
Paffenbarger and colleagues (1978) developed the Activity Survey to evaluate the amount of activity in which an individual engages during an average week. Questions about walking, climbing stairs, and playing sports are included. This survey is considered to be a reliable measure of change in activity (Shelton & Klesges, 1995). The Minnesota Leisure-Time Questionnaire developed by Taylor et al. (1978) is administered by an interviewer and evaluates physical activity over the past year. This questionnaire has been found to be correlated with physical fitness and caloric intake (Washburn & Montoye, 1986). In a review of physical activity measures, Shelton and Klesges (1995) concluded that the Minnesota Leisure-Time Questionnaire is a reliable, yet time consuming measure that is difficult to score.

The Baecke is a 16-item questionnaire designed to assess habitual physical activity over a 1 year period (Baecke et al., 1982). It has been found to adequately evaluate physical activity relating to work, leisure time, and sporting activities.

The Seven-Day Physical Activity Recall (PAR) developed by Blair (1984) assesses physical activity over the past seven days and categorizes activities in terms of intensities. The PAR is considered to be most useful in evaluating changes in physical activities (Shelton & Klesges, 1995). A somewhat different measure, the Commitment to Exercise Scale (CES; Davis et al., 1993), is an eight item questionnaire designed to evaluate an individual’s commitment to exercising. The CES was found to have two factors: obligatory exercising and pathological exercising. Further validation for this measure is needed.
Measures of Overeating

Many self-report inventories of overeating and binge eating have been developed. Among the most commonly used are the Disinhibition scale of the TFEQ (TFEQ-D; Stunkard & Messick, 1985), the Binge Eating Scale (BES; Gormally, Black, Daston, & Rardin, 1982), the Bulimia Test-Revised (BULIT-R; Thelen, Farmer, Wonderlich, & Smith, 1991), the external eating scale of the DEBQ (Van Strien et al., 1986.), and the Questionnaire on Eating and Weight Patterns-Revised (QEWP-R; Yanovski, 1993).

The Disinhibition scale of the TFEQ measures overeating independent of caloric restriction (Heatherton, Herman, Polivy, King, & McGree, 1988; Westenhoefer et al., 1990; Williamson, Lawson, et al., 1995). Good internal consistency has been reported (Stunkard & Messick, 1985). Lowe and Caputo (1991) found that the TFEQ-D along with the restraint and hunger scales accurately predicts binge eating. This scale has also been found to correlate with the TFEQ’s perceived hunger scale (Williamson, Lawson, et al., 1995). In a recent study, high scores on the TFEQ-D scale were found to be associated with increased caloric consumption and a faster rate of eating when compared to low scores (Smith et al., 1995).

The DEBQ contains a scale that evaluates external eating. It has been found to have adequate internal consistency, coefficient alpha of .80 (Van Strien et al., 1986). Wardle (1987) found that bulimics scored higher on the external
eating scale than anorexics and obese individuals. High correlations with the TFEQ-D have also been reported (Hill, Weaver, & Blundell, 1991).

The Binge Eating Scale (BES; Gormally et al., 1982) was developed to evaluate binge eating in the obese. The BES is a 16-item measure that assesses behaviors, thoughts, and feelings associated with binge eating. The authors report that total BES scores significantly differ across severity of binge eating behavior.

Binge eating and purging behaviors are evaluated by the Bulimia Test-Revised (BULIT-R; Thelen et al., 1991). The authors report high internal consistency (r = .97) and good test-retest reliability (r = .95). The BULIT correlates with the frequency of bulimic behaviors (Williamson, Davis, Bennett, Goreczny, & Gleaves, 1989). Furthermore, Williamson and colleagues (1990) found that the BULIT discriminated subjects diagnosed with bulimia nervosa, obesity, and nonclinical controls.

The Questionnaire on Eating and Weight Patterns-Revised (QEWP-R; Yanovski, 1993) also assesses binge eating and purging. It was designed to diagnose binge eating disorder based on DSM-IV criteria (American Psychiatric Association, 1994). The QEWP-R has adequate internal consistency (.75 - .79) and established validity (Yanovski, Leet, & Yanovski, 1992).

**Measures of Pathological Eating**

Pathological eating behavior such as binge eating, self-induced vomiting, and fasting are common symptoms of eating disorders. There are several measures of pathological eating behavior including the Eating Attitudes Test
(Garner & Garfinkel, 1979), the Eating Disorder Inventory-2 (EDI-2; Garner, 1991), and Eating Questionnaire-Revised (EQ-R; Williamson, Davis, Goreczny, Bennett, & Watkins, 1987). As mentioned in the previous section, the BULIT-R, BES, and QEWP-R are also measures of disordered eating behavior. Specifically, all three measures adequately assess binge eating behaviors, and the BULIT-R also evaluates purgative behaviors such as self-induced vomiting and abuse of laxatives and/or diuretics.

The Eating Attitudes Test (EAT) was developed by Garner and Garfinkel (1979) to measure anorexic cognitions and behaviors. The EAT is one of the most extensively used rating scales in eating disorder research (Schlundt & Johnson, 1990). The reliability and validity of the EAT is well established. The EAT has been found to differentiate individuals with eating disorders and control subjects (Garner & Garfinkel, 1979; Prather & Williamson, 1988; Williamson, Cubic, & Gleaves, 1993), although the measure has not been found to be able to distinguish anorexia nervosa from bulimia nervosa (Williamson et al., 1993).

The Eating Disorders Inventory (EDI; Garner, Olmsted, & Polivy, 1983) evaluates cognitive and behavioral characteristics of anorexia and bulimia nervosa. The EDI-2 (Garner, 1991) contains the original eight scales along with three provisional scales. Ebernez and Gleaves (1995) reported adequate reliability and validity for the original eight scales. The EDI-2 appears to be an adequate measure of treatment outcome (Williamson, Anderson, Jackman, & Jackson, 1995).
The Eating Questionnaire-Revised (EQ-R; Williamson et al., 1989) was developed to evaluate bulimia nervosa symptoms. The authors reported good internal consistency and test-retest reliability. The EQ-R is correlated with the BULIT-R and the EAT and is able to discriminate individuals with eating disorders from nonclinical controls (Williamson et al., 1989).

**Measures of Emotional Eating**

According to a review by Polivy and Herman (1993), the most commonly cited elicitors of binge eating/overeating are stress and negative mood. However, only a few self-report inventories are designed to assess emotional eating. Ganley (1988) found that the TFEQ-D has two factors: weight lability and emotional eating. The emotional eating factor contains only six items which are answered in a true-false format. No additional studies have examined this factor. The DEBQ contains an emotional eating scale that contains 13 items and is composed of two factors: eating to diffuse emotion and eating while experiencing an emotion (Van Strien et al., 1986). Hill et al. (1991) found a high correlation between food craving and the DEBQ’s emotional eating scale.

Recently, Arnow et al. (1995) developed the Emotional Eating Scale (EES) to assess eating as a means of coping with negative emotions in obese individuals. Factor analysis revealed three factors: Anger/Frustration, Anxiety, and Depression. The authors reported adequate internal consistency. Discriminant validity was supported in that the EES did not correlate highly with measures of general psychopathology. All three subscales correlated positively with one week
recall of binge eating indicating that higher rates of binge eating are related to the desire to eat during negative affective states (Amow et al., 1995).

**Measures of Body Dissatisfaction**

Disturbance in the way in which one perceives his/her body is common among individuals with eating disorders (Thompson, 1996a; Williamson, 1990) and overweight individuals (Stunkard & Burt, 1967). Researchers have argued that assessment and treatment of body image disturbance is an essential component in weight loss treatment (Brownell & Rodin, 1994; Garner & Wooley, 1991). Several measures of body image disturbance have been developed including the EDI-2's Body Dissatisfaction scale (Garner, 1991), the Multidimensional Body Self Relations Questionnaire's Body Areas of Satisfaction subscale (MBRSQ-BASS; Brown, Cash, & Milulka, 1990), the Body Shape Questionnaire (BSQ: Cooper, Taylor, Cooper, & Fairburn, 1987), and the Mirror Distress Rating (Butters & Cash, 1987).

The Body Dissatisfaction scale of the EDI-2 evaluates an individual's body image concern by measuring agreement with statements describing body parts being too large (Garner, 1991). This subscale has been found to be a reliable measure among eating disordered adolescents and children (Shore & Porter, 1990).

The MBRSQ-BASS evaluates satisfaction with eight body areas, including areas associated with weight and non-weight-related areas (Brown et al., 1990). The BSQ contains 34 items that measure excessive concern with body size
(Cooper et al., 1987). A recent study found the BSQ to have satisfactory validity (Rosen, Jones, Ramirez, & Waxman, 1996).

The Mirror Distress Rating evaluates discomfort level of individuals after viewing themselves in a mirror for 30 seconds (Butters & Cash, 1987). The rating is based on the Subjective Units of Distress scale (SUDS). Satisfactory validity has been reported for this measure (Fisher & Thompson, 1994).

There are also several measures of body image dissatisfaction that utilize silhouettes including the Body Image Silhouette Scale (Powers & Erickson, 1986), the Breast/Chest Rating Scale (BCRS; Thompson & Tantleff, 1992) and the Body Image Assessment (BIA; Williamson, Davis, Bennett, Goreczny, & Gleaves, 1989). The BIA has been proven to be valid and reliable measures of body image disturbance in individuals with eating disorders as well as obesity. In addition, body image concerns can be adequately assessed using computer programs and video equipment (Thompson, 1996a).

**Measures of Dieting Self-Efficacy**

Several scales have been developed to assess certain aspects of dieting such as responses to temptation and perceived self-efficacy. Four such inventories are reviewed: the Situation-Based Dieting Self-Efficacy Scale (SDS; Stotland, Zuroff, & Roy, 1991), the Dieter's Inventory of Eating Temptations (DIET; Schlundt & Zimering, 1988), the Situation Appetite Measure (SAM; Stanton, Garcia, & Green, 1990), and the Eating Self-Efficacy Scale (ESES; Glynn & Ruderman, 1986).
The Situation-Based Dieting Self-Efficacy Scale (SDS) was developed by Stotland et al. (1991) to measure a dieter's self-efficacy in a variety of situations. The authors reported good internal consistency ($r = .95$) and adequate test-retest reliability ($r = .80$). After eating a dietary preload, subjects scoring low on the SDS ate significantly more than subjects scoring high, suggesting the SDS has adequate predictive validity. The SDS was moderately correlated with social desirability and did not correlate with body mass (Stotland et al., 1991).

The Dieter's Inventory of Eating Temptations (DIET; Schlundt & Zimering, 1988) is a measure of overweight individuals' self-reported weight control competence in specific situations. Factor analysis found five stable factors in this 40-item questionnaire: negative emotional eating, exercise, craving sweets, overeating, and food preparation with coefficient alphas ranging from .73 to .87. All of the DIET's factors correlated with increased body mass index (Schlundt & Zimering, 1988), indicating that the inability to remain in control in terms of dieting in tempting situations increases with body weight.

Similar to the DIET and the SDS, the Situation Appetite Measure (SAM; Stanton et al., 1990) evaluates a dieter's self-control in difficult situations. One version, the SAM-U assesses the urge to eat, whereas another version, the SAM-E, measures self-efficacy. The authors reported adequate reliability and validity. The SAM was found to be highly correlated with the negative affect scale of the Eating Self-Efficacy Scale (ESES; Glynn & Ruderman, 1986). The ESES is another measure evaluating dieter's self-efficacy in high risk situations. The ESES
is a 25-item questionnaire that contains two factors: negative affect and socially acceptable circumstances. The authors report a coefficient alpha of .92, and test-retest reliability was found to be adequate \((r = .70)\). A relative increase in self-efficacy as measured by the ESES was found in a sample of individuals in a weight loss program over the course of treatment (Glynn & Ruderman, 1986).

**Drawbacks of Existing Measures**

The three dietary restraint scales and two eating behavior and dieting scales previously reviewed have demonstrated adequate reliability and validity. Although several researchers have concluded that the dietary restraint scales evaluate separate constructs; therefore, they are not interchangeable (Gorman & Allison, 1995; Heatherton et al., 1988; Heatherton & Polivy, 1992; Lowe, 1993; Van Strien, 1996). In addition, this makes interpretation of the construct of dietary restraint confusing. When evaluation of specific dieting behaviors is desired, there are limitations to these measures as well as the EBI and CBDS. Specifically, these scales do not contain enough items to represent the wide range of weight control strategies that exist. This is not surprising since they were designed to measure intent to eat restrictively and since two of the inventories (TFEQ-R and DEBQ-R) were factorially derived which results in homogeneity of items. A measure that evaluates the full spectrum of weight control strategies is needed.

While measures that assess exercise frequency and physical activity typically evaluate a broad spectrum of behaviors, they are separate from measures that evaluate dietary strategies, disordered eating, overeating, and
emotional eating. Some eating disorder measures contain a few questions about excessive exercising, i.e., BULIT-R, but none assess exercise behaviors along with other weight control practices.

As noted earlier, there are several self-report inventories that assess the ability of overweight individuals or dieters to maintain self-control in tempting or high risk situations. Although items describing specific situations during which remaining on a diet might be difficult are included, these measures were not designed to evaluate specific dieting strategies. Thus, these scales focus on high risk situations as opposed to high risk behaviors. A measure that identifies unhealthy dieting behaviors and cognitions relative to overeating and emotional eating is needed so that certain behaviors that result in dieting failure can be targeted in health promotion and weight loss efforts.

Several psychometrically sound measures that assess overeating and binge eating have been developed. There are also self-report inventories that evaluate both dietary restraint and overeating (e.g., TFEQ and DEBQ). However, a multidimensional self-report inventory that evaluates overeating in relation to a wide range of weight control behaviors including dietary alterations and exercise does not exist. Given the consistently reported association between dieting and overeating, such a measure would be useful in further evaluating this relationship.

There are several inventories of disordered eating that are considered to be very reliable and valid measures of pathological eating. However, there are no measures of eating disorder symptoms that also evaluate the full range of eating
and dieting behaviors, and weight control strategies, including exercise, emotional eating, nonpathological dieting strategies, and overeating. A comprehensive questionnaire comprised of these important aspects of dieting and eating behavior could be used with clinical and nonclinical obese and eating disordered populations.

Measures of eating during negative affective states range from a subscale of a multidimensional measure to an entire inventory focused on evaluating emotional eating. The relationship between dieting and negative moods has received some attention from researchers, yet few conclusions have been reached. Therefore, a multidimensional scale that evaluates both constructs, emotional eating and weight control behaviors, would be desirable to aid in further investigations in this area.

For many years, researchers have indicated that body image disturbance is associated with eating disorders and obesity. Even though there are numerous methods for assessing body image concerns available, very few measures have attempted to measure body dissatisfaction along with other behavioral domains associated with eating and weight problems such as exercise, overeating, and emotional eating.

To summarize, there are several self-report inventories that have proven useful in evaluating dietary restraint, exercise, overeating, disordered eating, overeating during negative affective states, and overconcern with body shape. However, it appears that a measure assessing the full range of dieting behaviors
along with these related constructs is needed. In clinical populations, a battery of self-rating scales is often administered to patients which is often time-consuming and sometimes, costly. A single measure assessing multiple areas of eating behavior and exercise would be convenient, practical, and less time consuming. Given the increasing rates of dieting and obesity and the heightened interest in developing effective weight management programs, a multidimensional measure assessing these critical domains would be useful in clinical and research applications.

Other Methods of Evaluating Dieting and Overeating

In addition to self-report measures, there are other methods of evaluating eating habits, specifically, dieting behaviors and overeating. Using a behavioral assessment technique such as a standardized test meal administered across a variety of settings can aid in the assessment of an individual’s propensity to eat restrictively and/or to overeat. A major drawback of this type of assessment is that test meals are time intensive and expensive. Also, individuals may change their behavior as a result of being closely monitored.

Self-monitoring is another useful behavioral assessment method which can aid in the development of a functional analysis of eating behavior. An individual’s eating behavior can be assessed by self-monitoring amount and type of food eaten, time of day of eating, environmental setting, and mood prior to, during, and after eating (Schlundt & Johnson, 1990; Williamson, 1990). Exercise can also be monitored in this way. A limitation is that the self-monitoring procedure itself can
alter an individual's eating behavior (Schlundt, 1995). Also, subjects are sometimes noncompliant with the procedure, and the accuracy of the record cannot be checked. Studies have found that obese and lean individuals often underreport their actual caloric intake (Bandini, Schoeller, Cyr, & Dietz, 1990; Schoeller, 1990). Another limitation of self-monitoring is that specific dieting strategies are not noted, and therefore, can only be inferred from factors such as food choices and amount eaten.

**Predicted Behavioral Domains of the Current Measure**

Based on the review of this literature, some dieting strategies appear to be associated with overeating, eating disorder symptoms, and negative affect. Recent investigations have suggested that not all dieting behaviors are associated with these negative outcomes. It was predicted that the current measure would evaluate the following domains: dietary strategies, exercise, overeating, pathological eating, and emotional eating.

**Dietary strategies**

Since recent research findings suggest that there are at least two categories of dieting behaviors, healthy (flexible) and unhealthy (rigid) (French et al., 1994; Smith et al., in press; Westenhoefer, 1991) that are differentially related to overeating, the MMEBE was constructed so that a wide range of dieting behaviors and cognitions were represented such as lowering fat intake and being conscious of what one eats. It was predicted that factor analysis would derive two
scales of dieting strategies: one associated with positive behavioral outcomes and one less healthy scale that would be associated with overeating.

**Overeating**

As previously mentioned, the association between dietary restraint and overeating has been debated for several years (Herman & Polivy, 1975; Lowe, 1993; Polivy & Herman, 1985). In order to further evaluate this relationship, the current measure was intended to contain a scale that assesses overeating in a variety of situations. It was predicted that this scale, in conjunction with the predicted scales of healthy and unhealthy dieting strategies, would be useful in providing information about specific dieting behaviors that are commonly associated with overeating.

**Exercise**

Since comprehensive weight loss programs typically include some form of physical activity, exercise was also included as a domain in the current measure. In addition to evaluating the frequency and specific types of physical activity, this scale was predicted to assess motivation for exercising such as cardiovascular fitness and weight management.

**Pathological eating**

Since many researchers have suggested a causal relationship between dieting and the development of eating disorders, the current measure included a scale of pathological eating behavior that was comprised of behaviors typically observed in eating disordered individuals including self-induced vomiting, binge
eating, and tasting (chewing, but not swallowing food). It was expected that this scale in conjunction with both dieting scales, would provide information about the relationships among these constructs.

**Emotional Eating**

Overeating during and after negative affective states has received considerable empirical attention (e.g., Amow et al., 1995; Schlundt & Johnson, 1990; Schotte et al., 1990; Telch & Agras, 1994). Although not as well-studied as the association of negative affect and overeating, there is some evidence of a relationship between dieting and negative mood (e.g., Amow et al., 1995; Herman & Polivy, 1975; Rosen et al., 1987). The current measure was designed to contain a scale that evaluates the domain of emotional eating during negative affective states such as depression, anxiety, and anger, so that relationships of negative emotions with overeating and dieting can be better studied.

**Specific Aim**

Based on the above review of the relevant literature, it appears that some dieting strategies are associated with overeating, eating disorder symptoms, and negative affect. However, recent investigations have suggested that not all dieting behaviors are associated with these negative outcomes. In addition, dieting has not been adequately defined among researchers (French et al., 1994). A measure that evaluates a wide range of behaviors and cognitions that are associated with dieting and overeating is needed to address these issues as well as other unanswered questions. A specific aim of the current study was to develop such
a multidimensional measure to evaluate a wide range of eating behavior and
dieting strategies including extreme weight control practices, exercise, overeating,
body dissatisfaction, and emotional eating. A second aim of the current study was
to assess the reliability and validity of this measure. The present research
includes the empirical development of the Multidimensional Measure of Eating
Behavior and Exercise (MMEBE). The MMEBE development included item
construction, factor analysis, test-retest reliability, and a validation study.
Study 1: Item Construction and Factor Analysis

The first study consisted of two phases. Phase 1 included item construction, and Phase 2 included factor analysis and scale reduction to construct a preliminary measure to use in a validation study.

Phase 1: Method

Participants

Ninety-two college undergraduates (81% females and 19% males) from a large university were recruited for Phase 1. The sample was predominantly Caucasian (83%). Ages of the participants ranged from 18 to 29 with a mean age of 20.16 (SD = 1.90). Mean Body Mass Index (BMI) calculated from self-reported height and weight was 21.98 (SD = 3.90). Twenty-three percent of the subjects reported that they were “always” or “often” dieting, while 29% indicated that they “sometimes” dieted.

Materials

Questionnaire of Dieting and Overeating. This questionnaire was specifically designed for Phase 1 to gather information from participants regarding specific dieting strategies that they have used or that they knew other people had used in an attempt to lose weight. In addition, participants were asked to describe situations during which people overeat or that provoke overeating. Demographic information was also obtained using this questionnaire including age, ethnicity, and gender. Self-reported height and weight were obtained to calculated BMI.
The TFEQ is a 51-item questionnaire that evaluates three constructs: dietary restraint, disinhibition, and perceived hunger. The TFEQ was used to describe the participants of Phase 1.

Procedure

After signing a consent form, participants were asked to complete the Questionnaire of Dieting and Overeating and the TFEQ. The dieting strategies and overeating situations described by the participants were used to develop items for the MMEBE. Besides polling research participants, items were constructed from the extant literature, from consulting with researchers and graduate students in the area of eating behavior, and by revising relevant items of existing measures.

Results

The research participants scored the following on the three scales of the TFEQ: Dietary Restraint (M = 10.08, SD = 5.57), Disinhibition (M = 5.53, SD = 3.12), and Hunger (M = 6.61, SD = 3.95). These scores were within the normal range of these scales (Stunkard & Messick, 1985). In terms of weight control strategies, participants described an average of 3.80 (SD = 2.34) dieting behaviors ranging from "counting fat grams" to "regular exercise". Participants described several overeating situations (M = 5.53, SD = 2.06) such as overeating when depressed, after drinking alcohol, and after exercising. The initial version of the MMEBE contained 131 items assessing weight control practices, overeating, exercise, and emotional eating.
Phase 2: Method

Participants

This sample consisted of 533 research participants (57.2% females and 42.8% males). The participants were primarily Caucasian (78.2%). The remaining respondents were African American (11.8%), Asian (4.3%), Hispanic (3.0%), or from another ethnic group (2.7%). Twenty-one percent (21%) of the participants indicated that they were currently dieting to lose weight, while 54% reported that they were currently watching what they ate to maintain their current weight. When asked, “How often do you diet?”, participants endorsed the following responses: 5.5% “always”, 11.2% “often”, 22% “sometimes”, 26.1% “rarely”, and 35.2% “never”. Ages of the participants ranged from 17 to 56 with a mean age of 22.6 (SD = 6.8). The mean BMI calculated from self-reported height and weight was 23.3 (SD = 6.8).

Materials

131-item Multidimensional Measure of Eating Behavior and Exercise (MMEBE). Participants were asked to rate each item of the MMEBE on a 5-point Likert scale ranging from “always” to “never/not at all”.

Marlowe-Crowne Social Desirability Scale (SD; Crowne & Marlowe, 1964). The SD measures an individual’s tendency to respond in a socially desirable way. Scores range from 0 to 33. Mean SD score for the Phase 2 sample was 16.01 (SD = 5.24). The SD is a common external criterion for item selection (Spector, 1992). Items that positively correlated with the SD total score were discarded.
Procedure

Specifications for the measure were determined according to Spector's (1992) recommendations of scale development. A large portion of the MMEBE items (44%) were written to be reversed scored in an attempt to reduce response bias. Readability of the MMEBE was evaluated using Grammatik for WordPerfect (1994) and was found to be on a 5th grade reading level by the Flesch-Kincaid grade level test. The MMEBE's Flesch Reading Ease score was 87 (on a scale of 1-100). In addition, the words used in the measure had an average of 1.24 syllables.

As recommended by Haynes, Richard, and Kubany (1995), content validation was established. Five individuals (2 Ph.D. and 3 Master's level clinicians) with knowledge of eating behavior and exercise categorized the initial pool of 131 items into one of four groups: dieting strategies, exercise, negative affect, and overeating. Each rater was given definitions for the categories. Eight items were discarded because they were categorized differently by more than one rater (< 80% agreement).

Informed consent was obtained from the research participants. The preliminary 131-item measure and the SD were administered to the male and female participants. The first 35 participants were polled to ensure that the instructions were fully comprehensible. Factor analysis and subsequent scale reduction techniques were performed on the MMEBE.
Results

Prior to item analysis, eight additional items were deleted because of positive correlations (p < .01) with the SD total score.

Factor Analysis

Principal components analysis with orthogonal varimax rotation was performed through SPSS-PC 6.0 (Norusis, 1988) to determine the factor structure of the 115 remaining items of the MMEBE. An orthogonal rotation was chosen as opposed to an oblique rotation based on the low to moderate factor correlations and the presence of less than 10% item loading overlap (Tabachnich & Fidell, 1989). There were 28 Eigenvalues greater than 1. Based on the results of a scree test (Cattell, 1966), six factors were retained with Eigenvalues greater than 1.4. The six factors were associated with Eigenvalues of 5.80, 3.78, 3.37, 2.14, 1.56, and 1.45, respectively, accounting for 53.2% of the total variance. Only items with factor loadings ≥ .4 on one factor and < .4 on all other factors were retained.

The first factor initially contained 30 items predominantly related to excessive concern with body shape and eating in general. Seven of these items were deleted because they did not conceptually relate to the meaning of the majority of items. Factor 1 was named Overconcern with Body Size and Eating.

The second factor contained ten items that essentially described exercise behavior and a positive attitude toward physical activity. Two items of the second
factor were deleted because they did not describe physical activity or thoughts about exercise. Factor 2 was labeled Exercise.

Factor 3 contained 12 items describing behaviors and situations associated with overeating. All of the items of the third factor were related to this construct; thus, all 12 were retained for further analyses. This factor was named Overeating.

The fourth factor contained eight items that described avoidance of sweets and foods high in fat content. All eight items of Factor 4 were retained, and the scale was labeled Avoidance of Fattening Foods and Sweets.

Factor 5 consisted of ten items suggesting overeating during negative affective states. Three items were deleted because they were not conceptually related to the predominant construct. This factor was called Emotional Eating.

The sixth factor initially contained ten items that described extreme weight control practices. Three items that were not directly related to this behavioral domain were discarded. Factor 6 was named Extreme Weight Control.

Multiple Regressions

To reduce the total number of items of the MMEBE, stepwise multiple regressions were performed for each factor using the total score as the independent variable and the individual items of each scale as dependent variables. Using a minimum R Square of .90 as a cut off, it was decided that the first seven items entering the equation would be retained for each factor. Tables 1-6 display the variables, multiple R, R square, adjusted R square, F value, and significance of the first seven items of each factor. The second version of the
MMEBE contained 42 items (7 items per factor). Table 7 displays the rotated factor matrix of the remaining items of the MMEBE.

**Reliability**

Coefficient alphas (Cronbach, 1951) were calculated to evaluate internal consistency of each factor. Internal consistency reflects the item intercorrelation and indicates that the same underlying construct is being measured by the items. According to Nunnally (1978) coefficient alphas should be .70 or higher to demonstrate adequate internal consistency. Moderate internal consistency would be expected from a multidimensional measure containing scales that are intended to evaluate a wide range of behaviors. Table 8 illustrates the reliability coefficients for the six scales and for the total measure. All alphas were greater than .70 and ranged from .72 to .86.

Finally, to assess for the possibility of a response bias, the mean subtotals of all positively worded items and all reverse-scored items were compared. The mean response for positively worded items (M = 2.98, SD = .45) was significantly greater than the mean response for negatively worded (reverse scored) items (M = 2.47, SD = .41; p < .01), suggesting that participants rated positively worded items higher than reverse scored items. Since several reversed scored items were discarded following the factor analysis and since some factors had an unequal distribution of positively and negatively worded items, sixteen items of the remaining 42 were rewritten to balance the number of reverse scored items.
Table 1

**Stepwise Multiple Regression of Factor 1: Overconcern with Body Size and Eating**

<table>
<thead>
<tr>
<th>Item #</th>
<th>Multiple R</th>
<th>R²</th>
<th>Adj. R²</th>
<th>S.E.</th>
<th>F value</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>68</td>
<td>.74</td>
<td>.55</td>
<td>.55</td>
<td>11.43</td>
<td>641.21</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>61</td>
<td>.85</td>
<td>.73</td>
<td>.73</td>
<td>8.86</td>
<td>711.75</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>25</td>
<td>.90</td>
<td>.80</td>
<td>.80</td>
<td>7.52</td>
<td>727.79</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>49</td>
<td>.92</td>
<td>.85</td>
<td>.85</td>
<td>6.59</td>
<td>751.22</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>80</td>
<td>.94</td>
<td>.87</td>
<td>.87</td>
<td>6.04</td>
<td>735.63</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>71</td>
<td>.95</td>
<td>.90</td>
<td>.89</td>
<td>5.53</td>
<td>748.53</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>54</td>
<td>.95</td>
<td>.91</td>
<td>.91</td>
<td>5.08</td>
<td>772.36</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

Note: Abbreviations: adj. = adjusted and S.E. = standard error.

Table 2

**Stepwise Multiple Regression of Factor 2: Exercise**

<table>
<thead>
<tr>
<th>Item #</th>
<th>Multiple R</th>
<th>R²</th>
<th>Adj. R²</th>
<th>S.E.</th>
<th>F value</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>129</td>
<td>.81</td>
<td>.66</td>
<td>.66</td>
<td>3.69</td>
<td>1035.18</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>62</td>
<td>.87</td>
<td>.76</td>
<td>.76</td>
<td>3.13</td>
<td>821.18</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>105</td>
<td>.90</td>
<td>.81</td>
<td>.81</td>
<td>2.77</td>
<td>753.32</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>126</td>
<td>.92</td>
<td>.86</td>
<td>.85</td>
<td>2.42</td>
<td>779.98</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>102</td>
<td>.94</td>
<td>.88</td>
<td>.88</td>
<td>2.32</td>
<td>754.14</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>114</td>
<td>.95</td>
<td>.90</td>
<td>.89</td>
<td>2.06</td>
<td>752.14</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>5</td>
<td>.95</td>
<td>.91</td>
<td>.91</td>
<td>1.90</td>
<td>767.51</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

Note: Abbreviations: adj. = adjusted and S.E. = standard error.
### Table 3

**Stepwise Multiple Regression of Factor 3: Overeating**

<table>
<thead>
<tr>
<th>Item #</th>
<th>Multiple R</th>
<th>R²</th>
<th>Adj. R²</th>
<th>S.E.</th>
<th>F value</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>77</td>
<td>.72</td>
<td>.52</td>
<td>.52</td>
<td>5.06</td>
<td>580.65</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>33</td>
<td>.82</td>
<td>.68</td>
<td>.68</td>
<td>4.14</td>
<td>566.95</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>58</td>
<td>.87</td>
<td>.76</td>
<td>.76</td>
<td>3.58</td>
<td>564.86</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>30</td>
<td>.90</td>
<td>.82</td>
<td>.82</td>
<td>3.13</td>
<td>593.52</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>8</td>
<td>.93</td>
<td>.86</td>
<td>.86</td>
<td>2.75</td>
<td>646.64</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>99</td>
<td>.94</td>
<td>.89</td>
<td>.89</td>
<td>2.45</td>
<td>705.34</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>39</td>
<td>.95</td>
<td>.91</td>
<td>.91</td>
<td>2.16</td>
<td>797.67</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

Note: Abbreviations: adj. = adjusted and S.E. = standard error.

### Table 4

**Stepwise Multiple Regression of Factor 4: Avoidance of Fattening Foods and Sweets**

<table>
<thead>
<tr>
<th>Item #</th>
<th>Multiple R</th>
<th>R²</th>
<th>Adj. R²</th>
<th>S.E.</th>
<th>F value</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>124</td>
<td>.73</td>
<td>.54</td>
<td>.54</td>
<td>3.61</td>
<td>623.11</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>100</td>
<td>.85</td>
<td>.73</td>
<td>.73</td>
<td>2.77</td>
<td>715.73</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>37</td>
<td>.90</td>
<td>.82</td>
<td>.81</td>
<td>2.29</td>
<td>780.76</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>112</td>
<td>.93</td>
<td>.87</td>
<td>.87</td>
<td>1.95</td>
<td>854.57</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>79</td>
<td>.95</td>
<td>.91</td>
<td>.91</td>
<td>1.59</td>
<td>1077.53</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>64</td>
<td>.97</td>
<td>.94</td>
<td>.94</td>
<td>1.28</td>
<td>1443.39</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>7</td>
<td>.98</td>
<td>.97</td>
<td>.97</td>
<td>.89</td>
<td>2642.53</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

Note: Abbreviations: adj. = adjusted and S.E. = standard error.
Table 5

**Stepwise Multiple Regression of Factor 5: Emotional Eating**

<table>
<thead>
<tr>
<th>Item #</th>
<th>Multiple R</th>
<th>R²</th>
<th>Adj. R²</th>
<th>S.E.</th>
<th>F value</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>53</td>
<td>.76</td>
<td>.57</td>
<td>.57</td>
<td>4.07</td>
<td>715.07</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>88</td>
<td>.89</td>
<td>.78</td>
<td>.78</td>
<td>2.90</td>
<td>967.02</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>78</td>
<td>.92</td>
<td>.85</td>
<td>.85</td>
<td>2.38</td>
<td>1038.87</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>43</td>
<td>.95</td>
<td>.90</td>
<td>.90</td>
<td>1.93</td>
<td>1250.25</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>46</td>
<td>.97</td>
<td>.94</td>
<td>.94</td>
<td>1.54</td>
<td>1637.02</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>66</td>
<td>.98</td>
<td>.96</td>
<td>.96</td>
<td>1.21</td>
<td>2255.57</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>95</td>
<td>.99</td>
<td>.98</td>
<td>.98</td>
<td>0.95</td>
<td>3228.92</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

Note: Abbreviations: adj. = adjusted and S.E. = standard error.

Table 6

**Stepwise Multiple Regression of Factor 6: Extreme Weight Control**

<table>
<thead>
<tr>
<th>Item #</th>
<th>Multiple R</th>
<th>R²</th>
<th>Adj. R²</th>
<th>S.E.</th>
<th>F value</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>122</td>
<td>.71</td>
<td>.51</td>
<td>.51</td>
<td>2.12</td>
<td>547.56</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>127</td>
<td>.88</td>
<td>.78</td>
<td>.78</td>
<td>1.41</td>
<td>948.39</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>32</td>
<td>.93</td>
<td>.87</td>
<td>.87</td>
<td>1.09</td>
<td>1171.46</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>120</td>
<td>.96</td>
<td>.92</td>
<td>.92</td>
<td>.87</td>
<td>1456.35</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>4</td>
<td>.97</td>
<td>.95</td>
<td>.95</td>
<td>.70</td>
<td>1865.32</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>123</td>
<td>.98</td>
<td>.96</td>
<td>.96</td>
<td>.57</td>
<td>2412.77</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>121</td>
<td>.99</td>
<td>.98</td>
<td>.98</td>
<td>.44</td>
<td>3554.83</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

Note: Abbreviations: adj. = adjusted and S.E. = standard error.
Table 7

Rotated Factor Matrix of the MMEBE

<table>
<thead>
<tr>
<th>Item #</th>
<th>Fac1</th>
<th>Fac2</th>
<th>Fac3</th>
<th>Fac4</th>
<th>Fac5</th>
<th>Fac6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>61</td>
<td>.68</td>
<td>.09</td>
<td>.06</td>
<td>.12</td>
<td>-.06</td>
<td>.14</td>
</tr>
<tr>
<td>80</td>
<td>.65</td>
<td>.13</td>
<td>.01</td>
<td>.05</td>
<td>-.18</td>
<td>.17</td>
</tr>
<tr>
<td>25</td>
<td>.63</td>
<td>.23</td>
<td>-.20</td>
<td>.31</td>
<td>.05</td>
<td>.09</td>
</tr>
<tr>
<td>68</td>
<td>.60</td>
<td>.21</td>
<td>-.10</td>
<td>.24</td>
<td>-.21</td>
<td>.22</td>
</tr>
<tr>
<td>49</td>
<td>.57</td>
<td>-.04</td>
<td>.31</td>
<td>.05</td>
<td>-.04</td>
<td>.12</td>
</tr>
<tr>
<td>54</td>
<td>.56</td>
<td>.25</td>
<td>-.10</td>
<td>.23</td>
<td>-.15</td>
<td>.20</td>
</tr>
<tr>
<td>71</td>
<td>.54</td>
<td>.13</td>
<td>-.06</td>
<td>.11</td>
<td>-.18</td>
<td>.25</td>
</tr>
<tr>
<td>Factor 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>129</td>
<td>-.06</td>
<td>.80</td>
<td>.05</td>
<td>.03</td>
<td>.02</td>
<td>-.02</td>
</tr>
<tr>
<td>105</td>
<td>-.14</td>
<td>.74</td>
<td>.10</td>
<td>.09</td>
<td>-.01</td>
<td>.07</td>
</tr>
<tr>
<td>62</td>
<td>.09</td>
<td>.73</td>
<td>-.07</td>
<td>.09</td>
<td>-.04</td>
<td>-.05</td>
</tr>
<tr>
<td>5</td>
<td>-.26</td>
<td>.69</td>
<td>.07</td>
<td>.04</td>
<td>.06</td>
<td>.06</td>
</tr>
<tr>
<td>102</td>
<td>.08</td>
<td>.59</td>
<td>-.03</td>
<td>.05</td>
<td>-.06</td>
<td>-.14</td>
</tr>
<tr>
<td>126</td>
<td>.07</td>
<td>.56</td>
<td>.00</td>
<td>.05</td>
<td>-.03</td>
<td>-.19</td>
</tr>
<tr>
<td>114</td>
<td>.05</td>
<td>.48</td>
<td>.02</td>
<td>.15</td>
<td>-.16</td>
<td>.22</td>
</tr>
</tbody>
</table>

(table con'd)
<table>
<thead>
<tr>
<th>Item #</th>
<th>Fac1</th>
<th>Fac2</th>
<th>Fac3</th>
<th>Fac4</th>
<th>Fac5</th>
<th>Fac6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>77</td>
<td>.03</td>
<td>-.05</td>
<td>.73</td>
<td>-.01</td>
<td>.08</td>
<td>.02</td>
</tr>
<tr>
<td>33</td>
<td>.22</td>
<td>-.11</td>
<td>.60</td>
<td>-.12</td>
<td>.03</td>
<td>-.10</td>
</tr>
<tr>
<td>39</td>
<td>.03</td>
<td>-.15</td>
<td>.59</td>
<td>-.14</td>
<td>.11</td>
<td>.02</td>
</tr>
<tr>
<td>58</td>
<td>.04</td>
<td>.06</td>
<td>.57</td>
<td>-.27</td>
<td>-.05</td>
<td>.11</td>
</tr>
<tr>
<td>99</td>
<td>.23</td>
<td>.12</td>
<td>.57</td>
<td>-.11</td>
<td>-.07</td>
<td>.03</td>
</tr>
<tr>
<td>8</td>
<td>-.05</td>
<td>.08</td>
<td>.50</td>
<td>-.01</td>
<td>.08</td>
<td>-.12</td>
</tr>
<tr>
<td>30</td>
<td>-.08</td>
<td>-.16</td>
<td>.46</td>
<td>-.34</td>
<td>.11</td>
<td>-.11</td>
</tr>
<tr>
<td>Factor 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>-.00</td>
<td>.30</td>
<td>-.04</td>
<td>.64</td>
<td>-.02</td>
<td>-.03</td>
</tr>
<tr>
<td>64</td>
<td>.05</td>
<td>-.22</td>
<td>-.12</td>
<td>.62</td>
<td>-.10</td>
<td>-.03</td>
</tr>
<tr>
<td>124</td>
<td>.22</td>
<td>.26</td>
<td>-.13</td>
<td>.58</td>
<td>-.09</td>
<td>.01</td>
</tr>
<tr>
<td>37</td>
<td>.33</td>
<td>.32</td>
<td>-.14</td>
<td>.58</td>
<td>-.03</td>
<td>.10</td>
</tr>
<tr>
<td>100</td>
<td>-.16</td>
<td>-.15</td>
<td>-.05</td>
<td>.57</td>
<td>-.06</td>
<td>.03</td>
</tr>
<tr>
<td>112</td>
<td>-.22</td>
<td>.07</td>
<td>-.01</td>
<td>.48</td>
<td>-.01</td>
<td>.11</td>
</tr>
<tr>
<td>79</td>
<td>.18</td>
<td>.12</td>
<td>.01</td>
<td>.48</td>
<td>.01</td>
<td>.01</td>
</tr>
</tbody>
</table>

(table con'd)
<table>
<thead>
<tr>
<th></th>
<th>Fac1</th>
<th>Fac2</th>
<th>Fac3</th>
<th>Fac4</th>
<th>Fac5</th>
<th>Fac6</th>
</tr>
</thead>
<tbody>
<tr>
<td>item #</td>
<td>Factor 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>88</td>
<td>-.08</td>
<td>-.05</td>
<td>.06</td>
<td>-.01</td>
<td>.71</td>
<td>-.03</td>
</tr>
<tr>
<td>95</td>
<td>-.14</td>
<td>-.03</td>
<td>.05</td>
<td>-.18</td>
<td>.70</td>
<td>.01</td>
</tr>
<tr>
<td>66</td>
<td>-.11</td>
<td>-.07</td>
<td>.02</td>
<td>-.01</td>
<td>.69</td>
<td>.02</td>
</tr>
<tr>
<td>53</td>
<td>-.20</td>
<td>-.04</td>
<td>.12</td>
<td>-.08</td>
<td>.68</td>
<td>.02</td>
</tr>
<tr>
<td>46</td>
<td>.10</td>
<td>-.04</td>
<td>.10</td>
<td>-.15</td>
<td>.66</td>
<td>-.08</td>
</tr>
<tr>
<td>43</td>
<td>-.14</td>
<td>-.16</td>
<td>.09</td>
<td>-.08</td>
<td>.65</td>
<td>.12</td>
</tr>
<tr>
<td>78</td>
<td>-.09</td>
<td>.09</td>
<td>.08</td>
<td>-.09</td>
<td>.64</td>
<td>.11</td>
</tr>
<tr>
<td>Factor 6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>123</td>
<td>.13</td>
<td>-.05</td>
<td>.03</td>
<td>.10</td>
<td>-.02</td>
<td>.65</td>
</tr>
<tr>
<td>121</td>
<td>.05</td>
<td>.02</td>
<td>.03</td>
<td>.05</td>
<td>-.08</td>
<td>.62</td>
</tr>
<tr>
<td>122</td>
<td>.26</td>
<td>-.03</td>
<td>.06</td>
<td>.10</td>
<td>.01</td>
<td>.62</td>
</tr>
<tr>
<td>32</td>
<td>.15</td>
<td>.00</td>
<td>.01</td>
<td>-.01</td>
<td>.01</td>
<td>.54</td>
</tr>
<tr>
<td>120</td>
<td>.34</td>
<td>.04</td>
<td>-.04</td>
<td>.04</td>
<td>.04</td>
<td>.49</td>
</tr>
<tr>
<td>4</td>
<td>.16</td>
<td>.08</td>
<td>-.05</td>
<td>-.04</td>
<td>.03</td>
<td>.44</td>
</tr>
<tr>
<td>127</td>
<td>.10</td>
<td>-.13</td>
<td>-.08</td>
<td>.01</td>
<td>-.04</td>
<td>.42</td>
</tr>
</tbody>
</table>

Table 8

**Internal Consistency of the MMEBE’s Total Score and Factors Before the Second Study**

<table>
<thead>
<tr>
<th></th>
<th># of Items</th>
<th>Coefficient Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMEBE total</td>
<td>42</td>
<td>.74</td>
</tr>
<tr>
<td>Factor 1:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overconcern with Body Size and Eating</td>
<td>7</td>
<td>.85</td>
</tr>
<tr>
<td>Factor 2:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exercise</td>
<td>7</td>
<td>.85</td>
</tr>
<tr>
<td>Factor 3:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overeating</td>
<td>7</td>
<td>.77</td>
</tr>
<tr>
<td>Factor 4:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avoidance of Fattening Foods and Sweets</td>
<td>7</td>
<td>.75</td>
</tr>
<tr>
<td>Factor 5:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotional Eating</td>
<td>7</td>
<td>.86</td>
</tr>
<tr>
<td>Factor 6:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extreme Weight Control</td>
<td>7</td>
<td>.72</td>
</tr>
</tbody>
</table>
Study 2: Validation and Test-Retest Reliability

The specific aim of Study 2 was to assess the validity of the MMEBE using a multitrait-multimethod design (Campbell & Fiske, 1983) by comparing the MMEBE's factors to measures evaluating similar as well as contrasting constructs. Specifically, discriminant and concurrent validity were evaluated. A second aim of the second study was to evaluate test-retest reliability of the MMEBE and its factors.

Method

Participants

Female (n=157) and male (n=69) students enrolled in a large university were recruited for the second study. Ages of the participants ranged from 18 to 51 years (M = 21.62, SD = 5.56). Participants were predominantly Caucasian (79%). Mean BMI was 22.38 (SD = 3.77) and ranged from 17 to 37. Twenty-eight percent of the respondents reported that they were currently dieting to lose weight. The majority of participants (60%) indicated that they were currently watching what they ate to maintain their current weight.

Materials

To evaluate concurrent and discriminant validity, research participants completed the following measures:

Multidimensional Measure of Eating Behavior and Exercise (MMEBE). The 42-item version of the MMEBE was administered to the participants. The mean total score was 113.20 (SD = 16.67) and ranged from 72 to 157.
Three Factor Eating Questionnaire (TFEQ; Stunkard & Messick, 1985). The TFEQ assesses Dietary Restraint, Disinhibition, and Perceived Hunger. The 16 items of the Disinhibition scale and the 21 items of the Dietary Restraint scale were administered to the participants. Investigations have found that the Dietary Restraint scale measures self-reported dieting behavior (Allison et al., 1992; Laessle et al., 1989). The Disinhibition scale has been found to measure the breaking of dietary restraint as well as overeating independent of restrictive eating (Heatherton et al., 1988, Rosen, Tacy, & Howell, 1990; Williamson, Lawson, et al., 1995). Mean scores for these two factors were 8.54 (SD = 5.64) for Dietary Restraint and 5.53 (SD = 3.31) for Disinhibition.

Correlations between these two scales and the factors of the MMEBE were examined. Specifically, the relationships between the TFEQ's Dietary Restraint scale with the MMEBE's Avoidance of Fattening Foods and Sweets and the Overconcern with Body Size and Eating scales were examined for convergent validity. In addition, correlations between the Overeating and Emotional Eating scales of the MMEBE with the Disinhibition scale were compared to evaluate concurrent and discriminant validity, respectively.

Bulimia Test-Revised: Binge Eating Factor (BULIT-R-BEF; Thelen et al., 1991). The BULIT-R is a measure of bulimic symptoms which correlates with the frequency of binge eating and purging (Williamson et al., 1987). The authors report good reliability and validity. The 16 items of the Binge Eating Factor of the BULIT-R were administered to the research participants to evaluate convergent
of the MMEBE's Overeating and Extreme Weight Control scales. The mean score on this subscale was 28.59 (SD = 9.82).

_**Baecke's Physical Activity Questionnaire**_ (Baecke, Burema, & Frijters, 1982). This self-report inventory was designed to evaluate three areas of physical activity: work, leisure, and sports. The authors report good reliability and validity. This questionnaire was administered to the research participants to test the convergent validity of the Exercise scale of the MMEBE. Means for the three subscales were as follows: work (M = 3.02, SD = .83), leisure (M = 2.72, SD = .70), and sports (M = 2.55, SD = .64).

_**Body Shape Questionnaire**_ (BSQ: Cooper et al., 1987). This self-report inventory has been found to be a useful measure of excessive concern about body weight and shape. Good test-retest reliability, concurrent validity, and criterion validity have been reported for the BSQ (Rosen et al., 1996). Mean scores on the BSQ was 89.32 (SD = 39.54). Research participants were asked to complete the BSQ to test the validity of the Overconcern with Body Size and Eating scale of the MMEBE.

_**Eating Attitudes Test-Dieting Factor**_ (EAT-D; Garner & Garfinkel, 1979). The EAT is a self-report questionnaire that evaluates anorexic attitudes. The authors have reported good reliability and validity for the EAT. The 13 items of the EAT's Dieting factor were administered to the participants to evaluate the convergent validity of the Extreme Weight Control scale of the MMEBE (Garner
et al., 1982). Participants scored within the normal range (M = 7.67, SD = 6.38) on this subscale.

**Multiaxial Assessment of Eating Disorders Symptoms-Avoidance of Forbidden Food Scale** (MAEDS-AFF: Anderson, Williamson, Duchmann, Gleaves, & Barbin, submitted manuscript). The authors have reported that this measure evaluates a wide range of eating disorder symptoms. The MAEDS-AFF scale (10 items) has been found to evaluate avoidance of foods high in fat and sugar content. Participants in the current study completed this scale to evaluate convergent validity by correlating it to the Avoidance of Fattening Foods and Sweets scale of the MMEBE. The mean score on the MAEDS-AFF scale was 33.96 (SD = 13.86).

**Diet and Health Knowledge Survey** (P.J. Geiselman, personal communication). This survey evaluates dietary and health knowledge of seven areas: fat, other macronutrients, micronutrients, fiber, cholesterol, nutrient-deficient diseases, and the food pyramid. The 34 items selected for the current study were ones on which participants in a preliminary study were 30-40% to 70-80% correct. Out of a total score of 34, the mean score for participants was (M = 22.31, SD = 4.40) ranging from 6 to 32.

**Body Mass Index (BMI)**. Self-reported height and weight were obtained in order calculate BMI using the formula: body weight (kg) / height (m2). BMI is recognized as a valid index of adiposity (Garrow, 1983). Self-reported height and weight have been found to correlate highly (r = .96-.99) with actual measurements
(Jeffery, 1996; Stunkard & Albaum, 1981) and have been accepted as an adequate method of obtaining measurements in large survey studies (Smith, Hohlstein, & Atlas, 1992). Correlations between MMEBE factors and BMI were performed. Specifically, convergent validity of the Overeating factor was assessed. In addition, discriminant validity of the Exercise and Avoidance of Fattening Foods and Sweets were evaluated using BMI.

**Marlowe-Crowne Social Desirability Scale** (SD; Crowne & Marlowe, 1964). The SD served as a measure of response bias. Although positive correlations between the SD and some of the MMEBE items were likely, strong relationships were not expected. Items that were positively correlated with the SD total score were to be discarded. The means score on the SD was within normal limits (M = 16.01, SD = 5.24)

**Procedure**

After obtaining informed consent from the research participants, the revised 42-item multidimensional measure was administered to the research participants along with TFEQ's Dietary Restraint and Disinhibition scales, the BULIT-R's binge eating factor, the EAT's Dieting Factor, the BSQ, the MAEDS-AFF scale, Baecke's Physical Activity Questionnaire, the SD and the nutrition questionnaire. Demographic data was also gathered along with self-reported height and weight in order to calculate BMI. Participants received extra credit in a psychology course for their participation. A portion of the participants (n = 50) were offered the opportunity to receive additional extra credit for completing the 42-item MMEBE
a second time two weeks following their initial participation to evaluate test-retest reliability.

Results

None of the 42 items were positively correlated with the SD total score; therefore, all items were retained for further analyses.

Item-to-factor correlations provide information as to how well items covary with the sum of the remaining items of their respective factor. Item analysis found all items to be moderately to highly correlated with their respective factors. Ranges of item-to-factor correlation coefficients for the six factors were as follows: Factor 1 (.37 to .67), Factor 2 (.32 to .75), Factor 3 (.24 to .47), Factor 4 (.42 to .73), Factor 5 (.33 to .56), and Factor 6 (.20 to .58).

Factors were refined by discarding items that decreased the internal consistency of their respective scales. The first factor, Overconcern with Body Size and Eating, retained its seven items. One item (#41) was deleted from Factor 2: Exercise, thereby raising the internal consistency by .02. All seven items of the Overeating scale (Factor 3) were retained. Factor 4: Avoidance of Fattening Foods and Sweets and Factor 5: Emotional Eating retained all of their original items. One item (#5) from Factor 6: Extreme Weight Control was discarded because it decreased internal consistency by .03. Table 9 displays coefficient alphas for the MMEBE and its six factors.

Factor scores were obtained by summing the items of each factor. Negatively worded items were reversed scored. The means and standard
Table 9

**Internal Consistency of the MMEBE's Total Score and Factors After the Second Study**

<table>
<thead>
<tr>
<th># of Items</th>
<th>Coefficient Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMEBE total</td>
<td>40</td>
</tr>
<tr>
<td>Factor 1: Overconcern with Body Size and Eating</td>
<td>7</td>
</tr>
<tr>
<td>Factor 2: Exercise</td>
<td>6</td>
</tr>
<tr>
<td>Factor 3: Overeating</td>
<td>7</td>
</tr>
<tr>
<td>Factor 4: Avoidance of Fattening Foods and Sweets</td>
<td>7</td>
</tr>
<tr>
<td>Factor 5: Emotional Eating</td>
<td>7</td>
</tr>
<tr>
<td>Factor 6: Extreme Weight Control</td>
<td>6</td>
</tr>
</tbody>
</table>

deviations for each factor follows: Overconcern with Body Size and Eating (M = 18.64, SD = 6.11); Exercise (M = 22.68, SD = 4.62); Overeating (M = 20.40, SD = 4.42); Avoidance of Fattening Foods and Sweets (M = 17.74, SD = 5.85); Emotional Eating (M = 19.44, SD = 5.12); Extreme Weight Control (M = 7.81, SD = 2.76).

Gender differences were found for several of the MMEBE scales. Specifically, one-way ANOVAs found that females scored significantly higher (p's
< .01) than males on three scales: Overconcern with Body Size and Eating (M = 20.49, SD = 5.82 vs. M = 14.35, SD = 4.40), Avoidance of Fattening Foods and Sweets (M = 18.46, SD = 5.82 vs. M = 16.07, SD = 5.63), and Extreme Weight Control (M = 8.20, SD = 2.94 vs. M = 6.90, SD = 2.02). In addition, females scored significantly lower on the Overeating scale (M = 19.98, SD = 4.33 vs. M = 21.38, SD = 4.51; p < .01). No gender differences were found for the Emotional Eating (females: M = 19.45, SD = 5.70 and males: M = 19.41, SD = 3.45) and Exercise scale (females: M = 22.81, SD = 4.60 and males: M = 22.38, SD = 4.68; p's > .05).

Factor correlations were performed. Table 10 displays the intercorrelation of factor scores. Factor 1: Overconcern with Body Size and Eating and Factor 4: Avoidance of Fattening Foods and Sweets were the most highly correlated factors (r = .54). Factor 4 was also highly correlated with Factor 2: Exercise. The only significant negative correlation (r = -.28) was between Overeating and Avoidance of Fattening Foods and Sweets. Positive relationships between Emotional Eating and Overeating as well as Avoidance of Fattening Foods and Extreme Weight Control were also found (r = .29 and r = .24, respectively).

Factor scores were entered into a correlation matrix with selected measures to evaluate concurrent and discriminant validity. Table 11 displays the correlations matrix.
### Table 10

**Correlation Matrix of MMEBE's Factors**

<table>
<thead>
<tr>
<th>Factor</th>
<th>Fac1</th>
<th>Fac2</th>
<th>Fac3</th>
<th>Fac4</th>
<th>Fac5</th>
<th>Fac6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>.23**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>-.12</td>
<td>-.05</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>.54**</td>
<td>.44**</td>
<td>-.28**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>.13</td>
<td>.15*</td>
<td>.29**</td>
<td>.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>.41**</td>
<td>.01</td>
<td>-.04</td>
<td>.24**</td>
<td>.15*</td>
<td></td>
</tr>
</tbody>
</table>

Table 11

Correlation Matrix of the MMEBE's Factors and Selected Measures

<table>
<thead>
<tr>
<th>Scale</th>
<th>Fac1: Body</th>
<th>Fac 2: Exer</th>
<th>Fac3: Over</th>
<th>Fac4: Avoid</th>
<th>Fac5: Emotion</th>
<th>Fac6: Extreme</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSQ</td>
<td>.76**</td>
<td>.09</td>
<td>.01</td>
<td>.33*</td>
<td>.21**</td>
<td>.36**</td>
</tr>
<tr>
<td>TFEQ-R</td>
<td>.77**</td>
<td>.37**</td>
<td>-.33**</td>
<td>.71**</td>
<td>.04</td>
<td>.26**</td>
</tr>
<tr>
<td>TFEQ-D</td>
<td>.51**</td>
<td>.04</td>
<td>.40**</td>
<td>.16*</td>
<td>.52**</td>
<td>.38**</td>
</tr>
<tr>
<td>EAT-Diet</td>
<td>.60**</td>
<td>.07</td>
<td>.02</td>
<td>.36**</td>
<td>.07</td>
<td>.31**</td>
</tr>
<tr>
<td>BULIT-R-Binge</td>
<td>.46**</td>
<td>-.03</td>
<td>.38**</td>
<td>.13</td>
<td>.31**</td>
<td>.51**</td>
</tr>
<tr>
<td>MAEDS-AFF</td>
<td>.61**</td>
<td>.39**</td>
<td>-.33**</td>
<td>.78**</td>
<td>-0.03</td>
<td>.16*</td>
</tr>
<tr>
<td>Physical Activity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>sport</td>
<td>-.07</td>
<td>.56**</td>
<td>-.03</td>
<td>.19**</td>
<td>.03</td>
<td>-.07</td>
</tr>
<tr>
<td>leisure</td>
<td>.20**</td>
<td>.47**</td>
<td>-.10</td>
<td>.34**</td>
<td>.08</td>
<td>.08</td>
</tr>
<tr>
<td>Nutrition</td>
<td>.18**</td>
<td>.28**</td>
<td>.10</td>
<td>.15*</td>
<td>.15*</td>
<td>-.06</td>
</tr>
<tr>
<td>BMI</td>
<td>.11</td>
<td>-.03</td>
<td>.07</td>
<td>.02</td>
<td>.12</td>
<td>.01</td>
</tr>
</tbody>
</table>

**Concurrent Validity**

Several correlations between the factors of the MMEBE and existing self-report inventories that assess similar constructs were found (see Table 11).

As expected, the Overconcern with Body Size and Eating factor was highly correlated with both the TFEQ’s Dietary Restraint Scale \( (r = .77) \) and the BSQ \( (r = .76) \). Strong correlations between this factor and the EAT’s Extreme Weight Control scale and the MAEDS’s Avoidance of Forbidden Food scale were also found \( (r = .60 \text{ and } r = .61, \text{ respectively}) \).

Exercise was most highly correlated with measures assessing sport and leisure physical activity \( (r = .56 \text{ and } r = .47) \) indicating that this scale is adequately evaluating physical activity. This factor was also moderately correlated with the TFEQ’s Dietary Restraint scale \( (r = .37) \), the MAEDS’s Avoidance of Forbidden Food scale \( (r = .39) \), and the nutrition survey \( (r = .28) \).

Factor 3: Overeating was found to be highly correlated with the TFEQ’s Disinhibition scale \( (r = .40) \) and the BULIT-R’s Binge eating factor \( (r = .38) \). Given that these validation measures have been found to evaluate overeating and binge eating, these correlations were anticipated. However, Overeating was not significantly correlated with BMI \( (.07) \) as expected.

The fourth factor, Avoidance of Fattening Foods and Sweets, was most highly correlated with the MAEDS’s Avoidance of Forbidden Food \( (r = .78) \) and the TFEQ’s Dietary Restraint scale \( (r = .71) \). This factor was also correlated with the
BSQ (r = .33), EAT’s Dieting Factor (r = .36), and physical activity during leisure
time (r = .34).

The Emotional Eating factor was most highly correlated with the TFEQ’s
Disinhibition scale (r = .52) and the BULIT-R’s Binge eating factor (r = .31). The
higher correlation with the Disinhibition scale of the TFEQ was expected since this
scale contains several items that describing overeating during negative affective
states (Stunkard & Messick, 1985). However, the correlations were moderate
indicating that the Emotional Eating scale is evaluating a different construct than
overeating or binge eating.

Factor 6: Extreme Weight Control was most highly correlated with the
BULIT-R binge eating factor (r = .51). This factor was moderately correlated with
the BSQ (r = .38) and the TFEQ’s Disinhibition scale (r = .38).

Results suggest that the MMEBE’s factors have adequate concurrent
validity with inventories measuring similar constructs.

**Discriminant Validity**

Discriminant validity was also evaluated using the correlations matrix of
validation measures and the MMEBE factor scores (see Table 11).

Factor 1: Overconcern with Body Size and Eating did not correlate highly
with measure of physical activity. As expected, the Exercise factor was least
correlated with BMI (r = -.03), based on findings in the literature (Grilo, 1994). In
addition, this factor was also not related to measures of overeating and binge
eating (BULIT’s binge eating factor, and TFEQ’s Disinhibition scale).
The Overeating scale (Factor 3) was negatively correlated with the MAEDS’ Avoidance of Forbidden Food \( (r = -0.33) \) and the TFEQ’s Dietary Restraint scale \( (r = -0.33) \) indicating that this scale does not measure restrictive eating.

The MMEBE’s Avoidance of Fattening Foods and Sweets factor was not significantly correlated with BMI \( (r = 0.02) \) nor with the BULIT-R’s binge eating factor \( (r = 0.13) \) indicating that this scale is not measuring binge eating or excessive overeating.

Discriminant validity for the MMEBE’s Emotional Eating scale was found in that this factor did not correlate with several measures including the TFEQ’s Dietary Restraint Scale, the EAT’s Dieting factor, the MAEDS’ Avoidance of Forbidden Food scale, and the two physical activity scales.

The Extreme Weight Control scale (Factor 6) correlated less well with measures of physical activity \( (r = -0.07, 0.08) \), body mass \( (r = 0.01) \), and nutrition \( (r = -0.06) \). Overall, results suggest the factors of the MMEBE have adequate discriminant validity.

**Reliability**

As noted earlier, the coefficient alphas for the MMEBE’s scales and total score ranged from poor \( (0.59) \) to adequate \( (0.84) \) (see Table 9). Of the 226 participants, 50 individuals (35 females and 15 males) returned 2 weeks after their initial participation to complete the MMEBE again. Mean total score was 110.34 \( (SD = 15.38) \). Overall test-retest reliability for the 42-item questionnaire was adequate \( (r = 0.92) \). Test-retest reliability for the individual factors were as follows:
Factor 1 ($r = .88$), Factor 2 ($r = .93$), Factor 3 ($r = .78$), Factor 4 ($r = .91$), Factor 5 ($r = .88$), and Factor 6 ($r = .58$).
Discussion

Based on a review of the literature, there is a need for a multidimensional measure that evaluates a wide range of eating behavior and weight control strategies (French & Jeffery, 1994; French et al., 1994; Lowe, 1993; Tepper et al., 1996). The specific aim of this study was to develop such a measure. This investigation included item construction, factor analysis, stepwise multiple regression to further refine the factors, establishment of reliability through internal consistency and test-retest reliability, and a validation study. The Multidimensional Measure of Eating Behavior and Exercise (MMEBE) is a multifactorial self-report inventory which evaluates six behavioral and cognitive domains related to eating behavior and weight control practices. Based on interpretations of the highest loading items, the six factors were labeled: Avoidance of Fattening Foods and Sweets, Overconcern with Body Size and Eating, Exercise, Overeating, Emotional Eating, and Extreme Weight Control.

Initially, 131 items were generated and designated to fit one of four categories: dieting strategies, overeating, eating during negative affective states, and exercise. Factor analysis found factors evaluating three of these four areas: Overeating, Emotional Eating, and Exercise. Based on the relevant literature and recent research findings (French et al., 1995; Smith et al., in press; Westenhoefer, 1991), the dieting strategies' category was expected to contain three factors: healthy versus unhealthy dieting strategies and extreme weight control practices. Although the Extreme Weight Control factor was found, groups of dieting
strategies clearly distinguished as being healthy and unhealthy were not found. Instead, a factor that evaluates avoidance of foods that are high in fat and sugar content and a factor that assesses preoccupation with eating and body weight emerged. The Avoidance of Fattening Foods and Sweets factor exclusively contained items that described dietary alterations, whereas the items of Overconcern with Body Size and Eating factor consisted of thoughts and behaviors indicative of preoccupation with one's food intake and body weight. These two factors were moderately correlated (r = .54), but only the Avoidance of Fattening Foods and Sweets scale was negatively correlated to the MMEBE's Overeating factor, indicating that this factor is negatively associated with overeating. The Overconcern with Body Size and Eating factor was not positively correlated with Overeating. Although the initial aim was to develop a multidimensional scale capable of evaluating healthy and unhealthy dieting strategies, the resulting scales appear to have a similar clinical and empirical utility, particularly among overweight and obese populations.

Gender differences found for several of the MMEBE scales were consistent with the literature. Overall, results suggest that males score lower on scales measuring avoidance of fattening foods, body dissatisfaction, and pathological eating behavior, whereas they scored higher on the Overeating scale. Research has consistently found that females diet more often and are more concerned with their body size than males (e.g., Conner-Greene, 1988, French, Jeffery, & Wing, 1994b; Thompson, 1996b). This is consistent with the current finding that females
scored higher on the Overconcern with Body Size and Eating and Avoidance of Fattening Foods and Sweets scales. In addition, investigations have reported that males eat more total calories than females (Rolls, Fedoroff, & Guthrie, 1991) which provides support for the present findings concerning the Overeating scale. As the current study found, extreme weight control strategies are more commonly reported by females (Hsu, 1989). Future investigations of the MMEBE should continue to investigate these differences and perhaps develop separate norms for females and male.

The MMEBE was designed to emphasize areas of eating behavior and weight control practices that are most frequently cited in the literature as being associated with one another such as dieting, overeating, and exercise. The multidimensional measure was intended to be a brief, yet comprehensive, assessment of a wide range of eating behavior and exercise. These preliminary results indicate that the MMEBE contains reliable factors for measuring such domains. The final version contained 40 items, making it a relatively brief assessment instrument. Satisfactory internal consistency and test-retest reliability was obtained for MMEBE factors with the exception of the Extreme Weight Control factor. This scale contained items describing pathological eating behavior ranging from taking laxatives to self-inducing vomiting. Perhaps this factor contained a range of items that was too wide to allow for internal consistency. Alternatively, the poor reliability of the Extreme Weight Control factor could partly be due to the fact that this normative sample was comprised of relatively healthy, non-eating
disordered, young adults. In addition, low heterogeneity of variance (i.e., $M = 7.81$, $SD = 2.76$) could have contributed to the low coefficient alpha and reliability of this scale. Further reliability and validity studies with populations exhibiting more pathological eating behavior are needed before conclusions can be drawn concerning this factor.

The evaluation of concurrent validity found predictable relationships among MMEBE factors and existing measures of body dissatisfaction, dietary restraint and dieting, disinhibition (overeating), exercise, avoidance of forbidden foods, and binge eating. While both the Avoidance of Fattening Foods and Overconcern with Body Size and Eating factors were strongly correlated with dietary restraint, it appears that these scales are measuring very different constructs. Specifically, the relationships of these two scales with the TFEQ-D (Stunkard & Messick, 1985), the BULIT-R-Binge Eating factor (Thelen et al., 1991), the BSQ (Cooper et al., 1987), and measures of physical activity scales are quite different. The Avoidance of Fattening Foods and Sweets scale exclusively evaluates the avoidance of certain foods and is related to the MAEDS-AFF scale which is purported to measure a similar construct (Anderson et al., submitted manuscript). This scale is a unique aspect of the MMEBE in that it measures dietary alterations which are consistent with a low-fat, low-calorie diet.

The MMEBE's Overconcern with Body Size and Eating scale appears to assess thoughts and behaviors indicative of preoccupation with body weight as well as restrictive eating. An expected relationship between this factor and the
BSQ was found. The Overconcern with Body Size and Eating factor was found to be strongly associated with the BULIT-R's Binge Eating factor as well as the TFEQ-D, indicating a possible lack of control over eating in individuals who score high on this scale. Notably, this scale was also strongly related to the EAT's Dieting factor (Garner & Garfinkel, 1979), indicating restrictive eating. It appears that this scale is measuring certain aspects of the construct of dietary restraint (Herman & Polivy, 1975; Lowe, 1993).

With regard to the MMEBE's Exercise factor, its highest correlations were with measures of physical activity. This scale was also positively associated with restrictive eating (TFEQ-R and MAEDS-AFF) as well as nutritional knowledge. These preliminary findings indicate that the Exercise factor is a valid measure of physical activity and is closely associated with weight control strategies.

The MMEBE's Overeating factor was not significantly related to BMI, as predicted, which may be due to the overall low mean BMI of the sample. Given that the Overeating factor was associated with two measures of overeating and binge eating in the validation study, it is predicted that future validation investigations of the MMEBE using overweight and obese samples will find a relationship between BMI and the Overeating factor.

As expected, the Emotional Eating scale of the MMEBE was most highly correlated to the TFEQ-D which contains a handful of items assessing overeating during negative affective states. This scale was also related to the BULIT-R-Binge Eating Factor providing further concurrent validity.
Discriminant validity was established for the MMEBE's factors by the failure of factors to correlate significantly with measures conceptually unrelated to the constructs of the newly developed inventory. For example, only the inventory designed to evaluate exercise was highly correlated with the physical activity measures. In addition, the Overeating scale was not related to a measure of dieting and was negatively correlated to a dietary restraint scale.

The MMEBE has many similarities and differences with existing measures. Similar to the EDI-2 (Garner, 1991), the MMEBE is a relatively brief self-report inventory that is capable of assessing several cognitive and behavioral domains related to eating and weight control. However, the MMEBE is different from the EDI-2 in that it is intended to be used with overweight and obese individuals as opposed to eating disordered individuals. With regard to individual factors of the MMEBE, the Overconcern with Body Size and Eating scale is similar to the BSQ (Cooper et al., 1987) in that they both appear to measure excessive concern with body weight and shape. However, a relative strength of the MMEBE scale is that it consists of 7 items whereas the BSQ contains over 30 items. A recent study found that the BSQ loaded onto a dietary restraint factor as well as a body dissatisfaction factor (Williamson, Barker, Bertman, & Gleaves, 1995). The same pattern of results was found for the MMEBE's Overconcern with Body Size and Eating scale, indicating that it measures a very similar construct as the BSQ which has been proven to be a valid measure of pathological weight concern in individuals with eating disorders. In addition, the Overconcern with Body Size and
Eating factor appears to be similar to other measures of body dissatisfaction such as the EDI-2's Body Dissatisfaction scale (Gainer, 1991).

The Overeating factor of the MMEBE is similar to the TFEQ-D (Stunkard & Messick, 1985) in that they both evaluate excessive food intake and are negatively correlated with dietary restraint measures. The Overeating scale also appears to measure behaviors and cognitions related to binge eating, making it similar to the BES (Gormally et al., 1982).

The MMEBE's Avoidance of Fattening Foods and Sweets scale is similar to the newly developed MAEDS-AFF scale (Anderson et al., submitted) in that they both appear to measure avoidance of certain foods. This scale is also related to restrictive eating (TFEQ-R; Stunkard & Messick, 1985 and EAT-Dieting Factor; Garner & Garfinkel, 1979), in general. The MMEBE's scale is related to exercise and nutrition knowledge, whereas the relationships among the MAEDS-AFF and these domains are currently unknown.

The MMEBE's Emotional Eating scale is similar to the EES (Arnow et al., 1995) and the TFEQ-D in that they all evaluate overeating during negative affective states. Unlike the TFEQ-D, the MMEBE's Emotional Eating scale is specific to negative emotions and does not assess other aspects of overeating such as loss of control while eating. An advantage of the MMEBE's Emotional Eating scale is that it contains only 7 items, whereas the EES contains 25 items.

The MMEBE's Exercise scale appears to be similar to questionnaires assessing exercise and physical activity (e.g., Baecke et al., 1982; Paffenbarger
et al., 1978). However, the MMEBE's scale is unique in that it evaluates physical activity with relatively few items. Another benefit of this Exercise scale is that it does not require a detailed recall of recent physical activity as some existing measures do (e.g., Blair, 1984).

The MMEBE has many potential uses. Based on the results of the factor analysis and validation study, it appears that the MMEBE is best suited for use with overweight and obese individuals, particularly persons interested in losing weight. Since the measure evaluates a dieting strategy as well as overeating, the MMEBE could be used as a screening measure for research studies investigating weight control practices and eating behavior. In addition, this multifactorial measure could potentially be utilized in weight loss treatment settings as an assessment measure as well as a treatment outcome measure. Furthermore, it may prove useful in studying and treating patients who have problems with binge eating.

There are other general advantages of the MMEBE compared to existing measures assessing similar constructs. First, it is brief and not time intensive as are several self-report inventories that are currently in use (e.g. BULIT-R; Thelen et al., 1991). Second, it is comprehensive and useful in measuring several areas related to eating behavior and weight control. Third, it is easy to administer and score. It takes less than 5 minutes to complete and can be scored within minutes using a scoring key. Fourth, it is a single measure of several constructs; thus, it
eliminates the need to give a battery of self-report inventories which can expensive and is time-consuming as well.

Although these preliminary studies provide some evidence for the reliability and validity of the MMEBE, a handful of limitations exist. First, a primary limitation is that the sample was restricted to undergraduate college students. This imposes potential constraints on the generalizability of the measure to other populations. Future investigations will need to assess the MMEBE's utility among different populations. Specifically, a normative sample of overweight and obese individuals is needed. Based on research findings that indicate there are significant racial differences in eating behavior and dieting practices (Klesges, DeBon, & Meyers, 1996), a collection of data from a sample of African Americans could also be useful.

A second limitation of the current study is that the validation measures used were predominantly self-report inventories, with the exception of body mass index. A third possible limitation of this study was the use of self-reported height and weight in order to calculate body mass index. Even though several studies have concluded that self-reported data are highly correlated ($r = .99$) with actual measurements (e.g., Jeffery, 1996), future studies may chose to measure these variables to ensure accuracy, particularly when one considers findings that indicate discrepancy in self-reported weight increases as the weight of the individual increases (Cash, Counts, Hangen, & Huffine, 1989).
To address these limitations and to further assess the psychometric properties of the MMEBE, specific aims of future research will include the development of norms for overweight and obese individuals to generalize the current findings. This could be accomplished by administering the MMEBE to individuals interested in participating in weight loss treatment. Another aim of future investigations will be to further evaluate the validity of the MMEBE's factors by using assessment methods that do not rely on self-report. For example, the relationship between the Exercise scale and actual exercise behavior could be examined through the use of self-monitoring. In addition, laboratory settings could be used to investigate the validity of the MMEBE's Overeating and Avoidance of Fattening Foods and Sweets scales. Furthermore, by using different methods of evaluating body image disturbance (e.g., BIA; Williamson et al., 1989) the validity of the MMEBE's Overconcern with Body Size and Eating scale could be further assessed.

To establish the MMEBE as a treatment outcome measure, a treatment study will be designed so that overweight individuals are administered the MMEBE once before beginning a weight loss program and a second time after they have completed the program. Changes in scores on scales of the MMEBE could indicate whether or not the MMEBE is a useful treatment outcome tool. For example, scores on the Overeating and Emotional Eating scales would be expected to decrease over the course of treatment, whereas scores on the Exercise and Avoidance of Fattening Foods and Sweets would be expected to
increase. Potentially, the MMEBE could also help clinicians identify specific problem areas and develop more individualized treatment plans.

Despite the current evidence that the MMEBE contains five out of six factors that can be considered reliable and valid measures of eating behavior and weight control practices, the measure should be considered experimental until further investigations of reliability and validity are performed. Based on the results of this investigation, it appears that the first steps in establishing the utility of the MMEBE as a self-report measure for behavioral factors associated with obesity have been taken.
References


Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.


Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.


Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.


Vita

Cheryl Funsch Smith was born in Rockmart, Georgia, in 1969. After graduating high school, she attended Emory University in Atlanta, Georgia. In 1989, she transferred to Purdue University in West Lafayette, Indiana, where she finished her bachelor of arts degree in Psychology in 1991. The following year she began the clinical psychology doctoral program at Louisiana State University in Baton Rouge. She married Bradley Clark Smith in 1994. Her master of arts degree in Psychology was conferred in 1995. Her clinical psychology internship was in Charleston, South Carolina, at the Medical University of South Carolina. In August of 1997 she received her doctorate in psychology, and she will begin a postdoctoral fellowship at Western Psychiatric Institute and Clinic in Pittsburgh, Pennsylvania, in September 1997.
Candidate: Cheryl Funsch Smith

Major Field: Psychology

Title of Dissertation: Development and Validation of a Multidimensional Measure of Eating Behavior and Exercise

Approved:

[Signatures of the examining committee members]

EXAMINING COMMITTEE:

Date of Examination:

6/26/97