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Treatment Outcome of Childhood Obesity: the Effect of Children's Psychological Distress and Problematic Behavior.

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**TREATMENT OUTCOME OF CHILDHOOD OBESITY:
THE EFFECT OF CHILDREN'S PSYCHOLOGICAL DISTRESS AND
PROBLEMATIC BEHAVIOR**

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

Psychology

by

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ABSTRACT

The number of children and adolescents effected by obesity has been increasing over the past 30 years. Current treatment of childhood obesity focuses primarily on increasing physical activity, modifying diet, providing nutritional education and teaching self-monitoring and stimulus control procedures. Although children have been shown to lose weight by participating in these treatment programs, the amount of weight children lose during treatment is often small, and long-term maintenance of weightloss continues to be challenging for many. Given the relatively weak outcome of childhood obesity treatment programs, research into factors that effect treatment outcome is needed. Psychological distress and problematic behavior are known to be associated with childhood obesity. However, investigations into their relationship with weightloss during treatment are limited. The current study examined the relationship between children's psycho-social distress and their outcome in an obesity treatment program. Unlike existing studies, this investigation included children's self-report of their psycho-social distress along with the parents' report for use in predicting children's weightloss success. The results of this study found that both parents and children provide unique information with regard to children's success in a group obesity treatment program as measured by a decrease in their BMI scores, and parents were the sole reporter of unique information about their children's internalizing difficulties that predicted their children's attendance in treatment.

INTRODUCTION

In the past 30 years, obesity rates for children ages 6- to 17-years have more than doubled (Centers for Disease Control & Prevention [CDC], 1996). The trend toward increasing obesity in children is not new and continues despite a 10-year national campaign of educating adults and children on the dangerous effects of obesity (National Center for Health Statistics [NCHS] 1999). As obesity has been shown to be linked to cardiovascular disease, hypertension, and diabetes (Berenson, Srinivasan, Wattigney & Harsha, 1993; Mo-Suwan & Lebel, 1996), public policy continues to include the prevention and treatment of obesity within the current national health campaign (NCHS, 2000).

Given its associated health risks, obesity is included as a general medical condition in the International Classification of Diseases Tenth Edition (ICD-10; World Health Organization, 1992). However, as specific psychological and behavioral characteristics do not consistently relate to obesity, the diagnosis is not included as a primary mental health diagnosis in the Diagnostic and Statistical Manual Fourth Edition (DSM-IV; American Psychiatric Association, 1994), but rather is included as a psychological factor affecting a general medical condition such as diabetes.

Early investigations into childhood obesity focused on factors related to genetic predisposition (Bar-Or et al., 1998), and socio-economic status (Sobal &

Stunkard, 1989). More recently, researchers have broadened the scope of their studies to examine psycho-social factors thought to be associated with childhood obesity such as maternal feeding practices (Sherman, Alexander, Clark, Dean & Welter, 1992), parental psychopathology and family functioning (Christoffell & Forsyth, 1989; Mendelson, White & Schliecker, 1995), and psycho-social characteristics (e.g. depression, self-esteem, externalizing behaviors, social problems) of obese children (Carey, Hegvik & McDevitt, 1988; Epstein, Myers & Anderson, 1996). In terms of treatment studies, researchers primarily have focused on the effectiveness of different treatment components (e.g. diet, exercise, behavior modification) in assisting children to lose weight and maintain their weightloss (Jelalian & Saelens, 1999). Only a few studies have begun to investigate the factors associated with children's success in losing weight in treatment programs such as parental psychopathology (Epstein, Myers & Anderson, 1996; Epstein, Wisniewski & Weng, 1994), and parents' reports of their children's psycho-social distress (Myers, Raynor & Epstein, 1998).

In conclusion, although many studies have reported on psycho-social characteristics of obese children and their families, our understanding of how psycho-social factors relate to children's success at losing weight during treatment and their ability to complete treatment programs is limited. Additionally, the few studies that have examined psycho-social factors in relation to treatment outcome have relied on

parent report of children's behavioral functioning and psychological distress, and have not examined children's self-report. Therefore, the purpose of this study is to review research on factors contributing to childhood obesity, to describe treatments for childhood obesity, and to explore both parents' and children's reports of the children's psycho-social characteristics, and how these characteristics effect children's weightloss success when in a treatment program.

Demographic Differences

Presenting data from the Third National Health and Nutrition Examination Survey (NHANES III) 1988-1994 (National Institutes of Health, 1998) reported that 11% of adolescents (ages 12- to 17-years) and 14% of children (ages 6- to 11-years) were obese. This represents an increase of 6% for both adolescents and children in the rates of obesity from 1976 to 1980. Reporting on prevalence rate by ethnicity and gender, the Morbidity and Mortality Weekly Report ([MMWR]; CDC, 1997) indicated that Caucasian male and female children and adolescents had the lowest obesity rates. The second lowest rates were seen in African American males and Mexican American females; and, the highest rates were obtained by both Mexican American males and African American females. The percent overweight ranged from 9.6% for Caucasian females (adolescents) to 18.8% for Mexican American males (children).

The Youth Risk Behavior Surveillance - United States, 1999 (Kann et al., 2000) reported similar prevalence rates by ethnicity and gender among high school students. Overall, 14.4% of Caucasian students, 18.8% of Hispanic students, and 22% of African American students were found to be overweight. Additionally, a significant gender difference was found for Caucasian students in that males (17.5%) were more likely than females (14.4%) to be overweight.

Investigating the effects of SES on childhood obesity, Sobal and Stunkard (1989) reviewed over thirty studies and found variability in the reported results. It was suggested that the variability between the studies may have been due to age or developmental differences in the participants. More recently, the National Center for Health Statistics (1999) reported that twice the number of adolescents from low SES households are overweight or obese as compared to adolescents from middle and high SES.

Etiology of Childhood Obesity

Genetics and family system variables

Multiple factors have been shown to contribute to obesity in children including genetic predisposition, family system variables, individual psycho-social characteristics, nutritional intake, and energy expenditure. With regard to genetic disorders, less than 5% of obesity cases have been found to be related to a single gene disorder such as Bardet-Biedle, Laurence-Moon, and Alstrom syndromes

(Braungart-Rieker & Bergeman, 1999). On the other hand, genetic predisposition studies indicate that up to 45% of obese children have at least one obese parent; and, the amount at which genetics has been estimated to contribute toward individual differences in body mass is 25 to 40% (Bar-Or et al., 1998). Twin studies give additional support for the genetic transmission of obesity. Maes, Neale, and Eaves (1997) examined data from 14,763 twins using Stealth Model analysis and found genetic factors explained 67% of the variance of obesity in male and female children. These results are similar to findings reported by others indicating genetic factors contribute significantly toward individual differences in obesity (Epstein & Cluss, 1986).

Other family variables that may put children at increased risk of obesity include parental modeling, parents' psychological distress, and family functioning. For example, Kinston, Miller, Loader and Wolff (1990) found that although obese girls as compared to obese boys had almost twice the incidence of obese parents, obese boys were more likely to have an obese father than obese mother. Additionally, relationships between children's gender, family functioning, and parents' mental health and degree of obesity have been found. For girls, the amount of obesity was positively correlated with parent report of positive mental health and family functioning. However, objective assessment indicated that the more obese the girl, the more dysfunctional the family. Additionally, families of obese girls were observed to

have high levels of hostility and ambivalence directed towards the obesity than did families of obese boys. For boys, a complex finding was reported with regard to the severity of the child's obesity. More severely obese boys had fathers who gave poor ratings of their own mental health as compared to less obese boys. The mothers of more severely obese boys gave poorer ratings of their families' functioning. Other studies also have found a positive association between childhood obesity, maternal psychiatric symptomatology (Christoffel & Forsyth, 1989; Favaro & Santonastaso, 1995), and a dysfunctional family system (Mendelson, White, & Schliecker, 1995).

In summary, both genetic and environmental factors have been shown to be associated with childhood obesity. Although genetic contributions to childhood obesity have been estimated at 25 to 40%, family variables such as having an obese parent and poor family functioning also contribute to childhood obesity (Bar-Or et al., 1998).

Psychological adjustment and assessment of children

Historically, parent report has been considered the primary source of information regarding their child's behavior as parents were thought to be most familiar with their child's development and behavior (Edelbrock and Costello, 1990; Edelbrock, Costello, Dulcan, Kalas, Conover, 1985). Self-report information from the child or adolescent may have been obtained but was considered secondary (Edelbrock, & Costello, 1990). Using children or adolescents as informants for

diagnostic purposes was considered inappropriate due to their lack of cognitive development (Edelbrock and Costello, 1990; Herjanic, Herjanic, Brown, & Wheatt, 1975; Witt, Elliott, Gresham, & Kramer, 1988). Additionally, self-report measures commonly resulted in information which did not parallel observed behavior (Pellegrini, Galinski, Hart, & Kendall, 1993).

Over the past decade, researchers have begun to re-examine the utility of assessment information gained from children and adolescents (Edelbrock and Costello, 1990; Jensen, & Watanabe, 1999; Shea, 1990). Children and adolescents are now considered important informants as they allow researchers or clinicians to understand their subjective interpretation of events, and provide information that may not be available from other sources (Hughes, 1989). Researchers recommend obtaining both parent- and self-report especially when assessing older children and adolescents (Achenbach and Edelbrock, 1987; DuPaul, Guevremont, & Barkley, 1991). Most importantly consideration should be given to adolescents' self-perceptions because their understanding of interpersonal relationships, emotions and ability to coordinate multiple perspectives simultaneously is developed to a greater extent than younger children (Hughes, 1989).

In diagnosing adolescents based on the DSM-III-R (American Psychiatric Association, 1987) or DSM-IV (American Psychiatric Association, 1994) classification systems, the relative value of parent reported versus self-reported

symptomatology in adolescents varies as a function of assessment method (rating scales vs. interview) and type of problem (internalizing vs. externalizing). Using structured diagnostic interviews, several studies found that parent report was sufficient for accurately diagnosing Attention Deficit Hyperactivity Disorder (ADHD) (Loeber, Green, Lahey, & Stouthamer-Loeber, 1989; Bird, Gould & Staghezza, 1992) in adolescents. Adolescent report was found to be sufficient for diagnosing anxiety and depressive mood disorders (Reich & Earls, 1987; Bird et al., 1992). Either parent report alone (Bird et al., 1992) or both informants were needed to derive a diagnosis of Oppositional Defiant Disorder (Reich & Earls, 1987; Loeber et al., 1990).

When using questionnaire data, Achenbach and Edelbrock (1987) suggest that both parent and adolescent information be obtained when screening for internalizing or externalizing disorders. For example, Stranger and Lewis (1993) probed the combined value of multiple informants using two questionnaires (e.g. CBCL and YSR) with a sample of 98, 13 year-olds. Results of step-wise regression analyses and conditional probabilities indicated that both parent and adolescent reports were needed to identify all deviant children. For Internalizing scores, only 20% of the subjects rated in the deviant range by mothers were also rated in the deviant range by the adolescent. Similarly, only 27.3% of the subjects rated in the deviant range by

adolescents were rated in the deviant range by mothers. Similar results have been obtained elsewhere (Jensen, Salzberg, Richters, and Watanabe, 1993).

Taking it one step further, a multi-method procedure, which combines interview and behavior rating scale data, has been suggested for use in clarifying discrepancies between informants (Barkley, 1988; Young et al., 1987). Jensen and Watanabe (1999) compared diagnoses as indicated by structured interview and rating scale data. Results suggested that false-negative cases (e.g. those meeting diagnostic criteria but not rating scale cutoff scores), may have reflected differences in clinical severity or impairment. Further, Jensen et al. (1996) investigated the relationship of external validators (e.g. self-report questionnaires, risk factors, evidence of behavioral impairment) to both a structured interview and parent-completed checklist. They concluded that the optimal assessment include both categorical and dimensional information, while utilizing the "natural raters" (e.g. teachers for school behaviors, parents for home behaviors, self-report for internalized behaviors) for the disorder of interest.

Childhood obesity and psychological adjustment

Associations between a child's degree of obesity and their psychological adjustment have been found in some samples. However, several variables have been found to mediate the association between obesity and psychological adjustment including age, race, peer relations, maternal psychopathology, socioeconomic status,

informant (i.e., parent, child), sample (i.e., clinical or seeking treatment, nonclinical or not seeking treatment for obesity), and the specific psychological variables of interest (Israel & Shapiro, 1985; Wadden & Stunkard, 1987). For example, Carey, Hegvik and McDevitt (1988) found a positive association between weight gain and difficult temperament in a general pediatric sample of 138 children from 4- to 5-years of age through 8- to 9-years of age. In trying to pinpoint the specific temperament characteristics, a smaller sample of 21 obese 6- to 12-year-old children were examined and were found to have less predictable routines (e.g. eating, sleeping) and lower levels of attention as compared to matched controls. The authors suggested that these behavioral characteristics may predispose a child to inappropriate eating habits, and may interfere in implementing a dietary treatment plan.

Epstein, Myers, and Anderson (1996) assessed child psychological problems using the parent-completed Child Behavior Checklist (CBCL; Achenbach & Edelbrock, 1983) in a clinical sample of 152 obese children. Similar to the rates of behavioral difficulties found in other clinical populations of obese children, approximately half of the children had at least one elevated subscale score on the CBCL. More specifically, elevations on the Somatic Complaints, Anxiety/Depression, Social Problems, Externalizing Problems and Internalizing Problems were found. However, in determining factors that contributed to the children's degree of behavioral difficulties, maternal psychiatric symptoms and SES

were found to predict child psychopathology across most of the CBCL subscales while the children's percent overweight was not found to be a significant predictor. These findings give support for general behavioral difficulties in clinical samples of children seeking obesity treatment, and indicate that factors other than degree of obesity may account for their psychological distress.

Myers, Raynor, and Epstein (1998) also reported elevations in CBCL scores in a clinical sample of 116 obese children (8- to 12-years). However, almost a 50% reduction in the number of children with elevated scores was found for the Somatic Complaints, Anxiety/Depression, and Social Problems scales, while a similar number of children were reported to have elevated scores on both the Externalizing Problems and Internalizing Problems scales. Myers and colleagues conducted additional statistical analysis of this data and the results indicated that at 1-year following treatment for obesity, a significant improvement from baseline scores was obtained for the Total Problems, Total Competence, Internalizing Problems, Withdrawn, Somatic Complaints, Anxious/Depressed, Social Problems, and Attention Problems subscales of the CBCL. Changes in ratings of Externalizing problems were not found. Building on the previous study completed by Epstein, Myers, and Anderson (1996), Myers and his colleagues investigated the relationship between maternal psychiatric symptoms and degree of obesity in contributing to the child's psychological problems. The results indicated that both the child's change in percent obese and the change in

maternal psychopathology were significant predictors of the child's improvements in psychopathology as measured by the CBCL. Therefore, children's success at losing weight was found to contribute unique information over and above improvements in maternal psychopathology in predicting improvements in children's psychological distress and problematic behavior. Additionally, gender was found to be a significant confound. Specifically, girls having greater reductions in weight were found to have greater improvements in their Total Problems score, whereas boys having greater reductions in weight were found to have smaller improvements in their Externalizing scores.

Investigating emotion-induced eating and its relationship to obesity in a nonclinical sample of 2,379 girls (ages 9- to 10-years), Striegel-Moore et al. (1999) found that although African American girls had significantly higher emotion-induced eating scores than Caucasian girls, emotion-induced eating in Caucasian girls was positively associated with increased sucrose intake. An unexpected finding was an inverse association between body mass index and emotion-induced eating for both races. In contrast, using a clinical sample of 292 children (9- to 12-years-old), Braet and van Strien (1997) found a positive association between emotional eating and obesity when using both parents and children as informants. The child's emotional eating, as reported by the parent, was associated with both the child's self-reported negative feelings of physical competence and parent-reported child behavior problems

as indicated by elevated Internalizing, Externalizing, and Total Problems scores on the Child Behavior Checklist (CBCL; Achenbach & Edelbrock, 1983).

Investigations into various aspects of self-esteem have found associations between poor self-esteem and obesity in children from both clinical and nonclinical samples (Braet, Mervielde & Vandereycken, 1997; Kimm et al., 1997; Miller & Downey, 1999; O'Dea & Abraham, 1999). For example, Braet, Mervielde & Vandereycken (1997) found obese children (9- to 12-years) from both a clinical and nonclinical population reported more negative physical self-perceptions and lower self-worth than their nonobese peers. Interestingly, while the samples did not differ in their reports of poor self-esteem, the clinical sample was reported by their parents to exhibit greater behavior difficulties than the nonclinical sample.

Possible mediating variables between self-esteem and obesity have been identified as age, gender, race, locus of control, quality of peer relations, and self-esteem. With regard to age, studies vary in reporting the age at which children begin to worry about becoming "fat", with ages ranging from 5- (Shapiro, Newcomb, & Loeb, 1997), to 9-years (Thelen, Powell, Lawrence & Kuhnert, 1992; Thompson, Corwin, & Sargent, 1997). In terms of race/ethnicity, Thompson et al. (1997) found that African American children select significantly heavier ideal body sizes than Caucasian children. Thus, it follows that as ethnic minorities prefer heavier body sizes, their preference might provide a buffer against the social stigma that Caucasian

individuals face (Miller & Downey, 1999). With regard to locus of control and peer relations, Pierce and Wardle (1997) suggest that obesity and poor self-esteem are mediated by the child's belief as to the cause and effects of being overweight.

Working with a clinical group of obese children (9- to 11-years), Pierce and Wardle found that the obese children had lower self-esteem than the nonclinical, average weight control group. However, within the obese group, poorer self-esteem scores were associated with having either an internal locus of control for the cause of their obesity, or blaming their obesity for causing poor relationships with peers. Last, Kimm et al. (1991) found overall scores of self-esteem to be within the normal ranges from a clinical sample of 130 obese children. However, within the sample, specific subgroups were found to have lower self-esteem. For example, nonwhite children reported lower overall self-esteem, boys with greater obesity reported lower scores with regard to their intellectual and school status, and younger Caucasian males reported lower levels of popularity.

Similar to the literature in children, research with adult populations have not found support for an association between obesity and increased rates of psychopathology. Multiple studies have been conducted comparing obese samples with nonobese controls with both clinical samples utilizing psychiatric interviews, and samples from the general population utilizing self-report measures (Perri, Nezu & Viegner, 1992). However, while groups of obese individuals may not have increased

rates of psychological disturbance, individuals who are overweight may be at increased risk for emotional difficulties that are directly associated with the stigma of being overweight in a society that values and promotes thinness. While studies with children have not found a clear association between self-esteem and obesity, support has been found in research with college and adult samples. In a meta-analytic study, Friedman & Brownell (1995) reported on 10 studies and found a weak association between self-concept and obesity. One primary interpretation of the finding, as reported by Friedman and Brownell, is that the association between obesity and self-esteem is age specific. That is, older adolescents and young adults who are obese may be at greater risk of developing a lower self-esteem given their increase in social pressures to be thin. The authors further suggested that studies of self-esteem within this population focus on the associations between body-esteem and self-esteem.

More recently, Miller & Downey (1999) reported on their meta-analytic study that was more comprehensive with regard to the addition of other relevant variables (i.e., SES, ethnicity, actual weight, perceived weight, gender) aside from age, obesity and self-esteem, and included the findings of 91 studies. Overall, obesity was negatively correlated with self-esteem with an average effect size of ($d = -.36$, $r = -.18$). Further analyses indicated that effect sizes were larger for clinical samples than nonclinical samples, larger for women than men, larger for higher SES individuals than lower SES, larger for Caucasian samples than for non-Caucasian samples, and

larger for those who perceive themselves as heavyweight than those who actually were heavyweight. With regard to age, variability was found across all four age groups (children, high school, college, and adults). Overall, the largest effect size was found for college samples ($d = -.59$, $r = -.28$), followed by high school samples ($d = -.45$, $r = -.22$), adult samples ($d = -.37$, $r = -.18$), and then samples of children ($d = -.25$, $r = -.12$). Significant differences were found between all age groups with the exception of the high school and adult samples. These results indicate a low to moderate inverse association between weight and self-esteem, and that early adulthood is a critical time period when this association has been found to be at its strongest.

In summary, inconsistencies have been found across studies in the association between a child's psychological adjustment and their degree of obesity. Studies from the general population have not found differences in psychological distress among obese and nonobese girls (Wadden, Foster, Stunkard, & Linowitz, 1989). While some children presenting for treatment do show elevated scores on a parent-completed questionnaire of psychological distress and problematic behavior, these scores may not reflect the impact of the child's obesity but rather be associated with the child's clinical status (e.g., seeking treatment), or other family variables (Epstein, Myers & Anderson, 1996).

and improvements in maternal psychopathology contribute to improvements in the child's psychopathology (Myers et al., 1998). In terms of child-completed self-report measures, in treatment studies improvements in weight were found to be associated with improvements in both self-esteem and depression (Wadden et al., 1990).

However, other inconsistencies exist. Both obese children seeking treatment and those not seeking treatment were shown to report more negative physical self-perceptions and lower general self-worth than nonobese peers by some researchers (Braet et al., 1997; Kimm et al., 1997; Miller & Downey, 1999; O'Dea & Abraham, 1999) but not by others (Mendelson & White, 1982; Kimm, Sweeney, Janosky, & MacMillan, 1991; Wadden, Foster, Brownell, & Finley, 1984). From these contradictory findings, it is suggested that much heterogeneity exists with regard to self-esteem and psychological distress within the population of obese children. Factors limiting what is known about the association between a child's psychological adjustment and their level of obesity include the small number of studies that have been conducted, the use of different questionnaire measures or questionnaire scores (e.g. total score, factor score) over the years, and those studies that have been conducted were completed with a restricted age group consisting primarily of children 8- to 12-years of age.

Diet and exercise

The other factors contributing to childhood obesity are poor diet and decreased physical activity. Reporting on a developmental perspective of eating, Birch (1991) states that as infants, eating is depletion-driven. That is, infants eat when they are hungry. However, by age 5 or 6, eating is based not only on physiological factors, but on sociocultural factors that have been learned such as time of day to eat, foods to eat at specific meals, food combinations, cues signaling eating, adding sugar or salt to foods and preferred foods. Drewnowski (1989) reviewed studies on food preference and found support for both social and physiological factors contributing to eating habits as children were found to choose foods based on their familiarity and sweetness. However, preference for sweet foods declined with age, while preference for fatty foods increased with age.

Research into the feeding practices from which children adopt their eating habits led to investigations of maternal variables. Maternal variables found to be associated with obesity in infants and children included mothers' external locus of control for their own weight, poor nutritional knowledge, pushy or frequent feeding practices, perceiving child's above average body size as ideal, and low SES (Sherman, Alexander, Clark, Dean & Welter, 1992). Additionally, Baldaro et al. (1996) found mothers of obese children had increased difficulty in decoding emotional facial expressions (anger, disgust, surprise, fear, happiness and sadness) as compared to the

control group. The authors suggested that the mothers' inability to recognize differences in their children's emotional states led to increased feeding of their children. Interestingly, the authors reported that the mothers' deficits also were seen in their children (8- to 16-years of age), indicating that the children may not have fully learned how to decode or express emotions, including differentiating true hunger from emotional stress.

Although the etiology of excessive eating may not be clear, it is clear that many children and adolescents have poor eating habits. Reviewing reports on the food that school-aged children and adolescents eat, the CDC (1996) stated that children and adolescents need to improve the quality of their diet. In general, children and adolescents eat too much fat, saturated fat, and sodium, and not enough fruits, vegetables, or calcium. Children's and adolescents' fat intake was reported as 33 to 35% of their total daily calories. Additionally, across a three-day recording of their food intake, 50.8% of youths ages 2- to 18-years reported eating fewer than one serving of fruit per day, and 29.3% ate fewer than one serving of nonfried vegetables per day. More recently, adolescents' poor nutritional eating habits were reported in the Youth Risk Behavior Surveillance - U.S. 1999 report (Kann, et al., 2000). In the 7 days preceding the survey, only 23.9% of high school students nationwide reported eating ≥ 5 servings per day of fruits and nonfried vegetables.

In addition to nutrition, regular physical activity is known to be important for maintaining a healthy weight and can assist in weight management (NCHS, 1999). The Dietary Guidelines for Americans (U.S. Department of Agriculture, 1992) recommends that children participate in at least 60 minutes of physical activity daily and limit inactive play (e.g. TV, video games). Unfortunately, research has found that this is not the case for most children and adolescents. Prevalence rates indicate that 64.7% of high school students nationwide participated in a vigorous activity for ≥ 20 minutes on ≥ 3 of 7 days preceding the survey (Kann et al., 2000). Across all racial/ethnic subpopulations, males (72.3%) were significantly more likely than females (57.1%) to have engaged in vigorous activity. Racial/ethnic differences were found in that Caucasian students (67.4%) were significantly more likely than African American students (55.6%) to have engaged in vigorous activity. Bar-Or et al. (1998) suggested that increased sedentary behaviors in children may be due to environmental factors such as decreased safety of allowing a child to play outside, fewer children walking to school, fenced in backyards, elimination of PE in school, limited community programs, increased technology (computers), and increased TV watching. Others have reported data confirming a relationship between increased TV or video play, decreased physical activity and increased obesity (Berkey et al., 2000; Shimai, Yamada, Masuda, & Tada, 1993).

Prevention and Early Intervention of Childhood Obesity

Costs associated with childhood obesity are great. Multiple medical risk factors have been identified including factors associated with cardiovascular disease, hypertension, and diabetes (Berenson et al., 1993; Mo-Suwan & Lebel, 1996).

Further, obesity during adolescence is associated with both an increased morbidity and mortality in adulthood independent of adult weight status (Must, Jacques, Dallal, Bajema, & Dietz, 1992), and a greater risk of being obese as an adult (NCHS, 1999).

Psycho-social risk factors of childhood obesity also have been identified including poor self-esteem, body-image disturbance, weight concerns, psycho-social problems (Jelalian & Saelens, 1999), and smoking (French, Perry, Leon, & Fulkerson, 1994).

Additionally, obesity in older adolescents was found to be associated with lower rates of marriage for men and women, and less education and lower household income for women. Given these factors, developing public policy in the prevention and early intervention of childhood obesity is of growing interest.

Current public policy with regard to preventing and treating childhood obesity is outlined in the Healthy People 2010 campaign (NCHS, 2000). In general, the goals call for increasing physical activity, and increasing intake of nutritionally dense foods while decreasing fat intake. Educating individuals on these goals is assigned to a variety of systems including medical providers, mental health providers, and schools. However, prior to designing specific childhood obesity prevention and treatment

programs, consideration must be given as to how children learn about health issues, and become motivated to act on their knowledge of behaviors that support good health.

Theories of Health Behavior in Children

In the 1950's, social psychologist within the U.S. Public Health department began developing adult models of behavior that could account for unique variance over the contribution of demographic variables (e.g. socioeconomic status, gender, ethnicity, age) in predicting the choices people make with regard to preventing and treating illnesses (Sheeran & Abraham, 1996). One such model, the Health Belief Model, was derived from stimulus-response theory (Hull, 1943; Thorndike, 1898; Watson, 1925) and cognitive theory (Kohler, 1925; Lewin, 1935). These models hypothesize that behavior is based on both an individuals' value of a particular goal, and their perception that a certain action will bring about the desired end (Clark & Becker, 1998; Stretcher, Champion & Rosenstock, 1997). Within a framework of health, these two theories can explain health behavior change as both an individuals' desire to get well or avoid illness, and their perception that certain health actions will return them to good health or prevent the onset of an illness (Clark & Becker, 1998). Following several revisions, the Health Belief Model now has six factors including an individual's perception of susceptibility, severity, benefits, barriers, cues to action, and their readiness to change or health motivation. (Sheeran & Abraham, 1996; Stretcher

et al., 1997). Susceptibility pertains to an individual's perception of their risk of getting an illness. Severity refers to an individual's assessment of the danger associated with getting an illness or not following the treatment for an illness. Benefits are an individual's belief in the usefulness of different actions which might decrease the threat of or treat an illness. Barriers reflect the individual's discernment of costs or difficulties associated with performing necessary health behaviors, including the individual's level of self-efficacy with regard to overcoming these difficulties to complete the required behavior. Cues to action pertain to the specific stimuli that spur the individual into making appropriate health decisions. Last, readiness to change or health motivation is an individual's current state of willingness to engage in health behavior change.

The health behaviors of adults are often formed during childhood. As such, many professionals now recognize the value of teaching health behaviors at an early age. However, as children's use and understanding of language, social relationships, and ability to think logically is qualitatively different than that of adults (O'Brien & Bush, 1997), the standard theories of adult health behaviors need to be adjusted to accommodate the perceptions of children. Thus, expanding on the health belief model, the children's health belief model incorporates cognitive development, social learning and behavioral intention theories to explain the development of children's health behaviors (O'Brien & Bush, 1997). First, cognitive developmental theory adapts

Piaget's four stages of development (i.e. sensory motor, preoperations, concrete operations, formal operations) and suggests that cognitive development occurs over time in a specific sequence across all topics including the acquisition of health behaviors. For example, during preoperations (age: 2- to 7-years) children interpret situations from their limited personal experiences, thus, they fail to attend to all aspects of a situation. During concrete operations (ages: 7- to 11-years), children begin to incorporate observable explanations or solutions when considering a situation. Finally, during formal operations (ages: 12 and up) children may develop the ability to think about situations in abstract terms and may not require concrete cues. In terms of health behavior, a common mistake in educating children is to assume that the primary goal is to increase the quantity of health facts that they know (O'Brien & Bush, 1997). Instead, educators should develop a curriculum or method of education that corresponds to the child's cognitive stage of development including their understanding of time and space, short-term and long-term consequences, and their limitations in thinking about unobservable events (O'Brien & Bush, 1997).

Second, social learning theory (Bandura, 1977) suggests that children interact in a social environment including family, school, peers, and media across a variety of settings. More importantly, children learn from the positive and negative consequences that come from the environment following the performance of a behavior. Expanding on social learning theory, Bandura's (1986) social cognitive

theory includes four steps (i.e. attention, retention, production, motivation) in the process of learning and predicting whether a behavior will be repeated. These steps occur within the context of a child's personal factors (e.g., value system, expectations based on experience), behavioral factors (e.g., performance skills) and environmental factors (e.g., modeling, opinions of others) (Robinson & Killen, 2001). Within the framework of teaching health behaviors, social cognitive theory suggests that children are more likely to develop healthy lifestyles if they have been taught to value good health, have had positive past experience in practicing healthy behaviors, believe that they can perform the behaviors necessary to maintain their health, and their parents, other caregivers and peers practice or model a healthful lifestyle (O'Brien & Bush, 1997).

The third theory included in the children's health belief model is behavioral intention theory (Fishbein & Ajzen, 1975). Behavioral intention theory interprets health behavior in terms of a child's personal beliefs about the consequences of performing a behavior, and the social impact (e.g. feedback from others) of engaging in the behavior. For example, as older children tend to spend less time with their parents than younger children, the implication is that adolescents are at greater risk of being influenced by nonfamily members (e.g. peers, schools, media, community) when selecting health beliefs and behaviors.

In summary, the childrens' health belief model can be outlined as a child's understanding and acceptance that specific behaviors are useful in maintaining good health and preventing or treating an illness. This understanding of positive health behaviors is learned from their personal experiences, observing the experiences of others, or with age, understanding the theoretical associations between healthy actions and good health. Finally, the likelihood of a child performing positive health behaviors increases with their belief that they can successfully perform these behaviors.

Issues of Compliance and Adherence in the Treatment of Children

The children's health belief model is consistent with other known factors found to increase children's cooperation and participation in medical treatments (LaGreca & Schuman, 1995). For example, it is suggested that treatment recommendations be adapted to accommodate a child's current developmental level such as simplifying instructions and explanations of the illness, and adjusting the extent of the treatment responsibilities that are given to the child (Christophersen, 1994; LaGreca & Schuman, 1995). Furthermore, as parents serve as their child's primary support and are an instructional component in administration of the treatment, they should be properly educated on both the child's illness and treatment regimen. Parents increased understanding of their child's illness and treatment requirements also allows them to give their approval for and model appropriate health behaviors.

Research investigating treatment adherence in pediatric populations has estimated compliance to be at 50% (LaGreca & Schuman, 1995; Rapoff, 1998). Consistent with the adult literature several factors have been identified which contribute to poor treatment adherence including regimens that are slow to produce observable changes in improved health, interfere or restrict a child's lifestyle, or have multiple, complex components making them difficult to follow (Christophersen, 1994; LaGreca & Shuman, 1995). In such cases, children and their families may weigh the benefits and costs of adhering to the prescribed treatment and choose not to follow the physician's recommendations. Additionally, a child with identified behavior difficulties and noncompliance at home or school has lowered expected compliance to treatment (Rapoff & Christophersen, 1982). Therefore, for those children identified as having general behavior problems, it is suggested that they participate in counseling or their parents be guided in child behavior management strategies prior to the onset of medical treatment (Christophersen, 1988).

To assist in identifying children with behavior difficulties and other factors associated with poor compliance, behavioral questionnaires can be completed by parents. Christophersen (1994) recommends the use of one of several behavioral questionnaires such as the Eyberg Child Behavior Inventory (ECBI; Robinson, Eyberg, and Ross, 1980), the Conner's Parent Symptom Questionnaire (PSQ; Goyette, Conners, and Ulrich, 1978), or the Achenbach Child Behavior Checklist

(CBCL; Achenbach and Edelbrock, 1983). While the ECBI is appropriate as an initial screen due to its short format, the CBCL is described as a second-stage evaluation tool as it is more comprehensive in assessing psychosocial functioning of children (Christophersen, 1994; Wallander & Thompson, 1995).

Over the years, several additional treatment outcome measures have been utilized to investigate compliance depending on the illness of interest and the prescribed treatment protocol. For example, categorical variables using one cutoff score to group individuals by their level of adherence (i.e. poor, moderate, good) is commonly utilized in pediatric research. However, determining the exact cutoff score or percent compliance required to translate into a positive therapeutic outcome is not known within most pediatric samples. Additionally, for some chronic illnesses (i.e., diabetes) a direct relationship does not exist between high levels of adherence and good disease control (Johnson, 1994).

A second method of determining compliance is to combine multiple adherence variables such as drug assays, self-monitoring or verbal recall of primary treatment variables (e.g. medication compliance, dietary intake, glucose levels), parents' report of their child's compliance, computerized monitoring meters, and overall attendance to treatment sessions. Of these, self-monitoring measures are most frequently used due to their ease of use and low cost. While providing useful information, caution should be taken as self-report measures of adherence have been shown to

overestimate adherence due to inaccuracies associated with social desirability and delays in self-monitoring (e.g. completion of forms just prior to appointments) (LaGreca & Schuman, 1995). While the use of drug assays and computerized monitoring devices are the most accurate measures of adherence, they can not be used in all treatment protocols. Finally, attendance, considered to be a general measure of compliance to appointments, and a strong measure of those willing to continue seeking treatment, does not actually measure adherence to specific treatment components.

Although learning about factors that may increase treatment compliance from participants who remain in treatment is important, a unique approach to compliance research is to determine barriers to adherence for those who would otherwise drop-out of treatment. Therefore, in the interest of increasing overall treatment continuation, determining methods for identifying children who are at greatest risk of leaving treatment would allow for a more decisive way to promote treatment compliance from a preventive manner (LaGreca & Schuman, 1995).

Treatment Outcome Measures

Success in the treatment of obesity is commonly measured as a change in Body Mass Index (BMI) as it is reported to predict both morbidity and mortality rates (Miller, 1996). Currently, for children and adolescents, obesity is defined as a BMI at or above the sex- and age-specific 95th percentile, (NSHS, 2000). Further, overweight

is most commonly defined as a BMI at or above the sex- and age-specific 85th percentile but below the 95th percentile.

Miller (1996) suggests the use of four broader categories in measuring success including body-related variables, medical/health issues, eating/exercise habits, and psychological/body image/quality of life. Body related measurements include the standard variables of weight, body composition (fat to lean ratio), body measurements, waist-to-hip ratio, and BMI. Medical and health issues might include a change in status of hypertension, diabetes, and hypercholesterolemia. Eating and exercise habits might include calories consumed, nutritional composition of food consumed, portion sizes consumed, and the frequency, duration and intensity of physical activity. Psychological health and quality of life variables might include personality traits, mood, family interaction, perception of body image, and subjective satisfaction with life. Overall, Miller suggests that progress not perfection be emphasized. For example, in adults, a loss of 10% of total body weight can lead to improvements in hypertension and hypercholesterolemia, and a loss of 5 kg has been associated with improvements in mood and quality of life measures.

Treatment Programs

Most weight loss programs for children and adolescents are behaviorally based, combining several components including diet, nutritional education, exercise plans, self-monitoring, stimulus control procedures, and a maintenance plan (Duffy &

Spence, 1993). Behaviorally based weight loss programs have been shown to be superior to no treatment controls and alternative treatments (Israel, 1990).

Additionally, behaviorally based studies have shown support for maintenance of weightloss at 5 and 10 year follow-ups (Epstein, McCurley, Wing & Valoski, 1990; Epstein, Valoski, Wing & McCurley, 1994). However, for many treatment programs, participants continue to be obese even after losing weight during the treatment (Israel et al, 1994). Continued obesity remains a problem as the average weight of children and adolescents at the beginning of treatment is 20 to 50% in excess of ideal weight, and the average weightloss reported by most studies is only 4 to 8% (Duffy & Spence, 1993). Therefore, increasing effectiveness through increased participant adherence (e.g. parent, child), and component analysis of the programs has been the focus of many research studies in the past decade.

Diet

There is general agreement across studies that a restrictive diet is a necessary component of weightloss programs. However, the type of dietary restriction varies across studies. The most common diet to assist in weight reduction is a hypocaloric diet that is low in fat. Based on a balanced calorie, low fat diet, the Traffic-Light diet was created to promote weightloss in children participating in a family-based weight management program (Epstein, Wing, & Valoski, 1985). Over the past 15-years, the Traffic-Light diet has been an effective component in weight management programs

for children that have shown maintenance of weightloss at 5- and 10-year follow-ups (Epstein, McCurley et al., 1990; Epstein, Valoski, Wing, & McCurley, 1994). Foods on the Traffic-Light diet are divided into 11 categories and then divided again into color groups (e.g. red, yellow, green). Green signifies foods that can be eaten without restriction (e.g. vegetables and < 20 calories per serving). Yellow signifies foods that should be eaten in moderation and includes foods from the four basic food groups that are within 20 calories of the average food within each of those food groups. Red signifies foods that are greater than 20 calories above the average food within each of the four basic food groups, and are limited to no more than 4 times per week. Other weightloss programs utilizing diets based on restricting saturated fat and dietary cholesterol have also been shown to be effective (van Horn et al., 1993).

Programs using a protein-sparing modified fast (PSMF) diet also have been shown to be an effective component for weight reduction in children, adolescents, and adults (Suskind, et al., 1993; Wadden, Stunkard & Brownell, 1983). A PSMF diet consists of lean protein with small amounts of carbohydrate, and added vitamins and minerals (Figuerola-Colon, von Almen, Franklin, Schuftan & Suskind, 1993).

Therefore the foods on the diet include lean pork, beef and poultry, fish, and small amounts of vegetables that are very low in carbohydrates. Due to its severe restriction on carbohydrate intake and possible physiological difficulties that could develop during a state of semi-starvation, initial investigations into the PSMF took place

during lengthy hospital stays with severely obese patients. For example, Merritt, Bistrian, Blackburn, and Suskind (1980) utilized the PSMF diet during a 4-week, inpatient program with severely obese (152 to 237% of ideal body weight; IBW) children and adolescents (9- to 16-years). Protein intake ranged from 1.4 to 3 gm/kg IBW/day. The mean weight loss reported was -7.11 kg. Throughout the diet, strict monitoring of food intake and metabolic functioning were conducted and the PSMF diet was found to be safe for achieving rapid weight loss in severely obese children and adolescents. Other studies using an inpatient sample investigated the relationship between weightloss, metabolic functioning and the PSMF diet also have shown that the PSMF diet can be used safely by medical professionals as part of an overall program to treat obesity in children and adolescents (Archibald, Harrison & Pencharz, 1983; Dietz & Schoeller, 1982; Merritt, Blackburn, Bistrian, Batrus & Suskind, 1983; Stallings, Archibald, Pencharz, Harrison & Bell, 1988).

Over the years, outpatient programs also have found that the PSMF diet can be used safely by medical professionals as part of an overall program to treat obesity in children and adolescents (Figueroa-Colon et al., 1993; Suskind et al., 1993) For example, Figueroa-Colon et al. (1993) compared the PSMF diet to a hypocaloric diet across two groups of children for 10 weeks. Following the initial 10-weeks, all of the children were placed on a balanced calorie diet and meetings were held monthly for one year. While their initial diets varied, both of the groups participated in education

on activity and life-style changes. Although both groups of children lost weight, the PSMF diet resulted in significantly greater changes in percentage overweight at 10-weeks as compared to the hypocalorie diet (-30% vs -14%, respectively). This trend continued to be seen at 6-months (-32% vs -18%), and at 14.5-months (-23.3 vs -20.3).

The Committed-To-Kids (CTK; www.committed-to-kids.com) weightloss program is another example of a comprehensive pediatric outpatient program utilizing the PSMF diet for children 6- to 18-years of age. The CTK program was created about 14-years ago and has grown to include 11 clinics in 8 states including Florida, Illinois, Kentucky, Louisiana, Ohio, Washington, Arizona, Missouri. The program is manualized and contains four phases. Each phase contains 10 activity and monitoring exercises. Booklets containing food and exercise monitoring forms also are available for each phase in the program. Phase I (Red) is for children more than 200% of their ideal body weight (IBW). Phase II (yellow) is for children 150 to 199% of their IBW. Phase III (Green) is for children 120 to 140% of their IBW. Phase IV (Blue) is for children less than 120% of their IBW. The program begins with a physical exam, comprehensive body measurements (e.g. height, weight, calculation of overweight and body fat analysis), lipid profiles and biochemical parameters assessed, and exercise and nutritional evaluations. Additionally, children and their parents complete questionnaires with regard to their children's behavior. Questionnaires common to the

program include the parent-completed Child Behavior Checklist (CBCL; Achenbach, 1991), the Child Depression Inventory (CDI; Kovacs, 1992) and the Piers-Harris Children's Self-Concept Scale (Piers, 1984). Further comprehensive body measurements and behavioral questionnaires are completed at 10-weeks, and every 3-months throughout the duration of the program.

Children are assigned to begin the program at the appropriate phase based on their percentage of IBW. Children assigned to phases I through III begin the program on the PSMF diet. Children assigned to phase IV are given instruction in a 1200-calorie balanced diet that follows the American Dietetic Association (ADA) guidelines. A team of specialists, including a pediatrician, nutritionist, exercise physiologist, and behavioral therapist conduct weekly group sessions with the children and their parents. Weekly sessions begin by weighing with the pediatrician, followed by reviewing their weekly goals (e.g. nutrition, exercise, behavior) with one of the other specialist. Following weighing, nutrition, behavior modification and exercise topics are covered. Examples of lessons include instruction in food groups, portion sizes, restaurant survival, label reading, eating rules and behavior, limit setting and social triggers, relapse prevention, health benefits of exercise, fitness facts, and safe and effective exercise techniques. As the children progress through the program, small group or individual sessions are conducted to instruct the children on the balanced calorie diet when they are ready to begin phase IV. Readiness to begin

phase IV of the program is indicated when the children reach 120% of their IBW, at the request of the family, or as otherwise instructed by the pediatrician. The program is intended as a 42-week commitment, or until such a time as the children have reached their goal weight which is determined by the children and pediatrician.

Success in losing weight through the CTK program has been documented. Suskind et al. (1993) reported 77% of their participants had significant weightloss following the initial 10-week phase (-9 kg), and all those completing the first 10-week phase maintained their weightloss at 36 weeks. Similar findings were reported by Sothorn, et al. (2000).

More recently, diets following a low-glycemic index also have been shown to be effective during weight management programs for children. Spieth et al. (2000) found that over a four-month period, children adhering to a low-glycemic diet lost significantly more weight (-2.03 kg) than those adhering to a low-fat diet (+1.31 kg). Ludwig (2000) reports on the low-glycemic index diet indicating that it was derived from research suggesting that high levels of dietary fat do not consistently lead to increased weight; reducing fat intake generally leads to small and temporary weightloss; and, while the prevalence rates of obesity continues to rise in the United States, consumption of dietary fat has decreased. Given these findings, it is suggested that dietary variables other than fat are important in weight management.

The low-glycemic index diet is based on eating foods which have a low rate of carbohydrate absorption once they are eaten as this has been shown to increase satiety, delay the return of hunger, and direct nutrients toward oxidation in the muscle and not toward storage in fat (Ludwig, 2000). The glycemic index of a food is measured as the area under the glucose response curve after consumption of 50 g carbohydrate of a test food divided by the area under the curve after consumption of 50 g carbohydrate from a control food such as white bread (Wolever, Jenkins, Jenkins, & Josse, 1991). In general, foods with a low-glycemic index include vegetables, fruits and legumes, whereas refined grain products and potato have a higher-glycemic index (Ludwig, 2000). As yet, the low-glycemic index diet has not been utilized with either an inpatient or outpatient weightloss program. However, the theoretical and experimental work conducted to date indicates that it may be an effective diet in promoting weightloss.

In summary, diets consisting of restricting calories, fats, or carbohydrates have been shown to be an important aspect of a weight reduction program. The low-glycemic index diet is the newest diet and least studied. Studies involving either a hypocaloric diet or the PSMF diet indicate that both are effective weightloss approaches when used within a comprehensive program (Epstein, Wing, & Valoski, 1985; Suskind et al., 1993). Initial investigations comparing both the PSMF diet to the hypocaloric diet indicate advantages in greater weightloss with the PSMF diet

(Spieth et al., 2000). However, additional studies replicating this finding are needed. Additionally, in terms of long-term weightloss, data are not yet available on programs utilizing the PSMF diet, while the hypocaloric diet has been shown to be effective at reducing weight and maintaining weightloss in children (Epstein, McCurley et al., 1990; Epstein, Valoski, Wing, & McCurley, 1994).

Exercise

Similar to diet, exercise is a well accepted component of behavioral weightloss programs. Therefore, many studies have focused on the effects of different forms of exercise, and how clinicians are able to motivate children to engage in physical activity. For example, Epstein, Wing, Koeske, and Valoski (1985) compared lifestyle exercise, aerobic exercise and calisthenics for exercise within a weightloss program for children. While all groups of children showed significant weightloss by the end of the 1-year treatment, only the lifestyle group was able to maintain significant weight changes by the 2-year follow-up.

More recently, Sothorn et al. (2000) conducted a 10-week behavioral weightloss program for children (ages 7- to 12-years) and varied the type of exercise taught. Forty-eight control participants enrolled in the program utilizing a standard three day a week walking exercise. Nineteen treatment participants enrolled in a similar program, with the exception of utilizing resistance strength training using 1- to 5-pounds of weight in conjunction with moderate intensity aerobic and flexibility

exercises for the exercise component. The study successfully demonstrated that resistance training could be safely used in an outpatient clinic-based program for obese pre-adolescents. Participants' percent of ideal body weight and BMI were significantly reduced at 10-week and 1-year follow-up for both groups. Surprisingly, program completion was greater for the resistance training treatment group with a 1-year retention rate of 35% as compared to 20.8% for the control participants. The authors hypothesized that resistance training may have provided a preferred alternative to weight-bearing exercise for severely obese children.

Epstein, Valoski, Vara, et al. (1995) investigated the differential effects of reinforcing children for decreasing sedentary behaviors, increasing exercise or both. At 1-year follow-up, the group who was reinforced for decreasing sedentary behavior had the greatest weight loss than either the combined or exercise groups. However, these results did not hold for Epstein, Paluch, Gordy and Dorn (2000) when they again compared the effects of using reinforcement to decrease sedentary behaviors or increase physically active behaviors in a family-based behavioral weight control program. In contrast to Epstein, Valoski, Vara et al. (1995), results indicated that both groups responded equally as well to the treatment with no significant difference between groups in amount of weightloss through the 2-year follow-up.

School-based studies

School based programs targeting only health based knowledge without a direct behavior change component is common. For example, Cohen, Felix, and Brownell (1989) targeted knowledge of nutrition, as well as blood pressure and smoking prevention in a school-based program. An additional component of the study was the inclusion of older peers (grades 9 through 12) and classroom teachers as instructors in the school-based, health education program. At one year follow-up, the adolescents (grades 5 through 7) who attended the peer-led group demonstrated a greater increase in knowledge as compared to the teacher-led group for the blood pressure curriculum only. No difference was found in knowledge gained between the peer-led and teacher-led classes for either the smoking or nutritional curriculum. This study gives support toward including peers as instructors in school-based health education classes.

More recently, Smolak, Levine and Schermer (1998) found some success in educating 5th graders through a specially created class curriculum targeting nutrition, dieting, attitudes about fat people, body esteem, and exercise. Similar to Cohen et al. (1989), the children did not participate in direct behavior change or self-monitoring tasks, but instead participated in the classroom lessons and completed homework based on each lesson. Post test results indicated improvements in knowledge of nutrition, effects of dieting and causes of body fat. Unfortunately, attitude changes

about overweight people were not as well improved, and no changes were found in eating or exercise patterns, weight reduction attempts, and teasing of overweight children.

Studies investigating school-based programs to teach life changes in dietary and activity expenditure in children and adolescents have reported disappointing results. For example, Goldberg et al. (1980) conducted a school-based educational program that focused on changing eating habits in 68 elementary children over a three-year period to reduce atherosclerotic risk factors. In addition to educational lessons provided by the teachers, newsletters were forwarded to the parents, and school cafeteria selections were altered to provide healthier choices. Outcome data was reported as changes in serum cholesterol, blood pressure, degree of overweight, and knowledge of educational materials taught. Over the three-year period, a significant differences was reported between the 68 children in the experimental group and the 23 children in the control group only for improvement in knowledge of atherosclerosis and its associated risk factors. More recently, Webber et al. (1996) conducted a similar study investigating cardiovascular risk factors among children in a school-based program across 2 1/2-years. Similar results were found in that despite changes in the schools' food service, physical education class and changes in the children's eating and physical activity behaviors, significant changes were not found in the children's levels of obesity, blood pressure and serum lipids.

School-based programs specifically targeting weightloss have reported greater success than those programs targeting life changes. Brownell and Kaye (1982) conducted a 10-week, school based program for 63 obese children (5 to 12 years). Program components included behavior modification, nutrition education, and physical activity. Additionally, the program included participation at varying levels by parents, teachers, physical education instructor, food service personnel, school administrators, and the nurse's aide. As compared to a no treatment control group, 60 of the 63 children lost an average of 4.4 kg while only 3 of the 14 control children lost weight. Further, the average change of weight in the control group was a gain of 1.2 kg. More importantly, as compared to their own medical history from the past three years, the children in the treatment group were able to reverse a trend of yearly weight gain.

Foster, Wadden, and Brownell (1985) also conducted a school based program targeting weightloss in 89 obese children (grades 2 to 5). Differing from Brownell and Kaye (1982), Foster and colleagues implemented a 12-week behaviorally based program, but trained 8th grade peer counselors to monitor the children's packed lunches, and diaries containing food intake and participation in physical activity. The parental component varied between attending 2 basic program description meetings or 5 intensive meetings targeting nutrition, physical activity and principles of positive reinforcement and behavior modification. Overall, children in the treatment group

reduced their percentage overweight (- 5.3%) as compared to the control groups gain (+0.3%) at post-treatment. At an 18 week follow-up, the treatment group continued to show a significant reduction in percent overweight from baseline (-3.6%). Additionally, at post-treatment and 18 week follow-up, a significantly greater improvement in self-concept, as reported on the Piers and Harris (1969) questionnaire, was found for children in the treatment group as compared to the control group. Level of parental involvement was not found to have an effect on weight loss.

In assessing the benefit of school-based programs for treating childhood obesity, the goals being targeted and the request for students to make a direct behavior change appear to be important in the success of the programs. Educational programs were successful at increasing students' knowledge of the material being taught, but did not produce a corresponding change in the children's behavior. Educational programs that also made system changes (e.g. school lunches, school PE classes) were successful at changing the children's behavior while they were in the system. However, the change did not translate into changes in physiological measurements (e.g. cholesterol levels, obesity). The most successful programs were those that included education, system changes, and a direct request for the student to make changes in their behavior regardless of whether they were home or at school.

These programs have given evidence of success in reducing children's weight through school-based intervention programs.

Parental participation in treatment

Early studies in the treatment of childhood obesity routinely included parents as participants for completing various components of their children's obesity treatment. However, from a developmental standpoint, the role of parents in the treatment of childhood obesity may vary depending on the age of their child.

Brownell, Kelman and Stunkard (1983) evaluated 3 conditions (Mother-Child Separate, Mother-Child Together, Child Alone) in the treatment of 42 Caucasian adolescents (12- to 16-years). As compared to the Mother-Child Together (-7%) and Child Alone (-6.8%) groups, the Mother-Child Separate (-17.1%) group had a significantly greater decrease in adolescents' percent overweight during the 16 week treatment. Furthermore, at a 1 year follow-up, the Mother-Child Separate group maintained their weight loss (-7.7 kg) over pretreatment weights, as compared to a weight gain (+3 kg) in the other two groups. Given the success of the Mother-Child Separate group, this study gives support for adolescents and parents to meet separately when attending adolescent obesity treatment programs.

In contrast, Wadden, Stunkard, Rich, et al (1990) conducted a similar study with 36 African American adolescents (12- to 16-years) and did not find differences in weightloss among the three conditions at the end of the 16-week program.

Interestingly, mothers' attendance, regardless of condition, was found to be related to daughters' success. Mothers who had good attendance had daughters who lost significantly more weight than if the mothers had poor or no attendance. Similarly, Resnicow et al. (2000) also implemented a treatment program for teenagers that did not include their parents. Participants were 57 low-income, inner-city, African American adolescents (11- to 17-years). Twice weekly sessions were conducted in community space or public housing developments for 4 months, then weekly for 2 additional months. The program was tailored to be culturally sensitive and included shopping in local grocery stores, food preparation, physical exercise including hi/hop funk aerobics and "afrobics", and communication skills to increase the adolescents frequency of asking parents to purchase healthier foods. Results indicated that following the 6-month treatment, high attenders (> 50% of session attended) had significantly greater nutrition knowledge scores, significantly more low-fat practices, and reported greater social support from friends and family. While a trend toward improvements was seen with slight declines in total cholesterol and systolic blood pressure, significant changes in weight did not occur for high or low attenders.

Further investigating the role of parents' participation in their children's obesity treatment, Israel, Solotar and Ziman (1990) varied parents' responsibility by having them serve as either a helper for their child (age 9- to 13-years), or participating in treatment for their own weight reduction. Forty children and at least one of their

parents participated in 14 behaviorally based treatment sessions over a 26 week period, and a 1 year follow-up assessment. Results found a significant weightloss for both groups of children during the initial 8 weeks of treatment. During the extended treatment phase (weeks 8 to 26) a slight improvement for the Helper group was found in a decrease in the children's percent overweight, while a nonsignificant increase in percent overweight was found for children whose parents were in the weightloss condition. However, at 1 year follow-up, both groups showed similar rates of success.

In a review comparing 4 of their past treatment studies at 5-year (Epstein, McCurley, Wing & Valoski, 1990) and 10-year (Epstein, Valoski, Wing, & McCurley, 1994) follow-up, parental participation was found to be a significant factor in contributing to longterm treatment success for children (ages 6- to 12-years). Significant differences in treatment groups (e.g. child-and-parent, child-only) and control groups were found in two of the studies in which reinforcement was given for child-and-parent behavior change (e.g. habit change, habit change + weight change). The behavioral variables related to the children's outcome at 5-years included child's report of selecting low calorie snacks, graphing weight, eating fewer "red" (e.g. high calorie, low nutrition) foods, and parent-reported use of praise.

Overall, research into parents' participation in the treatment of their children's obesity has found mixed results. As studies involving adolescents are limited, it appears that further research is needed with this population to determine the

differential effects of parents' participation on the adolescents' weightloss success. As Brownell et al. (1983) and Wadden, Stunkard, Rich et al. (1990) had different results but conducted similar studies with the exception of samples that varied in ethnicity, research that includes components to address the varying needs of culturally diverse populations may prove to be informative. With regard to children, it appears that parents' participation in their children's weightloss program has been shown to be effective at reducing their percentage overweight, and maintaining the weightloss over time.

Child-regulated components of treatment

Israel, Guile, Baker and Silverman (1994) investigated the benefits of having obese children be more involved in their own treatment by adding a self-management training component to a standard 26 week, behavioral treatment protocol. Thirty-four children between the ages of 8 and 13 years participated in the program. In the standard (ST) behavioral treatment group, the parents were placed in charge of making sure that treatment homework was completed and their child followed program rules. In the enhanced child involvement (ECI) group, attention was given to the children's management of their own weight loss efforts and participation in the program (e.g. self-goal setting, implementing a plan to change behavior, self-evaluation, self-reward, problem-solving behaviors). At post-treatment, participants in both groups were not significantly different in outcome as measured by change in

percent overweight. Further, at 1- and 3-year follow-ups, a general trend to gain in percentage overweight above the post-treatment results was found. However, in analyzing individual patterns for the children at 3-year follow-up, a significant difference was found in that 44% of the children in the ECI condition versus 0% of the children in the ST condition remained below posttreatment levels of percents overweight giving slight support for the use of self-management training within a behavioral treatment program.

Similarly, Duffy and Spence (1993) explored the relative value of a cognitive self-management component in a behavioral intervention for 29 children ages 7- to 13-years. The behavioral intervention alone condition was composed of diet, nutritional education, exercise, and parent implemented goal-setting and positive reinforcement. For the control group, a placebo component of progressive muscle relaxation was added to the behavioral intervention. For the self-management condition components involving monitoring of negative thoughts, restructuring of negative or maladaptive thoughts, problem-solving skills, self instructional training, and self-reinforcement were added to the behavioral intervention. At post-treatment, both groups had similar reductions in overweight (-8.5%). Additionally, these outcomes were maintained for both groups at 3 and 6 month follow-up indicating that the self-management component did not contribute significantly to the standard behavioral treatment program.

More recently, Epstein, Paluch, Gordy, Saelens, and Ernst (2000) modified a family-based, behavioral treatment program for obese children by adding the self-management component of problem solving. Three groups, parent-child problem solving, child problem solving, or the standard treatment with parental involvement but with no problem solving were compared at 6 month post-treatment, 1-year, and 2-year follow-up. Measurement of problems solving skills indicated significant increases from baseline through 1-year for all groups. However, the children in the standard and child problem solving groups had larger decreases in BMI than those in the parent-child problem solving group at 2-year follow-up. In terms of adherence, between-group difference were not found for either parents or their children. Based on these results, the authors suggested that the problem solving component may actually have hindered participants by distracting the parent-child group from learning new eating and exercise habits needed for long-term changes.

Taking a slightly different approach, Epstein, McKenzie, Valoski, Klein and Wing (1994) modified a standard 1 year, family-based, behavioral treatment program for obese children (ages 8- to 12-years) by adding reinforcement contingent on mastery of treatment components, requiring mastery of treatment components prior to advancing further through the treatment program, and having parents master parenting skills of praise and stimulus control. As compared to the yoked-control group, the experimental group showed significantly greater weight change at 6 and 12

months, but this difference was not maintained at the 24 month follow-up. In terms of adherence, the children in the experimental group showed significantly different changes in "red" (e.g. poor choice foods) foods per week, days with complete recording, and days within the calorie range as compared to the control group. Differences between groups in adherence were not found for graphing weight, child meetings per week, or meeting the exercise goal.

Overall, investigation into adding a self-management component to a standard behavioral treatment program for children (ages 7- to 13-years) was not found to enhance the effectiveness of the treatment program. In the case of Epstein, Paluch, Gordy, Saelens, et al. (2000), the addition of a problem-solving component actually appeared to have hindered the participants' progress. While these strategies were not shown to be useful with younger children, future research could investigate their use with adolescents.

Psychological adjustment and treatment outcome

Epstein, Wisniewski and Weng (1994) first looked at the possible impact that parents' distress had on their children's psychopathology and the potential resulting impact on the children's success in weightloss treatment. Participants were 45 children (ages 8- to 11-years) and their parents. Mothers' and fathers' distress were measured at baseline using the Cornell Medical Index (CMI; Brodman, Erdmann & Wolf, 1956). Children's psychological symptoms were assessed at baseline by mothers

completing the CBCL. At the end of the 6-month treatment, path analysis model indicated mothers' and fathers' distress and children's age were shown to contribute to the children's Anxiety/Depression scores, explaining 36% of the variance. At stage two in the analysis, the children's Anxiety/Depression scores were shown to contribute to the children's change in percent overweight, explaining 8% of the variance with children who had greater levels of Anxiety/Depression losing more weight than those with lower levels. Overall, the model was shown to account for 41% of the shared variance in explaining children's change in percent overweight. At the 18-month follow-up, path analysis indicated mothers' and fathers' distress were shown to contribute to the children's Social Problems score, explaining 63% of the variance. At stage two in the analysis, the children's Social Problems score was then shown to contribute to the children's change in percent overweight during maintenance, explaining 15% of the variance with children having larger Social Problems scores having a greater increase in percent overweight during maintenance. Overall, the model was shown to account for 68% of the shared variance in explaining children's change in percent overweight during maintenance. Variables that did not improve the fit of either path model included children's percent overweight, children's sex, and other CBCL scores.

More recently, Epstein, Paluch, Gordy, Saelens, and Ernst (2000) assessed children's psycho-social functioning and its relationship to treatment outcome within a

family-based behavioral weightloss program for children (ages 8- to 12-years). Children's psycho-social functioning was assessed by having parents complete the CBCL with regard to their children's behavior. Consistent with previous research, results found a significant reduction in children's Total Behavior problems and Internalizing Problems at 6-month, 1-year, and 2-year follow-up, but no changes were found in children's Externalizing Behavior Problems. In predicting factors contributing to changes in children's BMI over 2-years, logistic regression found the CBCL Total Behavior problems at baseline and change in Total Behavior Problems over 2-years to be significant.

In summary, research into how children's psychological adjustment appears to influence their success in weightloss treatment programs is recent. Studies support the contribution of parent-reported child psychopathology in predicting change in children's weightloss. However, the studies reviewed varied in the factors that were shown to be significant predictors of success. This variation may be due to differences in the statistical analyses or parents' distress variables. Of the two studies that have been conducted, both rely on parent-reported measures of child psychopathology without the addition of children's self-report measures of psychopathology.

Summary and Purpose

The number of children and adolescents effected by obesity has been increasing over the past 30 years (CDC, 1996). This growth in childhood obesity is of

concern as childhood obesity is a major medical problem with associated health risks such as cardiovascular disease, hypertension, and diabetes (Berenson et al., 1993; Mo-Suwan & Lebel, 1996). Additionally, obesity during adolescence is associated with both an increase in morbidity and mortality in adulthood independent of adult weight status (Must et al., 1992) and a greater risk of being obese as an adult (NCHS, 2000). Psychosocial risk factors associated with childhood obesity also have been established including poor self-esteem, body-image disturbance, weight concerns, and parent-reported children's psychological distress and problematic behavior (Jelalian & Saelens, 1999). Given the increasing number of children and adolescents effected with obesity and the severity of its associated health risks, it is important to determine factors related to the successful treatment of this condition.

To date, treatment of childhood obesity has focused primarily on increasing physical activity, modifying diet, providing nutritional education and teaching self-monitoring and stimulus control procedures (Duffy & Spence, 1993). In general, children who attended weightloss treatment programs have reported immediate success. However, the amount of weight children lose during treatment has been described as minimal in comparison to the amount of weight they need to lose (Israel et al., 1994). Furthermore, long-term maintenance (e.g. 5- to 10-years) of weightloss has been demonstrated in only two studies, both of which were with younger children (Epstein, McCurley et al., 1990; Epstein, Valoski, Wing & McCurley et al., 1994).

Given the relatively weak outcome of childhood obesity treatment programs, research into factors that effect treatment outcome is needed.

Although psychological distress and problematic behavior are known to be associated with childhood obesity, investigations into their relationship with weightloss during treatment is limited. Treatment of psychological distress and problematic behavior is not a primary component of most obesity treatment programs. Still, self-reported depression and self-esteem has been shown to improve in adolescents who are successful at losing weight (Wadden, Stunkard, Rich et al., 1990), and weightloss in children has been shown to be a predictor of improvements in children's psychological distress and problem behavior as reported by parents (Myers, Raynor, and Epstein, 1998). Only two studies have examined whether psychological distress and problematic behavior predict children's success in a weightloss program. Epstein and colleagues, in two separate reports, found that children's psychological distress and problematic behavior, as reported by parents, predicted children's weightloss success (Epstein, Wisniewski et al., 1994; Epstein, Paluch, Gordy, Saelens et al., 2000). However, the two reports varied in terms of the psychosocial distress factors that were shown to be significant predictors of weightloss success. Additionally, these studies focused only on children (≤ 12 years of age) and relied solely on parent-report of child emotional and behavioral functioning. Furthermore, Epstein's work did not consider whether children's

psychological distress and problematic behavior are associated with their participation or attendance in a weightloss program.

It is clear that additional research is needed to more fully understand if and to what extent child psychological and behavioral factors are associated with outcome in weightloss treatment. The current study aims to further elucidate the relationship between children's and adolescents' psycho-social distress and their outcome in an obesity treatment program. Unlike existing studies, this retrospect investigation will include children's self-report of their psycho-social distress along with the parents' report for use in predicting children's weightloss success. Research has shown that self-reported data may provide unique assessment information over and above parent reported data (Jensen & Watanabe, 1999; Stranger & Lewis, 1993). Therefore, including children's self-report of their psycho-social distress may provide unique information apart from the parents' report and result in a more comprehensive model in predicting children's weightloss success. Additionally, this research will utilize a broader sample that includes adolescents, and will examine the association between children's psychological and behavioral functioning and attendance in the treatment program.

Hypotheses

Hypothesis I

It was hypothesized that after controlling for age, race and gender, baseline reports of children's psychological distress and problematic behavior would contribute to predicting children's baseline BMI. Specifically, it was predicted that increased scores on the Social Problems, Internalizing, Externalizing and Total Problems factor scales of the parent-completed CBCL, lower levels of self-reported self-esteem and higher levels of self-reported depression would contribute to predicting increased BMI.

Hypothesis II

It was hypothesized that after controlling for age, race, gender and number of sessions attended, both parent-completed and child self-report measures of children's baseline psychological distress and problematic behavior would contribute to predicting weightloss. Specifically, it was hypothesized that children's lower scores on the CBCL Social Problems, Internalizing, Externalizing and Social Problems subscales, higher Total Scores on the Piers-Harris Self-Concept Scale and lower Total Scores on the Child Depression Inventory would contribute to predicting children's weightloss success. Although it was hypothesized that the parent-completed measures would account for greater variance than the child-completed measures,

based on previous research supporting the contribution of child report in assessment, the child-completed measures were hypothesized to contribute to the model.

Hypothesis III

It was hypothesized that after controlling for age, race and gender, both parent-completed and child self-report measures of children's baseline psychological distress and problematic behavior would contribute to predicting attendance during the treatment program. Specifically, it was expected that higher scores on the CBCL indicators and the Children's Depression Inventory, and lower scores from the Piers-Harris Self-Concept Scale would predict lower attendance.

METHOD

Participants

The participants were 83 children and adolescents between the ages of 8- and 17- years and one of their parents. Participants were enrolled in one of six Committed-To-Kids weight loss groups between 1996 and 2000. The 83 participants came from an original sample of 120 children who inquired about the Committed-To-Kids weight loss program. The program was sponsored by the Pennington Biomedical Research Center and the Department of Pediatrics at the Louisiana State University Health Sciences Center and Earl K. Long Medical Center in Baton Rouge, Louisiana. Prior to participating in the group treatment, informed consent was obtained, a physical examination was performed, a comprehensive medical history was taken by the treatment team's pediatrician, and a general behavioral history was taken by the behavior therapist. Ideal body weight (IBW) was calculated by measuring weight and height. Participants were included in the treatment program if their BMI ≥ 25 , if the participant reported that they wished to participate in the program to lose weight, and if one parent committed to oversee their child's participation in the program. Additionally, participation in the treatment program was fee-based, costing \$150 per month.

From the original 120 children who participated in the intake process, 5 children were eliminated from this study as they fell outside of the age requirements, and 3 children did not enroll in the weight loss program. As shown in Table 1 an

additional 29 participants were excluded from the analyses as they did not complete all baseline questionnaires. Of the remaining 83 included in the analyses, 14 were male and 69 female with a mean age of 11.46 years (SD=2.15). The sample included primarily middle to upper income Caucasian families (76 Caucasian, 7 African American). A series of t-test and chi-squares were performed on continuous and categorical data, respectively, to determine whether significant relationships existed between those included in the study and those excluded due to not completing the behavioral questionnaires.

Table 1

Participants Included and Excluded from the Analyses

	Range	Mean	SD
<u>Participants Excluded</u>			
Baseline BMI	23.61 to 50.44	31.13	6.72
Change in BMI	+1.10 to -15.85	-2.72	3.33
Weeks Enrolled	4 to 48	34.86	17.33
Weeks Attended	3 to 48	25.18	13.88
<u>Participants Included</u>			
Baseline BMI	20.04 to 60.76	31.39	6.62
Change in BMI	+8.36 to -20.13	-3.66	3.71
Weeks Enrolled	1 to 70	34.98	17.57
Weeks Attended	1 to 54	25.42	13.79

These analyses revealed no significant differences between groups with respect to age [$t(109) = .06, p > .05$], baseline BMI [$t(107) = .18, p > .05$], change in BMI [$t(104) = 1.14, p > .05$], number of weeks attended [$t(101) = .07, p > .05$], number of weeks enrolled [$t(101) = .03, p > .05$], race [$\chi^2(1, N=110) = .92, p > .05$], and gender [$\chi^2(1, N=111) = .90, p > .05$].

Measures

Behavior intake

A general history form was designed for the Committed-to-Kids weightloss program sponsored by the Louisiana State University Medical Center, Department of Pediatrics in Baton Rouge, Louisiana. The questionnaire was designed to be administered during a 30 minute interview prior to or following the child's physical exam. The questions use either an open ended, or forced choice response format covering the child's family history, social history, eating habits, and exercise habits. As the questionnaire was designed for use in the Committed-to-Kids program, reliability and validity data are unavailable.

Body mass index

Body mass index (BMI) was assessed by calculating weight in kilograms divided by height in meters squared. BMI is frequently used to assess obesity in epidemiological research, and has been shown to be related to morbidity from illnesses associated with obesity (Pine, Cohen, Brook & Coplan, 1997). For the

purposes of this study, a BMI of 25 or above was utilized to determine if a child was overweight, as this is one of the guidelines developed by the National Heart, Lung, and Blood Institute (Devlin, Yanovski & Wilson, 2000).

Child behavior checklist

The Child Behavior Checklist (CBCL; Achenbach & Edelbrock, 1991) is a reliable and valid rating scale designed for completion by parents to measure general psychopathology of children ages 4- to 18-years. The rating scale contains 113 items. Eight narrow-band factors (Withdrawal, Anxious/Depressed, Thought Problems, Somatic Complaints, Social Problems, Attention Problems, Delinquent Behavior, Aggressive Behavior), two broad-band factors (Internalizing, Externalizing), and a Total Problems score are derived from the 113 items. Subscale scores mean test-retest reliability estimates range from .82 to .95 for a one week interval, and .30 to .60 for a seven month interval. Internal consistency estimates for the subscales range from .62 to .92 (Achenbach & Edelbrock, 1991). The CBCL has been shown to discriminate between mental health referred and non-referred children (Achenbach & Edelbrock, 1991). The CBCL Social Problems, Internalizing, Externalizing, and Total Problems factor scores were used in the analyses. This questionnaire and these factors were chosen for use in this study as they are considered to be the gold-standard measure of parents' report of children's functioning (Wallander & Thompson, 1995).

Childrens depression inventory

The Childrens Depression Inventory (CDI; Kovacs, 1992) consists of 27 self-report items designed to assess cognitive, behavioral, and affective symptoms of depression in children ages 8 to 17 years. Each item has a range of three choices differing in severity, and the child is instructed to choose the one that best describes them during the past 2 weeks. Each item is scored from 0-2 with 2 indicating greater severity. The sum of all items yields a Total CDI score (range of 0 to 54). The CDI has 5 factors including Negative Mood, Interpersonal Problems, Ineffectiveness, Negative Self-esteem and Anhedonia. The CDI has been shown to have good internal consistency and moderate test-retest reliability and validity estimates (Kovacs & Beck, 1981). The Total Score was used in the analyses.

Piers-Harris children's self-concept scale

The Piers-Harris Children's Self-Concept Scale (Piers-Harris; Piers, 1984) is a self-report measure to assess self-esteem in children 8- to 17-years of age. The scale is composed of 80 yes-no items. It contains a Total Score, and six subscale scores including Behavior, Intellectual and School Status, Physical Appearance and Attributes, Anxiety, Popularity, and Happiness and Satisfaction. The scale has an average test-retest reliability of .77 for the Total Score (Wolf, Sklov, Hunter, Webber, & Berenson, 1982).

Procedure

As previously described, the Committed-To-Kids (CTK) weightloss program is a comprehensive pediatric outpatient program utilizing the PSMF diet for children 6- to 18-years of age. The program is manualized and contains IV phases with different manuals for each phase. Each manual contains 10 activity and monitoring exercises. Booklets containing food and exercise monitoring forms also are available for each phase in the program. Phase I (Red) is for children more than 200% of their IBW. Phase II (yellow) is for children 150 to 199% of their IBW. Phase III (Green) is for children 120 to 140% of their IBW. Phase IV (Blue) is for children less than 120% of their IBW.

The program begins with a physical exam, comprehensive body measurements (e.g. height, weight, calculation of overweight and body fat analysis), lipid profiles and biochemical parameters assessed, behavioral history, and exercise and nutritional evaluations. Additionally, children and their parents completed psychological questionnaires as part of the enrollment process so that the children's baseline psychological distress and problematic behavior could be assessed and utilized for this study. Although not utilized for this study, the behavioral questionnaires as well as comprehensive body measurements (e.g., height, weight) were completed again at 10-weeks, and again at 3-month intervals throughout the duration of the program.

Children were assigned to the appropriate phase based on their percentage of IBW. Variation in how children were assigned to each phase took place during the study. From 1996 to 1999, children were assigned to phases I through III began the program on the PSMF diet, while children assigned to phase IV were given instruction in a 1200-calorie balanced diet that follows the American Dietetic Association (ADA) guidelines. From 1999 through 2000, children entering the program were assigned to phases I and II as previously described. However, children at or below 150% IBW were assigned to the IV phase and given instruction in a 1200-calorie balanced diet that follows the American Dietetic Association (ADA) guidelines.

A team of specialists, including a pediatrician, nutritionist, exercise physiologist, and behavioral therapist then conducted weekly group sessions with the children and their parents to instruct and monitor the children's progress. The behavioral therapist was a master's level graduate student enrolled in a clinical psychology doctoral program. Each weekly session began by weighing the children, followed by reviewing their weekly goals (e.g. nutrition, exercise, behavior) with one of the other specialists. Following weigh-ins, nutrition, behavior modification and exercise topics were covered every week. As the children progressed through the program, small group or individual sessions were conducted to instruct the children on the balanced calorie diet when they were ready to begin phase IV. Readiness to

begin phase IV of the program was indicated when the children reached 120 to 150% of their IBW (depending on the program rules at the time of entry), at the request of the family or as otherwise instructed by the pediatrician. The program was intended to be attended weekly for 42-weeks. If a child missed two consecutive sessions, one of the team members attempted to contact the family to determine if they continued to have an interest in participating in the program.

RESULTS

All analyses were conducted using the Statistical Package for the Social Sciences version 7.5.1 for windows (SPSS, 1996). Preliminary analyses were conducted across CTK program variables (BMI, change in BMI, number of weeks enrolled, number of weeks attended), demographic variables (age, race, gender) and behavioral questionnaires (CDI, Piers-Harris, CBCL) prior to conducting regression analyses to test the three primary hypotheses. Specifically, to further describe participants enrolled in the study and the outcome of the treatment program descriptive statistics were conducted to determine baseline BMI, change in BMI, number of weeks enrolled and number of weeks attended. Second, to report on the number of children experiencing distress at the onset of treatment, frequency counts were computed to determine the number of questionnaires that were clinically significant, and the number of items endorsed on each of the questionnaires. Additionally, to investigate informant agreement and as an internal validity check, pearson product moment correlations were conducted across questionnaires. Third, during the preliminary investigation into potential predictors of baseline BMI, change in BMI and number of weeks attended, pearson product moment correlations were conducted to determine the associations between demographic and CTK program variables (BMI, change in BMI, number of weeks attended), and the behavioral questionnaires and CTK program variables. Last, hierarchical multiple regressions

were conducted to test the three hypotheses. Prior to performing the regression analyses, data screening was conducted and one participant of severe obesity was identified and removed from the analyses as an outlier. Additionally, assumptions of linearity and homoscedasticity were verified and the data was analyzed in a hierarchical multiple regression with backward elimination of the independent variables within each block with a statistical cutoff for exclusion of $p > .10$ as suggested by SPSS (1996).

Demographic and Treatment Outcome

To examine the contribution of treatment participation on weightloss, descriptive statistics were conducted for baseline BMI, change in BMI, number of weeks enrolled and number of weeks attended as shown in Table 2. On average, participants were found to attend 25 sessions ($M = 25.42$, $SD = 13.79$) across 35 weeks of enrollment ($M = 34.98$, $SD = 17.57$). Overall, participants were found to benefit from the program with a decrease in BMI ($M = 3.66$, $SD = 3.71$) and weight as measured in pounds ($M = 14.98$, $SD = 19.41$).

Levels of Psychological Distress and Problematic Behavior

Frequency counts were computed on number of questionnaires that had clinically elevated scores. The parent-completed CBCL indicated clinical significance on the Social Problems (19%, $N=16$), Internalizing (21%, $N=17$), Externalizing (6%, $N=5$), and Total Problems (13%, $N=11$) factors. Fewer child-completed

questionnaires met clinical significance. Only two children (2%) had elevated scores on the CDI, and three children (4%) had elevated scores on the Piers-Harris.

Frequency counts were computed on the number of items endorsed on each of the questionnaires. On the parent-completed CBCL, raw scores included Social Problems ($M = 4.61$, $SD = 2.65$), Internalizing ($M = 12.88$, $SD = 9.81$), Externalizing ($M = 8.82$, $SD = 7.12$), and Total Problems ($M = 36.20$, $SD = 23.55$). On the child-completed questionnaires, raw scores included CDI ($M = 6.9$, $SD = 5.50$) and Piers-Harris ($M = 57.54$, $SD = 11.10$).

Table 2

Demographic and Program Characteristics

Variable	Range	Mean	SD
Baseline BMI	20.04 to 60.76	31.39	6.62
Change in BMI	+8.36 to -20.13	-3.66	3.71
Weeks Enrolled	1 to 70	34.98	17.57
Weeks Attended	1 to 54	25.42	13.79

Questionnaire Data: Informant Agreement - Internal Validity Check

Pearson product moment correlation coefficients shown in Table 3 indicated significant within informant agreement in a moderate inverse association between the two child-completed questionnaires, the CDI and Piers-Harris. Children reporting high levels of depression reported low levels of self-esteem. Additionally, moderate to

very high levels of positive associations were found within the four subscale scores on the parent-completed CBCL.

Table 3

Pearson Correlation Coefficients between Questionnaire Scores

	<u>Child Measures</u>			<u>Parent Measure</u>		
	CDI	Piers-Harris	CBCL Social Problems	CBCL Internal Problems	CBCL External Problems	CBCL Total Problems
<u>Child Measures</u>						
CDI	--	-.63**	.27*	.29*	.28*	.32*
Piers-Harris	--	--	-.30*	-.27*	-.13	-.25*
<u>Parent Measure</u>						
Social Problems	--	--	--	.74**	.50**	.79**
Internalizing	--	--	--	--	.55**	.92**
Externalizing	--	--	--	--	--	.79**
Total Problems	--	--	--	--	--	--

Note: * $p < .05$, ** $p < .01$ following Bonferroni Correction

With regard to between-informant-agreement, low to moderate significant levels of association were found in the expected directions between the CBCL parent-completed questionnaire and the child-completed CDI and Piers-Harris Children's Self Concept scale. Children's report of higher levels of depression was associated with parents' report of high levels of children's psychological distress on the CBCL (e.g. Externalizing, Internalizing, Social and Total score). Further, children's report of

higher levels of self-esteem was associated with parents' report of low levels of children's psychological distress on the CBCL (e.g. Internalizing, Social and Total score).

Preliminary Univariate Analyses: Demographic and CTK Data

T-tests followed by Bonferroni corrections were conducted on continuous data to determine whether significant relationships existed between gender or race with regard to age, baseline BMI, change in BMI, and number of weeks attended. Analyses revealed a significant difference between both gender [$t(81) = 2.60, p \leq .05$] and race [$t(81) = 2.77, p \leq .04$] with regard to baseline BMI. Boys' baseline BMI was greater than girls' baseline BMI, and African Americans' baseline BMI was greater than Caucasians' baseline BMI. With regard to age, a significant positive association was found between baseline BMI and age ($r = .47, p < .01$), indicating that older children had greater baseline BMI scores at the start of the program. Age, however, was not found to be significantly associated with change in BMI or attendance.

Table 4 shows pearson product moment correlation coefficients obtained between the CTK program variables of change in BMI, baseline BMI, and number of weeks attended. As shown in Table 4, significant positive associations were found between change in BMI and both baseline BMI ($r = .27, p < .05$), and number of weeks attended ($r = .45, p < .01$). These results indicate that children with larger

decreases in BMI over the course of treatment had larger BMI scores at the start of the program, and attended more sessions throughout the program.

Table 4

Pearson Correlation Coefficients between Demographic and Program Data

	Baseline BMI	Change in BMI	Weeks Attended	Age
Baseline BMI	--	.27*	-.13	.47**
Change in BMI	--	--	.45**	.07
Weeks Attended	--	--	--	-.12

Note: * $p < .05$, ** $p < .01$ following Bonferroni Correction

Preliminary Univariate Analyses: Questionnaire and CTK Data

Table 5 shows pearson product moment correlation coefficients obtained between the behavioral questionnaire data and CTK program variables of baseline BMI, change in BMI, and number of weeks attended. As shown in Table 5, a significant positive association was found between the child-completed CDI and baseline BMI ($r = .23$, $p < .05$) indicating that children who reported higher levels of depression had larger baseline BMI scores. Neither of the child-completed questionnaires (e.g. CDI, Piers-Harris) were found to be significantly associated with the change in BMI score or number of week of attendance.

Table 5 further shows the associations between the parent-completed questionnaire and the CTK program data. Specifically, significant inverse associations

were found between the number of weeks attended and the parent-completed CBCL Internalizing ($r = -.26, p < .05$), Social Problems ($r = -.26, p < .05$), and Total Score ($r = -.26, p < .05$). These results indicate that children with greater levels of Internalizing, Social and Total Behavior Problems were found to have lower levels of attendance in the CTK program. Interestingly, although the parent reported levels of Externalizing Behavior Problems was not found to be significantly associated with attendance ($r = -.13, p > .05$), Externalizing Behavior Problems was found to be negatively associated with change in BMI ($r = -.22, p < .05$). That is, children with greater behavior problems had smaller decreases in their BMI score. These results indicate that children's acting out behaviors were not related to program attendance, but were related to treatment.

Table 5

Pearson Correlation Coefficients between Questionnaire Scores and Program Data

	<u>Child Measures</u>			<u>Parent Measure</u>		
	CDI	Piers-Harris	CBCL Social Problems	CBCL Internal Problems	CBCL External Problems	CBCL Total Problems
Baseline BMI	.23*	-.19	.08	.09	-.01	.05
Change in BMI	-.05	.14	.05	-.02	-.22*	-.10
Weeks Attended	-.26*	.10	-.26*	-.26*	-.13	-.26*

Note: * $p < .05$ following Bonferroni Correction

Hierarchical Linear Multiple Regression Analyses

Hypothesis one: predicting baseline body mass index

A hierarchical multiple regression analysis utilizing backward elimination within each block was conducted to establish the predictive value of the behavioral questionnaires in determining baseline BMI scores. In the analysis, race, gender, and age were entered into the equation in the first block, and the behavioral questionnaires (e.g. CBCL Social Problems, CBCL Internalizing, CBCL Externalizing, CDI, Piers-Harris) were entered into the equation in the second block. As the CBCL Total Problems score was found to have a high association with the other CBCL factors (e.g. Social Problems ($r = .79, p < .01$), Internalizing ($r = .92, p < .01$), Externalizing ($r = .79, p < .01$), the Total Problems score was not included in any of the regression analyses due to multicollinearity. In predicting baseline BMI score, all variables (e.g. race, gender, age) from the first block significantly ($R^2 = .36, p < .001$) contributed to the model and were retained. However, as shown in Table 6, when the second block (e.g. questionnaires) was entered into the analyses, only the Internalizing score ($R^2 = .03, p < .08$) from the CBCL was retained. The CDI and Piers-Harris child-completed questionnaires, and the Externalizing and Social Problems scores from the parent-completed CBCL were eliminated as they did not significantly ($p \geq .10$) contribute to the model. Overall, the variables included in the model predicting baseline BMI were age, race, gender and the CBCL Internalizing score. The final

model accounted for 39% of the variance ($p < .001$). Age was the greatest contributor to the model (Beta = .49). These results indicate that race (African American), gender (males), increasing age, and an elevated Internalizing score contributed to predicting greater baseline BMI scores.

Table 6

Final Model, Hierarchical Multiple Regression for Variables Predicting Baseline BMI

Variable	<u>B</u>	<u>SE B</u>	Beta
Age	1.51	.28	.49**
Race	-5.71	2.11	-.24**
Gender	-4.80	1.57	-.27**
Internalizing	.11	.06	.16*

Note: * $p < .08$, ** $p < .01$; Model $R^2 = .39$, $p < .01$

Hypothesis two: predicting change in body mass index

A hierarchical multiple regression utilizing backward elimination within each block was conducted to establish the predictive value of the behavioral questionnaires in determining changes in BMI. In the analysis race, gender, age and number of weeks attended were entered into the equation in the first block, and the behavioral questionnaires (e.g. CBCL Social Problems, CBCL Internalizing, CBCL Externalizing, CDI, Piers-Harris) were entered into the equation in the second block. Following the analyses of the first block, age, gender and attendance were retained in the model ($R^2 = .28$, $p < .001$) and race was eliminated ($p \geq .10$). Following the

analyses of the second block, the Piers-Harris, CBCL Externalizing and CBCL Social Problems were retained ($R^2 = .19$, $p < .001$) while the CBCL Internalizing score and CDI were eliminated ($p \geq .10$). Overall, as shown in Table 7, age, gender, number of weeks attended, CBCL Externalizing, CBCL Social Problems and Piers-Harris were found to significantly contribute to the model, predicting 46% of the variance ($p < .001$). Number of weeks attended (Beta = .57) and CBCL Social Problems (Beta = -.43) were the greatest contributors to the model. These results indicate that age (older children), gender (males), greater attendance, fewer externalizing and social problems, and greater levels of self-esteem contributed to predicting larger decreases in BMI.

Table 7

Final Model, Hierarchical Multiple Regression for Variables Predicting Change in BMI

Variable	<u>B</u>	<u>SE B</u>	Beta
Age	.32	.14	.20*
Gender	-1.93	.81	-.21*
Attendance	.14	.02	.57**
Externalizing	-.18	.05	-.38**
Social Problems	.55	.14	-.43**
Piers-Harris	.08	.03	.26**

Note: * $p < .02$, ** $p < .001$; Model $R^2 = .46$, $p < .001$

Hypothesis three: predicting number of weeks attended

A hierarchical multiple regression utilizing backward elimination within each block was conducted to establish the predictive value of the behavioral questionnaires in determining the number of weeks attended. In the analysis race, gender and age were entered into the equation in the first block, and the behavioral questionnaires (e.g. CBCL Social Problems, CBCL Internalizing, CBCL Externalizing, CDI, Piers-Harris) were entered into the equation in the second block. As shown in Table 8, following the analyses of the first block, age and gender were retained in the model ($R^2 = .04$, $p < .09$) and race was eliminated ($p \geq .10$). Following the analyses of the second block, the CBCL Internalizing score was retained ($R^2 = .09$, $p < .01$) while the Piers-Harris, CDI, CBCL Externalizing and CBCL Social Problems scores were eliminated ($p \geq .10$).

Table 8

Final Model, Hierarchical Multiple Regression for Variables Predicting Attendance

Variable	<u>B</u>	<u>SE B</u>	Beta
Age	-1.12	.69	-.18*
Gender	6.79	3.86	.19*
Internalizing	-.41	.15	-.30

Note: * $p < .10$, ** $p < .01$; Model $R^2 = .13$, $p < .01$

Overall, as shown in Table 8, age, gender and the CBCL Internalizing score were found to contribute to the model predicting 13% of the variance ($p < .01$). The

CBCL Internalizing score was the greatest contributor to the model (Beta = -.30).

These results indicated that age (younger children), gender (females) and smaller Internalizing scores contributed to the model predicting greater number of weeks in attendance.

DISCUSSION

The purpose of this study was to investigate the relationship between parent- and child-completed behavioral questionnaires and children's participation and success while enrolled in a group weightloss treatment program. Although psychological distress and problematic behavior are known to be associated with childhood obesity, and compliance within the general pediatric population, investigation into their relationship with weightloss success during treatment is limited. While previous studies only utilized parents' report of children's psychological distress and problematic behavior, this study contributes to the literature by adding self-report measures of depression and self-esteem. Additionally, this study further contributes to the literature by examining the relationship between children's psychological distress and problematic behavior and their continued attendance in treatment. In general, the program was found to be successful as, at the time of withdrawal from the CTK program BMI scores were reduced by an average score of 3.66. Further, only 57% of the participants remained in the obese to severely obese range and 40% were not obese as measured by their BMI.

Levels of Psychological Distress and Problematic Behavior

Percentage rates of parent-completed CBCL questionnaires meeting clinical significance found lower rates for the Externalizing scale (6%), while higher rates were found for both the Social Problems (19%) and Internalizing scales (21%). This

trend toward higher rates for internalizing and social difficulties as compared to externalizing behavior problems is consistent with the findings of others reporting on obese children who have presented for treatment (Braet, Mervielde & Vandereycken, 1997; Myers, Raynor & Epstein, 1998; Epstein, Myers, Anderson, 1996). Similarly, the finding of low rates of clinically elevated questionnaires completed by the children for both depression and low self-esteem is consistent with the findings of others reporting on obese children who have presented for treatment (Kimm, Sweeney, & Janosky, 1991). Additionally, given the reports of heterogeneity among variables that have been found to mediate self-esteem (e.g., gender, age, ethnicity), the current small sample size with its restrictive demographic characteristics (i.e., Caucasian females) would not be expected to reveal excessive reports of low self-esteem.

Predicting Baseline BMI

It was hypothesized that in addition to demographic variables of age, race and gender, both parent's and children's reports of the children's psychological distress and problematic behavior would predict their level of obesity prior to treatment. While age, race and gender were found to contribute to the model, only the Internalizing score from the parent-completed CBCL was found to contribute additional unique variance to the model. While the model remained significant at the $p < .01$ level, the level of significance of the Internalizing score within the model was $p < .08$ level. Thus, the contribution of the Internalizing score only approached a statistically

significant level, and age, gender and race were the primary predictors of children's BMI prior to treatment. Although past studies have not consistently found associations between parents' reports of their children's problematic behavior and the children's degree of obesity, or children's reports of psychological distress and their degree of obesity, it was thought that the collective reports from both the parent and child would clarify this possible association. However, consistent with known demographic prevalence rates of obesity, only the demographic variables were found to be significantly associated with the children's degree of obesity in this study and the first hypothesis was not supported within this sample (CDC, 1997; National Institutes of Health, 1998; Kann et al., 2000).

Predicting Changes in BMI

It was hypothesized that in addition to the number of weeks of attendance, and the demographic variables of age, race and gender, that both parent's and children's reports of the children's psychological distress and problematic behavior prior to treatment would contribute in predicting changes in their BMI following treatment. In testing this hypothesis, race was eliminated from the model; however, age, gender and attendance were retained. Furthermore, in support of this hypothesis, from the questionnaires, the CBCL Externalizing Problems, CBCL Social Problems, and Piers-Harris Total Self-Concept scores also were retained in the model predicting change in BMI over the contribution of the demographic variables and attendance.

The current study found that in addition to attendance, gender and age, a combination of fewer social and externalizing difficulties and higher levels of self-esteem contributed to increased treatment success. Although the specific questionnaire domains differed from previous studies within the childhood obesity treatment literature, this finding is congruent with the findings of others suggesting an association between psychological distress and success in obesity treatment (Epstein, Wisniewski et al, 1994; Epstein, Paluch, et al., 2000). Furthermore, the results from this sample are consistent with general treatment adherence literature. That is, lower behavior problems and higher rates of attendance in treatment sessions would be expected to be included in a model predicting treatment success (Christophersen, 1994). Of specific interest is that the child-completed measure of self-esteem, the Piers-Harris, was included in the model accounting for unique variance over attendance, age and gender, and in addition to the reports provided by the parents. Within the context of increasing success in obesity treatment, this finding indicates that child report is an important contribution toward assessing children's initial psychological distress and problematic behavior. These results suggest that attending to children's self-esteem and their feelings of success in social situations during group therapy could be an important aspect of increasing treatment success of childhood obesity.

Predicting Attendance

It was hypothesized that in addition to the demographic variables of age, race and gender, that both parent's and children's reports of the children's psychological distress and problematic behavior prior to treatment would contribute in predicting their attendance. In testing the third hypothesis, race was eliminated from the model; however, age and gender were retained. Furthermore, in support of this hypothesis, CBCL Internalizing score also remained in the model predicting attendance. However, it was the only questionnaire score found to contribute to the model predicting attendance. More specifically, lower levels of internalizing difficulties were associated with higher rates of attendance. Conversely, one would have expected the Externalizing factor to have been included in a model predicting attendance, given the known association between increased behavior problems and poor compliance (Christophersen, 1994). However, it could be that within a sample of obese children participating in group therapy, internalizing symptoms are of greater importance in contributing to the children's consistent attendance. For example, high anxious children may be more prone to avoiding group treatment sessions than highly disruptive children. As child-reports of depression (CDI) and self-esteem (Piers-Harris) were not found to contribute to the model, parents appear to remain as a valuable contributor of information with regard to their children's psychological distress and problematic behavior. However, as the CBCL Internalizing scale was

found to be significantly associated with attendance, it is possible that a child-completed measure of worry or anxiety would be a more appropriate measure of psychological distress as compared to those targeting self-esteem and depression. Alternatively, while this sample of children includes a broader range of ages than previous studies, the mean age of the participants was only 11.46. As it is known that younger children are better able to report on externalizing difficulties as opposed to internalizing difficulties (DuPaul, Guevremont & Barkley, 1991; Edelbrock & Costello, 1990; Herjanic, Herjanic, Brown & Wheatt, 1975), it is possible that this mixed sample of age ranges actually contributed to hiding the unique contributions of both the adolescents' and younger children's self-report of psychological distress.

Of specific interest is that a positive association was found between participation in the CTK program and those with the greatest reduction in BMI. That is, children enrolled in the CTK program for a longer period of time and who attended more sessions while enrolled, had the greatest reductions in their BMI scores by the end of their enrollment in the program. Therefore, given the importance of encouraging continued attendance to increase treatment success, further investigation is needed to identify barriers to adherence in order to identify and intervene with individuals who are at risk of dropping out of treatment.

Limitations and Future Directions

These findings should be interpreted in the context of several methodological limitations that may have contributed to the findings in this study. First, this study was conducted with a sample that was comprised primarily of Caucasian families from a moderate to high socioeconomic group, with females outnumbering males. Therefore, the results of the current study may not generalize but be limited to similar populations, namely Caucasian females from higher socioeconomic families.

A second limitation of the current study is that it lacked additional clinical measures that may have been associated with treatment outcome. For example, as parental psychopathology has previously been shown to be related to child psychopathology and child obesity, it may be a powerful predictor of children's success within an obesity treatment program (Epstein, Myers, & Anderson, 1996; Myers, Raynor & Epstein, 1998). Therefore, including measures assessing parental psychopathology and other family variables that may impact treatment success would be beneficial in providing for a more comprehensive assessment prior to the onset of treatment. In addition, even though attendance is one component of treatment adherence, other measures to assess adherence to the treatment protocol (e.g. diet and exercise) were not collected. Therefore, future studies would contribute further to the literature by including multiple measures of adherence.

A third limitation of the current study is that it lacked collection of weightloss maintenance data following withdrawal from the CTK program. While predictors contributing to a child's success in a weight management program are helpful, predictors of factors that allow children to maintain their weightloss following completion of the treatment program are needed. Therefore, future studies would benefit from obtaining a commitment from participants to attend maintenance sessions following the end of the formal treatment period.

Finally, this study is limited by sample size. While power analyses was conducted prior to the onset of the study to detect modest effects with an alpha $<.05$ for regression analyses, the sample was more heterogeneous with respect to age than was expected. Further, the overall sample size was too small to divide the participants into two age groups and analyze their data separately. Therefore, future studies would benefit from including a larger sample encompassing at least 2 age ranges (e.g. school age, high school) so separate statistical analyses could be conducted for each sample.

Summary

Despite the limitations mentioned above, the present study contributed unique information to the literature with regard to children's psychological distress and problematic behavior and its effect in the treatment of obesity. First, this study was one of a few to examine the predictive value of behavioral questionnaires in establishing links to treatment success in a children's obesity treatment program.

Furthermore, this study is unique as it utilized child-completed psychological questionnaires instead of relying only on parents as informants of the children's psychological distress and problematic behavior. Consistent with previous research findings, demographic variables of age, gender and race were found to be predictors of children's initial degree of obesity. Additionally, the results of this study found that both parents and children provide unique information with regard to children's success in a group obesity treatment program as measured by a decrease in their BMI scores. Finally, parents were found to be the sole reporter providing unique information about their children's internalizing difficulties that contributed to predicting their children's attendance in the obesity treatment program. These findings have important assessment and intervention implications for the effective treatment of obese children. First and foremost, as behavioral and emotional functioning of obese children was found to be related to their success in treatment, psychological screening prior to the onset of treatment may provide unique information with regard to their individual treatment needs. For example, supplemental treatment components could be added to address difficulties with increased anxiety or poor self-esteem. Additionally, if the psychological distress is pervasive and is found to interfere in attendance or participation in treatment, alternative sessions (i.e., small group, individual sessions) could be offered.

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VITA

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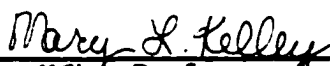
DOCTORAL EXAMINATION AND DISSERTATION REPORT

Candidate: Tana L. Hope

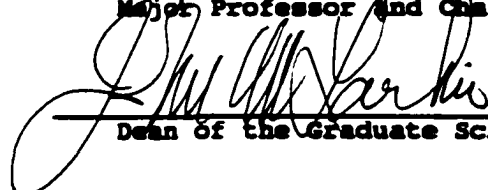
Major Field: Psychology

Title of Dissertation: Treatment Outcome of Childhood Obesity: The Effect of Children's Psychological Distress and Problematic Behavior

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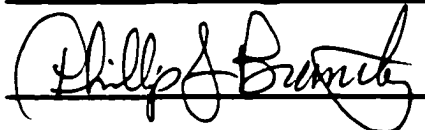
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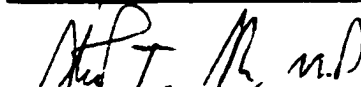
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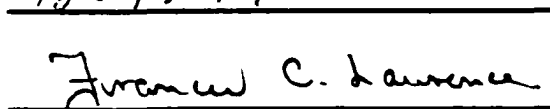
EXAMINING COMMITTEE:











Date of Examination:

November 12, 2001