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Children's and Parents' Depression in Relation to Family-Based Behavioral Weight Loss Treatment Outcome

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CHILDREN'S AND PARENTS' DEPRESSION IN RELATION TO FAMILY-BASED BEHAVIORAL WEIGHT LOSS TREATMENT OUTCOME

by

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The childhood obesity epidemic is a critical public health concern that necessitates effective treatment. Prevalence rates of overweight and obesity in youth have risen dramatically over the past three decades, with approximately 31% of children in the United States currently considered to be overweight or obese (Ogden, et al., 2006). For children, the Center for Disease Control and Prevention defines *overweight* as a body mass index (BMI; ratio of weight in kilograms to height in meters squared) between the 85^{th} and 95^{th} percentiles and *obesity* as a BMI at or above the 95^{th} percentile for age- and sex-specific distributions (Kuczmarski, et al., 2000).

Several medical and psychosocial problems are associated with child and adolescent overweight and obesity. Medical complications of childhood obesity include development of cardiovascular risk factors, such as hypertension, increased blood pressure, and higher total cholesterol and serum lipoprotein ratios (August, et al., 2008; Berenson, Srinivasan, Wattigney, & Harsha, 1993; Freedman, Dietz, Srinivasan, & Berenson, 1999; Ippisch & Daniels, 2008; Ogden, Flegal, Carroll, & Johnson, 2002), as well as type-2 diabetes mellitus (August, et al., 2008; Pinhas-Hamiel, et al., 1996; Rosenbloom, Joe, Young, & Winter, 1999). Other medical consequences of obesity include obstructive sleep apnea, which is also correlated with cardiovascular problems and poor academic performance, as well as bone and/or joint pain or disease (August, et al., 2008).

In addition to the medical problems of childhood obesity, the toll of obesity-related psychosocial consequences is equally devastating. The many psychosocial

complications associated with pediatric obesity include depression, anxiety, feelings of worthlessness, and behavioral problems and disorders (August, et al., 2008; Barlow, 2007; BeLue, Francis, & Colaco, 2009). Discrimination, prejudice, and teasing are commonly directed at overweight children and this stigmatization has increased over the past 40 years (Dietz, 2002; Goldfield & Chrisler, 1995; Gortmaker, Must, Perrin, Sobol, & Dietz, 1993; Hayden-Wade, et al., 2005; Latner & Stunkard, 2003). Overweight children are rated as less competent than normal-weight children in social and athletic areas (Banis, et al., 1988; Zeller, Reiter-Purtill, & Ramey, 2008). Severely overweight children and adolescents have lower quality of life ratings compared to their normal--weight counterparts in the domains of physical, emotional, social, and school functioning; these quality of life ratings are consistent across sex, ethnicity, and socioeconomic status and are similar to those found in children and adolescents diagnosed with cancer (Schwimmer, Burwinkle, & Varni, 2003). Overweight children are also considered to be less attractive and have worse body image than their non-overweight counterparts (Striegel-Moore, et al., 2000; Zeller, et al., 2008),with childhood overweight documented as one of the most robust risk factors for later development of eating disorders (Fairburn, Shafran, & Cooper, 1998; Fairburn, Welch, Doll, Davies, & O'Connor, 1997; Stice & Whitenton, 2002; Striegel-Moore, et al., 2005).

Perhaps one of the most significant health consequences of pediatric obesity is that overweight or obese children are more likely to become overweight or obese adults (Fisberg, et al., 2004; Whitaker, Wright, Pepe, Seidel, & Dietz, 1997). The medical and psychosocial sequelae associated with childhood obesity track into adulthood, as well (Serdula, et al., 1993). Ultimately, the treatment of pediatric obesity-related

complications leads to increased healthcare utilization and expenses (Hampl, Carroll, Simon, & Sharma, 2007). Thus, it is critical to intervene early to prevent excess weight gain: along with reducing present medical and psychosocial problems, early intervention for childhood obesity is one of the most important prevention tools for adult obesity, as well as eating disorders, and the severe complications that track into adulthood (Faith, Saelens, Wilfley, & Allison, 2001; Golan, Fainaru, & Weizman, 1998).

Effective treatment for childhood obesity has been developed and found to be efficacious with diverse samples: family-based behavioral weight loss treatment (FBT) is considered to be the "gold-standard" weight loss intervention for youth (Epstein, Paluch, Roemmich, & Beecher, 2007). FBT is a lifestyle intervention that focuses on: 1) improving dietary and physical activity habits; and 2) restructuring the home environment to limit cues for unhealthy behaviors and increase the availability of cues for healthy behaviors. Although lifestyle interventions are considered to be the most successful treatments for childhood obesity, studies suggest that there is variability in treatment response and long-term sustainability of outcome (Wilfley, et al., 2007). To enhance treatment effectiveness, it is important to elucidate variables that impact FBT response trajectory (i.e., rate of weight loss). Depressive symptoms may play an important role here, given that depression is related to increased weight in youth (Barlow, 2007; BeLue, et al., 2009). Furthermore, weight-related problems are one of the key behavioral features of a depressive episode (American Psychiatric Association, 2000), indicating that depressive symptoms may impact weight change and lead to weight loss treatment resistance.

Unfortunately, few studies have evaluated clinically-significant depression in overweight children and youth. Much of the extant research on psychosocial constructs focuses on social support, body image, self-esteem, or quality of life and suggests that impaired psychosocial functioning hinders weight loss treatment response (Goldschmidt, et al., 2010). Among those studies that investigate child depression in relation to weight loss treatment outcome, parents' reports on their children's depression, rather than children's self-reports, are typically used. The child clinical literature suggests that the assessment of children's depression is difficult in that it requires conceptual sophistication and language skills, which depend on children's developmental level (Hodges, 1990). Thus, studies often rely on parents to provide proxy-reports of their children's depression, although it is possible that children's self-reports may provide key information that extends the proxy-reports (Kolko & Kazdin, 1993; Moretti, Fine, Haley, & Marriage, 1985). To address this concern, self-reports have been developed and demonstrated to provide reliable and valid measures of children's depression (Hodges, 1990; Rhew, et al., 2010). Furthermore, the studies that evaluate children's depression (via parent-reports on their children) typically assess cross-sectional baseline measurements alone, which do not capture potential changes in depression. Given that these children are pre-pubescent, it is possible that natural shifts in depressive symptomatology will occur, as depressive symptoms may begin to be expressed in young children (Laucht, et al., 2000). Thus, as changes in depression may occur over the course of FBT, these shifts may impact treatment response, such that children who experience increases in depressive symptomatology exhibit poorer treatment outcome.

Furthermore, it is possible that parents' symptomatology influences the trajectory of overweight children's depressive symptoms, via both genetic and environmental factors (Epstein, Klein, & Wisniewski, 1994). In fact, reductions in parents' symptomatology throughout FBT has been found to predict reductions in children's internalizing symptoms (Myers, Raynor, & Epstein, 1998) and more severe parent psychopathology has been shown to predict poorer FBT response in children (Epstein, et al., 1994; Pott, Albayrak, Hebebrand, & Pauli-Pott, 2009), suggesting that it may be important to evaluate parent symptomatology in relation to FBT outcome. Therefore, to effectively capture the effects of child and parent depressive symptoms on FBT response, assessing depression via multiple informants (children and parents) may be warranted. Finally, in addition to assessing depression at baseline, it may be important to evaluate changes in depression throughout treatment and their impact on weight loss outcome.

Given that depression may hinder weight loss treatment response, overweight children who experience increases in depression may be less likely to respond to FBT. Therefore, it is critical to evaluate children's self-reports and parent-reports on their children's depression as both baseline measures and change trajectories throughout treatment, especially in light of the paucity of data regarding children who experience increases in depressive symptoms throughout treatment (Oude Luttikhuis, et al., 2009; Pott, Albayrak, Hebebrand, & Pauli-Pott, 2010). In fact, a recent study by Pott and colleagues (2010) demonstrated that children's self-reported baseline depression was not predictive of children's weight reduction, but that an increase in self-reported depressive symptoms was associated with a failure to lose weight. However, this study solely used reports from the children, and had a small sample size of children who experienced

increases in depression (n = 12). Thus, further investigation of the source (child versus parent self-reports), informant type (child self-report versus parent-report on child), and timing (baseline versus change over time), used to assess severity of children's depression throughout weight loss treatment is warranted.

To this end, the primary aim of the current study was to determine whether children's and parents' depressive symptomatology predicted child FBT outcome, when baseline depression was examined and when using change in depression from baseline to post-FBT as a predictor. Firstly, it was hypothesized that child (self-report and parent-report on child) and parent depression would be positively correlated, both at baseline and change from baseline to post-FBT. Secondly, it was hypothesized that higher child and parent depression at baseline would be related to poorer child FBT outcome (i.e., a smaller decrease in child percent overweight); both the main effects and the interactions of these variables was tested. Lastly, it was hypothesized that children who demonstrated an increase in depressive symptoms and whose parents also reported that they or their children experienced an increase in depressive symptoms would experience poorer treatment response as compared to children whose depression scores remained the same or decreased from baseline to post-FBT. Given the need to identify participant characteristics that relate to treatment response, the present study extends extant research by exploring the independent effects of depression, assessed via children's self-reports, parents' self-reports, and parent-reports on their children throughout FBT, as well as the impact of heightened depression on multiple reports (e.g., child self-report and parent-report on child). Assessing and addressing depression during the intervention offers implications for personalization of obesity treatment.

Methods

Participants

Participants were child-parent dyads, in which children were overweight (BMI ≥ 85th percentile for age and sex) and between the ages of 7 and 11. Child-parent dyads were participating in a larger randomized controlled trial (RCT) designed to evaluate weight maintenance treatments for overweight children following standard 4-month FBT. In accordance with the general study inclusion criteria, children had at least one overweight parent (BMI ≥ 25 kg/m^2), as children of overweight parents are at heightened risk for obesity (Whitaker, et al., 1997). Parent participants did not meet diagnostic criteria for a current diagnosis of a severe psychiatric disorder (i.e., were not suicidal or psychotic), as defined in the Diagnostic and Statistical Manual of Mental Disorders revised 4th edition (American Psychiatric Association, 2000; Spitzer, Kroenke, & Williams, 1999). The study was conducted in St. Louis, MO, and Seattle, WA and was approved by the Washington University and Seattle Children's Hospital institutional review boards.

Procedure

Participants in both St. Louis and Seattle were recruited from the local community. Interested families responded to: posted fliers; referrals from schools, nurses, and doctors; website postings; newspaper, radio, and television advertisements; and word of mouth. After completing a brief telephone screening questionnaire, potentially eligible participants were invited to complete an in-person orientation and screening assessment, during which their objective weight and height measurements were taken and they completed baseline questionnaire packets. Relevant to the present study, the following

variables were assessed in children and parents: age; gender; race/ethnicity; socio-economic status; and depression. Specifically, children and parents self-reported their own depression, and parents additionally provided a parent-report on child depression. Children provided informed assent and parents provided informed consent prior to beginning the study assessments.

All participants received FBT. The present study was part of a larger RCT assessing weight maintenance treatments in overweight children (following completion of FBT) that utilize a multi-level approach that focuses on social facilitation of healthy weight-related behaviors to promote long-term weight control. Following completion of FBT, families were randomized to one of the maintenance intervention conditions.

Intervention

FBT was delivered over the course of 16 weekly sessions and focused on energy balance behaviors (i.e., eating and activity) to achieve weight loss. The overarching goal was to lose at least 0.5 lb./week; to achieve the weight loss goal, behavioral targets were established, which followed the Traffic Light Plan (TLP) (Epstein & Squires, 1988). The TLP codes foods and activities into RED, YELLOW, or GREEN categories to provide a simple classification system. Families were encouraged to limit RED foods (high-fat, high-calorie, low-nutrient) and RED activity (e.g., "screen" time outside of work/school: watching television; playing videogames; talking/texting on the phone; using the computer) and replace them with GREEN foods (healthful, low-fat, low-calorie, high-nutrient) and GREEN activity (e.g., moderate-to-high intensity PA: playing basketball, running, bike riding). Families attended weekly sessions, which consisted of group sessions (conducted separately for children and parents) and individual sessions with an

interventionist. Weekly session content was provided in both the group and individual sessions. In addition, weekly weights and self-monitoring of energy balance behaviors were reviewed in the individual sessions, during which goals for the upcoming week were established.

Measures

Demographic variables. Parents reported on their own and their child's age, gender, race, and ethnicity. For the present study, race/ethnicity was categorized as White (non-Hispanic), Black/African-American, Hispanic/Latino, or Mixed/Other.

Barratt Simplified Measure of Social Status (BSMSS). The BSMSS is an updated adaptation of the Hollingshead index and provides a parent-reported measure of socioeconomic status (SES)(Barratt, 2006; Hollingshead, 1975). Higher scores indicate higher levels of SES.

Mood and Feelings Questionnaire – Short Form (SMFQ). The SMFQ is a brief, 13-item child self-report screening instrument for symptoms of depression. It has high internal consistency and good criterion validity, discriminant validity, and internal construct validity (Angold, et al., 1995). Scores are rated on a 3-point Likert scale ranging from 0 (*not true*) to 2 (*true*) for each item, with a higher score indicating greater depressive symptoms.

Brief Symptom Inventory (BSI). The BSI is a 53-item adult self-report measure of depression that has good internal consistency, test-retest reliability, and convergent validity, and predictive validity (Boulet & Boss, 1991; Derogatis & Melisaratos, 1983). Scores are rated on a 5-point Likert scale (0 = *not at all*; 1 = *a little bit*; 2 = *moderately*; 3

= *quite a bit*; and 4 = *extremely*). The present study focuses on the depression subscale, which is designed to assess depressive symptoms.

Child Behavior Checklist (CBCL). The CBCL is a comprehensive parent-report of children's emotional and behavioral functioning, and has good reliability and validity (Achenbach, 1991). Scores are rated on a 3-point Likert scale ranging from 0 (*not true*) to 2 (*very true or often true*) for each behavior; scores are converted to T-scores, with a higher score indicating greater symptomatology. The present study focuses on the Affective Problems subscale, which specifically measures DSM-IV-related depressive symptoms (Ferdinand, 2008).

Percent overweight. Child height and weight was measured at baseline and post-FBT. Measurements were performed by trained research assistants using a calibrated scale and stadiometer, respectively. Participants were measured without shoes. Percent overweight, defined as the percent above the median BMI for age and sex (Kuczmarski, et al., 2000), was used as the main outcome variable.

Analyses

All analyses were conducted using the SPSS version 18.0 software package (SPSS Inc, Chicago, IL). All families who entered FBT (N = 241) were included in analyses regarding baseline characteristics and baseline depression as a predictor of FBT outcome; to effectively evaluate the entire sample, intent-to-treat analyses were used, with child baseline percent overweight carried forward for those missing post-FBT assessments. For analyses of hypotheses regarding change in depression, completer analyses were used to analyze all children who completed the pre- and post-FBT assessments (n = 178).

T-tests, chi-square analyses, and Mann-Whitney U tests were used to examine: 1) baseline differences between those who did and did not complete post-FBT assessments; and 2) relations between demographic variables (age, gender, race, ethnicity, SES) and depression (child and parent self-reports, and parent-reports on their children) and change in percent overweight from baseline to post-FBT. To identify baseline characteristics of children who had higher versus lower depressive symptoms, a cutoff score of 8 on the SMFQ was used to classify children as "depressed" or "not depressed" at baseline (Angold, et al., 1995). Baseline depression and change in depression, as well as baseline percent overweight and change in percent overweight, were analyzed as continuous variables.

Pearson product-moment correlations were calculated between children's and parents' self-reports of baseline and change in depression, and paired-samples *t*-tests were used to examine change in depression within children and parents. Linear regression analyses examined change in depression from baseline to post-FBT as a predictor of child change in percent overweight from baseline to post-FBT. Regression models included depression variables and baseline variables that were found to significantly predict FBT child percent overweight change, followed by all interaction terms among variables (derived by multiplication of main effect variables). Non-significant interaction terms were then removed from each final model.

Specifically, child gender emerged as a significant predictor of child percent overweight change from baseline to post-FBT (see below) and thus was included in the first step (i.e., as a main effect) within all models predicting change in child percent overweight. The 2-way interactions between child gender and each report of baseline

depression, or between child gender and each report of change in depression, were included in all initial regression models predicting change in child percent overweight. In addition, the 3-way interaction between child gender, the first depression report (e.g., child self-report) and the second depression report (e.g., parent-report on child) was included in all initial regression models predicting change in outcome. However, none of these child gender interaction terms were significant and were thus removed from the final models.

Results

Sample Characteristics

Of the 241 children who entered the study, the median child age was 9.93 (SD = 1.32), and the sample was 62.7% female, and 72.2% White/non-Hispanic, 15.4% African-American, 8.3% Hispanic, and 4.1% Mixed/Other. The mean SES level was 43.1 (*SD* = 10.39). At baseline, 72 (29.9%) children were at or above the clinical cutoff on the MFQ (a score of ≥ 8). When analyzed by gender, male and female children did not differ by baseline prevalence of depression; 26 (28.8%) boys and 46 (30.5%) girls were at or above the clinical cutoff, $\chi^2(1, 241) = .07$, $p = .89$. There were no significant differences between the baseline characteristics of those who did and those who did not meet the MFQ cutoff at baseline with regard to child gender, age, race/ethnicity, SES, percent overweight, or parent depression. Regarding treatment outcome, child gender was significantly related to child change in percent overweight: on average, boys ($M = -11.95 \pm 10.04$) had a greater reduction in percent overweight, $t(239) = -2.57$, $p < .05$, than girls ($M = -8.88 \pm 8.28$). All other child baseline characteristics (i.e. child age race/ethnicity, and SES) were not significantly associated with child change in percent overweight.

Sixty-three children (26%) dropped out of treatment prior to the end of the study and were missing post-FBT assessments, leaving a sample of 178 families (178 children and 177 parents) for completer analyses. FBT completers and dropouts did not significantly differ with regard to child gender, age, race/ethnicity, baseline percent overweight, or child self-reported depression. However, children who did not complete FBT had significantly higher baseline scores on parent-report of child depression, $t(239) = 1.97$, $p = .05$, as compared to FBT completers ($M = 61.02 \pm 8.46$ versus 58.67 ± 7.96, respectively).

Change in Percent Overweight

Intent-to-treat analyses revealed that children had a significant decrease in percent overweight from baseline to post-FBT ($M = 65.96 \pm 26.09$ to 55.92 ± 27.74, respectively), $t(239) = 17.13$, $p < .001$.

Baseline Depression in Relation to Change in Percent Overweight

After including child gender as the first step in each model ($p < .05$), none of the following baseline variables were significant predictors of child change in percent overweight: child self-reported depression, $F(1, 238) = .03$, $p = .87$; parent self-reported depression, $F(1, 239) = .84$, $p = .36$; and parent-report on child's depression, $F(1, 238) = .45$, $p = .50$.

The full model examining baseline child self-reported depression and parent self-reported depression was not significant, $F(6, 234) = 1.72$, $p = .12$.

When the model was examined using baseline child self-report of depression and parent-report on child depression, the full regression model was significant $F(4, 236) = 2.99$, $p < .02$. The main effects of baseline child self-reported depression ($p = .97$) and

parent-report on child depression (p = .51) were not significant. However, the interaction between baseline child self-reported depression and parent-report on child depression was significant, $F(1, 236) = 4.84$, $p < .05$, with the poorest weight outcome seen in children who experienced heightened depressive symptoms and whose parents also reported that the children had heightened depressive symptoms.

Finally, the regression model examining baseline parent self-reported depression and parent-report on child depression was not significant, $F(6, 234) = .255$, $p = .23$. In summary, only the model with baseline child self-report and parent-report on child depression significantly predicted FBT outcome.

Change in Depression throughout FBT

All measures indicated that children's and parents' depressive symptoms significantly improved throughout FBT. There was a significant improvement in child self-reported depression from baseline to post-FBT ($M = 5.76 \pm 5.26$ versus 4.26 ± 4.23, respectively), $t(177) = 4.07$, $p < .001$. Similarly, children's depression significantly decreased from baseline to post-FBT when assessed via parent-report on child ($M = 58.68 \pm 7.958$ versus 55.42 ± 6.75), $t(172) = 6.60$, $p < .001$. Finally, parent self-reported depression also improved from baseline to post-FBT ($M = 47.89 \pm 9.99$ versus 45.72 ± 9.07), $t(176) = 3.47$, $p < .001$.

Associations between Child Self-report, Parent Self-report, and Parent-report on Child Depression

Baseline Depressive Symptoms. Child self-reported depression and parent self-reported depression were not significantly associated at baseline, $r = .06$, $p = .32$. Baseline child self-report and parent-report on child depression scores were significantly

correlated, $r = .19$, $p < .01$. In addition, baseline parent-report on child depression and parent self-reported depression were significantly correlated, $r = .27$, $p < .001$.

Change in Depressive Symptoms. None of the correlations between the depression change scores were statistically significant. Specifically, change in child self-reported and change in parent self-reported depression scores were not significantly associated, $r = .05$, $p = .55$. In addition, change in child self-report and change in parent-report on child depression were not significantly associated, $r = -.01$, $p = .89$. Finally, changes in parent-report on child and parent self-reported depression were not significantly, $r = .20$, $p = .20$.

Change in Depression as a Predictor of Change in Percent Overweight

The full model examining change in child self-reported depression and change in parent self-reported depression was significant, $F(4, 176) = 5.00$, $p = .001$. Neither the main effects of change in child ($p = .59$) nor parent ($p = .16$) self-reported depression was significantly associated with change in percent overweight. However, the interaction between child self-reported depression and parent self-reported depression was significant, $F(1, 172) = 7.12$, $p < .01$, with the poorest weight outcome seen in children who experienced a worsening of depressive symptoms and whose parents also experienced a worsening of depressive symptoms (see Figure 1).

When this same model was examined using change in child self-report of depression and change in parent-report on child depression, the full regression model was significant $F(4, 172) = 4.62$, $p = .001$. The main effects of change in child self-reported depression ($p = .58$) and parent-report on child depression ($p = .13$) were not significant. However, the interaction between change in child self-reported depression and parent-

report on child depression was significant, $F(1, 168) = 5.93$, $p < .05$, with the poorest weight outcome seen in children who experienced a worsening of depressive symptoms and whose parents also reported that children worsened in depressive symptoms (see Figure 2).

Finally, although the regression model examining change in parent self-reported depression and change in parent-report on child depression was significant, $F(4, 171) = 4.03$, $p < .01$, neither the main effects of parent self-reported depression ($p = .07$) or parent-report on child depression ($p = .17$), nor the interaction term ($p = .65$), were significant predictors of child change in percent overweight.

Discussion

Overall, children exhibited reductions in percent overweight and in depression from baseline to post-FBT. The present study investigated child and parent depression, informant on child depression (i.e., child-self report versus parent-report on child), and assessment timing (i.e., baseline depression versus change in depression over time). Approximately one-third of the children in the sample reported a clinically meaningful level of depressive symptoms (August, et al., 2008; Barlow, 2007; BeLue, et al., 2009), with equivalent rates for male versus female children. This finding is in contrast to studies that suggest that among overweight children, girls are more likely to experience depression than boys (Anderson, Cohen, Naumova, & Must, 2006). However, given that much of the extant research has used parent-report on child as a proxy-report of child degree of depressive symptomatology, it is possible that the children's self-reported depression provides additional information, perhaps especially in boys. There were significant associations among child and parent depression reports at baseline, but

changes in depression across the measures (e.g., change in child self-reported depression and change in parent-report on child depression) were not associated. This finding highlights the variability in depression among parents and children, and the potential problem of relying solely on parents' self-reported depression or on using parent-report when gauging child depression (Kolko & Kazdin, 1993). Further, results may explain previous data suggesting that children's baseline depression is not associated with weight loss treatment outcome (Braet, 2006), as depression has typically been assessed via parent-reports. Therefore, given that young children appear able to provide valid and reliable self-reports on their internalizing states (Varni, Limbers, & Burwinkle, 2007), including assessments of child self-reported depression may increase sensitivity and accuracy in diagnosing and addressing child depression.

Furthermore, findings suggest that evaluations of children's baseline depression from multiple sources are significantly predictive of FBT outcome, possibly because assessing multiple informants about children's depression may identify youth with high levels of depressive symptoms or at risk for depressive symptoms, thereby indicating heightened severity of depression in children. Using both child self-reports and parent-reports on their children, children who had consistently reported higher depressive symptoms (i.e., high scores on both the child and parent-reports on children) exhibited the poorest treatment response.

In terms of assessment timing, children's and parents' self-reported change in depression was associated with child weight outcome. Thus, it may be important to assess child depression at multiple time points to effectively capture potential changes in

depression throughout treatment. Further research is warranted to elucidate how changes in child and parent depressive symptoms influence child weight loss outcome.

As FBT relies on parental involvement to implement healthy behavior changes and provide a supportive environment for children, parent depression may be important to assess in this setting, especially to detect a worsening in parent functioning. Increased parent depressive symptoms may highlight a reduced ability for parents to engage with and implement the healthy strategies discussed throughout FBT, especially when their children are concurrently experiencing an increase in depressive symptoms. It is possible that either parents or children begin to experience worsened symptoms, which then may lead to diminished treatment adherence and motivation in either the child or parent, or both. Future research should explore treatment techniques to target parent depression and enhance parents' abilities to support their children's healthy weight control behaviors. For instance, it is plausible that increased self-monitoring and communication between parents and children regarding depressive symptoms, stigma- or body-image-related issues, and motivation would enhance children's and parents' self-efficacy and help them to remain engaged in treatment.

Given that the interaction of child gender and child or parent depression at baseline or change throughout FBT (i.e., change in child self-reported depression, parent self-reported depression, or parent-report on child depression) did not significantly add to the model, gender and depression trajectory seem to separately explain significant variance in treatment response, suggesting that it is important to take both factors into account.

It is possible that poor regulation of depression or worsening of depression, potentially due to weight-related stigmatization, poor body image, or overweight concerns (Erickson, Robinson, Haydel, & Killen, 2000), diminishes motivation for weight loss, self-efficacy, or interest in program compliance, which may negatively influence weight loss outcome. Thus, it may be critical to monitor depression via children's self-reports and parents' reports on themselves and their children, and to reassess depressive symptoms frequently as treatment progresses. For instance, youth may experience rapid improvements in depression (Gaynor, et al., 2003) or rapid worsening of depressive symptoms—the latter being potentially crucial to detect early on in treatment. More accurate and more frequent assessment of depression to identify shifts in symptomatology may provide key information regarding weight loss and may also highlight FBT-specific factors that may increase children's risk or resilience regarding the worsening of depressive symptoms.

Of note, parent-reports of their children's depression may predict dropout from treatment, possibly due to increased emotional and behavioral problems in the children, which may lead to decreased motivation, self-efficacy, or compliance. Alternatively, dropout may have occurred due to increased problems in the parents, as parent-reports on children are often influenced by how parents feel about themselves (Najman, et al., 2001), and parents may have felt unmotivated or overwhelmed. Future interventions should remain aware of the potential impact of baseline child depression on child outcome and adherence to the program.

Limitations

Given that percent overweight and depression were both assessed only at baseline and post-FBT, it is not possible to determine the causal nature of the relation between depression and percent overweight change. In fact, it is possible that changes in percent overweight influenced depression trajectory (Myers, et al., 1998), leading children who experienced less weight loss during FBT to then become more depressed. Follow-up analyses, including longitudinal tracking of both depression and percent overweight, will examine the question of whether the relation between change in depression and change in percent overweight is uni- or bidirectional. By collecting and analyzing changes in depression and percent overweight throughout FBT, such as on a weekly or biweekly basis, it may be possible to detect more sensitive shifts in either variable, as well as the directionality of the relation (i.e., if the trajectory of one variable predicts a shift in the other).

Conclusions

The results of the present study suggest that increases in child self-reported depression—in combination with increases in parent self-reported depression or parent-report on child depression—may be associated with poorer child weight loss treatment outcome. Moreover, children's self-reported depression warrants assessment, as it may provide additional information about FBT response beyond what is gained from parent-report on child or parent self-reported depression. Given that models of change in depression were significantly related to child treatment outcome, it is important to assess and address depression throughout the intervention, as this may optimize response to weight loss intervention. Future studies should evaluate the causal nature of the relations

between children's change in depression and change in percent overweight during FBT and at long-term follow-up. In addition, further evaluation of the predictive validity of assessing baseline depressive symptoms via child self-reports as well as parents' reports (of their own symptoms and of their children's symptoms) is warranted. Increased understanding of the relations between depression and weight loss trajectories will enhance the modification or tailoring of pediatric obesity treatment.

References

Achenbach, T. (1991). *Manual for the Child Behavior Checklist/4-18 and 1991 Profile*. Burlington, VT: University of Vermont Department of Psychiatry.

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., text rev. ed.). Washington, D. C.: Author.

Anderson, S. E., Cohen, P., Naumova, E. N., & Must, A. (2006). Association of depression and anxiety disorders with weight change in a prospective community-based study of children followed up into adulthood. *Arch Pediatr Adolesc Med, 160*(3), 285-291.

Angold, A., Costello, E., Messer, S., Pickles, A., Winder, F., & Silver, D. (1995). Development of a short questionnaire for use in epidemiological studies of depression in children and adolescents. *International Journal of Methods in Psychiatric Research, 5,* 237-249.

August, G. P., Caprio, S., Fennoy, I., Freemark, M., Kaufman, F. R., Lustig, R. H., et al. (2008). Prevention and treatment of pediatric obesity: an endocrine society clinical practice guideline based on expert opinion. *J Clin Endocrinol Metab, 93*(12), 4576-4599.

Banis, H. T., Varni, J. W., Wallander, J. L., Korsch, B. M., Jay, S. M., Adler, R., et al. (1988). Psychological and social adjustment of obese children and their families. *Child Care Health Dev, 14*(3), 157-173.

Barlow, S. E. (2007). Expert committee recommendations regarding the prevention, assessment, and treatment of child and adolescent overweight and obesity: summary report. *Pediatrics, 120 Suppl 4,* S164-192.

Barratt, W. (2006). The Barratt Simplified Measure of Social Status.

BeLue, R., Francis, L. A., & Colaco, B. (2009). Mental health problems and overweight in a nationally representative sample of adolescents: effects of race and ethnicity. *Pediatrics, 123*(2), 697-702.

Berenson, G. S., Srinivasan, S. R., Wattigney, W. A., & Harsha, D. W. (1993). Obesity and cardiovascular risk in children. *Ann N Y Acad Sci, 699,* 93-103.

Boulet, J., & Boss, M. W. (1991). Reliability and validity of the Brief Symptom Inventory. *Psychological Assessment, 3,* 433-437.

Braet, C. (2006). Patient characteristics as predictors of weight loss after an obesity treatment for children. *Obesity (Silver Spring), 14*(1), 148-155.

Derogatis, L., & Melisaratos, N. (1983). The Brief Symptom Inventory: An introductory report. *Psychological Medicine, 13,* 595-605.

Dietz, W. H. (2002). Medical consequences of obesity in children and adolescents. In C. G. Fairburn & K. D. Brownell (Eds.), *Eating disorders and obesity: A comprehensive handbook* (2nd ed., pp. 473-476). New York: Guilford Press.

Epstein, L. H., Klein, K. R., & Wisniewski, L. (1994). Child and parent factors that influence psychological problems in obese children. *Int J Eat Disord, 15*(2), 151-158.

Epstein, L. H., Paluch, R. A., Roemmich, J. N., & Beecher, M. D. (2007). Family-based obesity treatment, then and now: twenty-five years of pediatric obesity treatment. *Health Psychol, 26*(4), 381-391.

Epstein, L. H., & Squires, S. (1988). *The stoplight diet for children*. Boston: Little, Brown.

Erickson, S. J., Robinson, T. N., Haydel, K. F., & Killen, J. D. (2000). Are overweight children unhappy?: Body mass index, depressive symptoms, and overweight concerns in elementary school children. *Arch Pediatr Adolesc Med, 154*(9), 931-935.

Fairburn, C. G., Shafran, R., & Cooper, Z. (1998). A cognitive behavioral theory of anorexia nervosa. *Behaviour Research and Therapy, 37*, 1-13.

Fairburn, C. G., Welch, S. L., Doll, H. A., Davies, B. A., & O'Connor, M. E. (1997). Risk factors for bulimia nervosa. A community-based case-control study. *Arch Gen Psychiatry, 54*(6), 509-517.

Faith, M. S., Saelens, B. E., Wilfley, D. E., & Allison, D. B. (2001). Behavioral treatment of childhood and adolescent obesity: Current status, challenges, and future directions. In J. K. Thompson & L. Smolak (Eds.), *Body Image, Eating Disorders, and Obesity in Youth: Assessment, Prevention, and Treatment* (pp. 313-319). Washington, D. C.: American Psychological Association,.

Ferdinand, R. F. (2008). Validity of the CBCL/YSR DSM-IV scales Anxiety Problems and Affective Problems. *J Anxiety Disord, 22*(1), 126-134.

Fisberg, M., Baur, L., Chen, W., Hoppin, A., Koletzko, B., Lau, D., et al. (2004). Obesity in children and adolescents: Working Group report of the second World Congress of Pediatric Gastroenterology, Hepatology, and Nutrition. *J Pediatr Gastroenterol Nutr, 39 Suppl 2*, S678-687.

Freedman, D. S., Dietz, W. H., Srinivasan, S. R., & Berenson, G. S. (1999). The relation of overweight to cardiovascular risk factors among children and adolescents: the Bogalusa Heart Study. *Pediatrics, 103*(6 Pt 1), 1175-1182.

Gaynor, S. T., Weersing, V. R., Kolko, D. J., Birmaher, B., Heo, J., & Brent, D. A. (2003). The prevalence and impact of large sudden improvements during adolescent therapy for depression: a comparison across cognitive-behavioral, family, and supportive therapy. *J Consult Clin Psychol, 71*(2), 386-393.

Golan, M., Fainaru, M., & Weizman, A. (1998). Role of behaviour modification in the treatment of childhood obesity with the parents as the exclusive agents of change. *Int J Obes Relat Metab Disord, 22*(12), 1217-1224.

Goldfield, A., & Chrisler, J. C. (1995). Body stereotyping and stigmatization of obese persons by first graders. *Percept Mot Skills, 81*(3 Pt 1), 909-910.

Goldschmidt, A. B., Sinton, M. M., Aspen, V. P., Tibbs, T. L., Stein, R. I., Saelens, B. E., et al. (2010). Psychosocial and familial impairment among overweight youth with social problems. *Int J Pediatr Obes*.

Gortmaker, S. L., Must, A., Perrin, J. M., Sobol, A. M., & Dietz, W. H. (1993). Social and economic consequences of overweight in adolescence and young adulthood. *N Engl J Med, 329*(14), 1008-1012.

Hampl, S. E., Carroll, C. A., Simon, S. D., & Sharma, V. (2007). Resource utilization and expenditures for overweight and obese children. *Arch Pediatr Adolesc Med, 161*(1), 11-14.

Hayden-Wade, H. A., Stein, R. I., Ghaderi, A., Saelens, B. E., Zabinski, M. F., & Wilfley, D. E. (2005). Prevalence, characteristics, and correlates of teasing experiences among overweight children vs. non-overweight peers. *Obes Res, 13*(8), 1381-1392.

Hodges, K. (1990). Depression and anxiety in children: A comparison of self-report quesitonnaires to clinical interview. *Psychological Assessment: A Journal of Consulting and Clinical Psychology, 2*(4), 376-381.

Hollingshead, A. (1975). *Four-Factor Index of Social Status*. New Haven, CT: Yale University.

Ippisch, H. M., & Daniels, S. R. (2008). Hypertension in overweight and obese youth. *Pediatric Cardiology, 25*, 177-182.

Kolko, D. J., & Kazdin, A. E. (1993). Emotional/behavioral problems in clinic and nonclinic children: correspondence among child, parent and teacher reports. *J Child Psychol Psychiatry, 34*(6), 991-1006.

Kuczmarski, R. J., Ogden, C. L., Grummer-Strawn, L. M., Flegal, K. M., Guo, S. S., Wei, R., et al. (2000). CDC growth charts: United States. *Adv Data*(314), 1-27.

Latner, J. D., & Stunkard, A. J. (2003). Getting worse: the stigmatization of obese children. *Obes Res, 11*(3), 452-456.

Laucht, M., Esser, G., Baving, L., Gerhold, M., Hoesch, I., Ihle, W., et al. (2000). Behavioral sequelae of perinatal insults and early family adversity at 8 years of age. *J Am Acad Child Adolesc Psychiatry, 39*(10), 1229-1237.

Moretti, M., Fine, S., Haley, G., & Marriage, K. (1985). Childhood and adolescent depression: Child-report versus parent-report information. *Journal of the American Academy of Child Psychiatry, 24*(3), 298-302.

Myers, M. D., Raynor, H. A., & Epstein, L. H. (1998). Predictors of child psychological changes during family-based treatment for obesity. *Arch Pediatr Adolesc Med, 152*(9), 855-861.

Najman, J. M., Williams, G. M., Nikles, J., Spence, S., Bor, W., O'Callaghan, M., et al. (2001). Bias influencing maternal reports of child behaviour and emotional state. *Soc Psychiatry Psychiatr Epidemiol, 36*(4), 186-194.

Ogden, C. L., Carroll, M. D., Curtin, L. R., McDowell, M. A., Tabak, C. J., & Flegal, K. M. (2006). Prevalence of overweight and obesity in the United States, 1999-2004. *Jama, 295*(13), 1549-1555.

Ogden, C. L., Flegal, K. M., Carroll, M. D., & Johnson, C. L. (2002). Prevalence and trends in overweight among US children and adolescents, 1999-2000. *Jama, 288*(14), 1728-1732.

Oude Luttikhuis, H., Baur, L., Jansen, H., Shrewsbury, V. A., O'Malley, C., Stolk, R. P., et al. (2009). Interventions for treating obesity in children. *Cochrane Database Syst Rev*(1), CD001872.

Pinhas-Hamiel, O., Dolan, L. M., Daniels, S. R., Standiford, D., Khoury, P. R., & Zeitler, P. (1996). Increased incidence of non-insulin-dependent diabetes mellitus among adolescents. *J Pediatr, 128*(5 Pt 1), 608-615.

Pott, W., Albayrak, O., Hebebrand, J., & Pauli-Pott, U. (2009). Treating childhood obesity: family background variables and the child's success in a weight-control intervention. *Int J Eat Disord, 42*(3), 284-289.

Pott, W., Albayrak, O., Hebebrand, J., & Pauli-Pott, U. (2010). Course of depressive symptoms in overweight youth participating in a lifestyle intervention: associations with weight reduction. *J Dev Behav Pediatr, 31*(8), 635-640.

Rhew, I. C., Simpson, K., Tracy, M., Lymp, J., McCauley, E., Tsuang, D., et al. (2010). Criterion validity of the Short Mood and Feelings Questionnaire and one- and two-item depression screens in young adolescents. *Child Adolesc Psychiatry Ment Health, 4*(1), 8.

Rosenbloom, A. L., Joe, J. R., Young, R. S., & Winter, W. E. (1999). Emerging epidemic of type 2 diabetes in youth. *Diabetes Care, 22*(2), 345-354.

Schwimmer, J. B., Burwinkle, T. M., & Varni, J. W. (2003). Health-related quality of life of severely obese children and adolescents. *Jama, 289*(14), 1813-1819.

Serdula, M. K., Ivery, D., Coates, R. J., Freedman, D. S., Williamson, D. F., & Byers, T. (1993). Do obese children become obese adults? A review of the literature. *Prev Med, 22*(2), 167-177.

Spitzer, R. L., Kroenke, K., & Williams, J. B. (1999). Validation and utility of a self-report version of PRIME-MD: the PHQ primary care study. Primary Care Evaluation of Mental Disorders. Patient Health Questionnaire. *Jama, 282*(18), 1737-1744.

Stice, E., & Whitenton, K. (2002). Risk factors for body dissatisfaction in adolescent girls: a longitudinal investigation. *Dev Psychol, 38*(5), 669-678.

Striegel-Moore, R. H., Fairburn, C. G., Wilfley, D. E., Pike, K. M., Dohm, F. A., & Kraemer, H. C. (2005). Toward an understanding of risk factors for binge-eating disorder in black and white women: a community-based case-control study. *Psychol Med, 35*(6), 907-917.

Striegel-Moore, R. H., Schreiber, G. B., Lo, A., Crawford, P., Obarzanek, E., & Rodin, J. (2000). Eating disorder symptoms in a cohort of 11 to 16-year-old black and white girls: the NHLBI growth and health study. *Int J Eat Disord, 27*(1), 49-66.

Varni, J. W., Limbers, C. A., & Burwinkle, T. M. (2007). How young can children reliably and validly self-report their health-related quality of life?: an analysis of 8,591 children across age subgroups with the PedsQL 4.0 Generic Core Scales. *Health Qual Life Outcomes, 5*, 1.

Whitaker, R. C., Wright, J. A., Pepe, M. S., Seidel, K. D., & Dietz, W. H. (1997). Predicting obesity in young adulthood from childhood and parental obesity. *N Engl J Med, 337*(13), 869-873.

Wilfley, D. E., Tibbs, T. L., Van Buren, D. J., Reach, K. P., Walker, M. S., & Epstein, L. H. (2007). Lifestyle interventions in the treatment of childhood overweight: a meta-analytic review of randomized controlled trials. *Health Psychol, 26*(5), 521-532.

Zeller, M. H., Reiter-Purtill, J., & Ramey, C. (2008). Negative peer perceptions of obese children in the classroom environment. *Obesity (Silver Spring), 16*(4), 755-762.

Figure 1.

Children's and Parents' Self-Reported Depressive Symptoms in Relation to Child Change in Percent Overweight

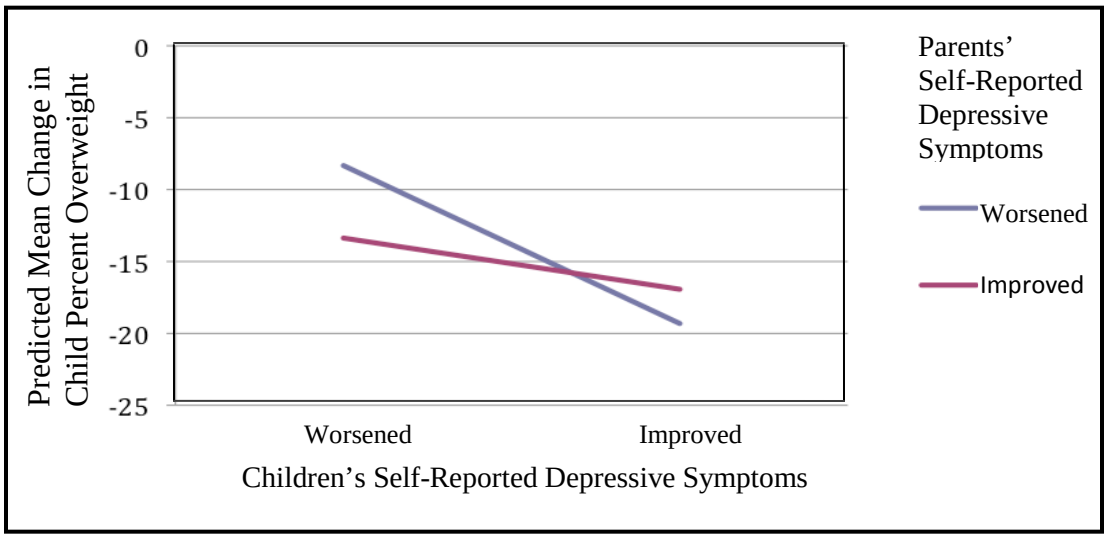

Figure 2.

Children's Self-reports and Parent-reports on Their Children's Depressive Symptoms in Relation to Child Change in Percent Overweight