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Parent Predictors of Self-Monitoring and Attendance in Family-Based Pediatric Obesity Treatment: The Role of Psychosocial Stressors, Motivation, and Consideration of Future Consequences

A dissertation submitted in partial satisfaction of the requirements for the degree

Doctor of Philosophy

in

Clinical Psychology

by

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2016
The Dissertation of Jennifer Madowitz Douglas is approved, and it is acceptable in quality and form for publication on microfilm and electronically:

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Chair

University of California, San Diego
San Diego State University
2016
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Chapters 1 through 4 of this dissertation will be submitted for publication with co-authors, Boutelle, Kerri; Matheson, Brittany; Liang, June. The dissertation author was the primary investigator and will be the primary author on this publication.
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ABSTRACT OF THE DISSERTATION

Parent Predictors of Self-Monitoring and Attendance in Family-Based Pediatric Obesity Treatment: The Role of Psychosocial Stressors, Motivation, and Consideration of Future Consequences

by

Jennifer Madowitz Douglas

Doctor of Philosophy in Clinical Psychology

University of California, San Diego, 2016
San Diego State University, 2016

Professor Kerri Boutelle, Chair

Pediatric overweight and obesity status currently affects approximately 30% of children in the United States. Pediatric overweight and obese status is associated with significant physical health difficulties and psychological problems. The gold standard treatment, family-based treatment for pediatric obesity (FBT) has long-term success rates of only 30%. It is important to identify key variables to success in FBT. Research suggests that two main factors are associated with success in FBT: treatment attendance and dietary self-monitoring. The role of parents is integral to success in FBT. Thus this study assessed parent factors that are associated with FBT attendance and self-monitoring.
One hundred and fifty parent-child dyads participated in a randomized controlled trial of FBT. Outcome variables included weekly attendance rates and weekly rates of self-monitoring for parents and children. Independent variables included parent depression, socioeconomic status, family ethno-racial minority status, consideration of future consequences, parent baseline motivation, and weekly parent motivation. Final models only included independent variables significantly correlated with outcome variables, in addition to a set of planned covariates (baseline body mass index, child depressive symptoms, child age). The analysis of attendance was time lagged such that motivation from the previous session predicted attendance at the subsequent session. Based on initial correlational analysis, a generalized linear mixed model approach assessed the time-varying relationship between parent weekly motivation, socioeconomic status, and family ethno-racial minority status with weekly attendance, weekly rates of parent self-monitoring, and weekly rates of child self-monitoring, respectively.

Results indicated that higher parent weekly motivation was related to higher same week rates of child and parent self-monitoring. Family ethno-racial minority status was related to lower child self-monitoring over time. Higher socioeconomic status, lower child depressive symptoms, and higher parent motivation ratings were related to lower rates of attendance. Parent depression, baseline parent motivation, and consideration of future consequences were not related to any outcome variables.

Enhancing treatment engagement for families with low parental motivation during treatment and families from ethno-racial minority backgrounds could be
important in improving self-monitoring in FBT. Future studies evaluating factors related to attendance in FBT may be needed to fully understand attendance findings from this study. Further study of variables that showed no relationship with attendance and self-monitoring may be warranted in future studies.
CHAPTER 1: INTRODUCTION

Pediatric overweight and obesity

Pediatric overweight and obesity is a growing public health concern that impacts quality of life and healthcare costs for many American families. Approximately one in three American children are currently overweight or obese (Ogden, Carroll, Kit, & Flegal, 2014). In children, overweight status is defined as a body mass index percentile greater than 85th percentile and less than 95th percentile while obesity is defined as a body mass index percentile greater than the 95th percentile (Barlow & Expert Committee, 2007). For the purpose of this study, the term “obesity” is used to refer to children in the overweight and obese categories. Pediatric obesity results in significant healthcare costs to the United States healthcare system (Wang & Dietz, 2002, Wang & Lobstein, 2006) and recent studies show a $19,000 average increase in lifetime medical cost for obese children compared to normal weight children (Finkelstein, Kang Graham, & Malhotra, 2014). Estimates of medical expenses for obese adults suggest even higher lifetime medical costs, with an estimated yearly increase of expenditure due to obesity of over $2,800 (Cawley & Meyerhoefer, 2012). Childhood obesity is related to adult health problems including asthma, musculoskeletal pain, disability, metabolic syndrome, stroke, diabetes, hypertension, and premature death (Micic, 2001; Dixon, 2010; Key et al., 2004; Reilly & Kelly, 2011; Magarey, Daniels, Boulton, & Cockington, 2003; Lloyd, Langley-Evans, & McMullen, 2012; Antony, et al. 2015; McCrindle, 2015) as well as psychosocial impairment (Luppino et al., 2010). Obese children also cope with
weight-related teasing within and outside of their families, and this teasing is associated with elevated depressive symptoms (Madowitz, Knatz, Maginot, Crow, & Boutelle, 2012). Additionally, peers have been shown to stigmatize obese children in social situations (Kraig & Keel, 2001; Zeller, Reiter-Purtill, & Ramey 2008; Vanderloo & Mandich, 2014; Puhl & Luedicke, 2012). Obese children exhibit high rates of anxiety, depression, low self-esteem, and negative emotions such as loneliness compared to their normal weight peers (Strauss, 2000; d'Autume et al., 2012; Wang, Wild, Kipp, Kuhle, & Veugelers, 2009). Furthermore, quality of life ratings of obese children are comparable to those obtained from youth diagnosed with cancer (Schwimmer, Burwinkle, & Varni, 2003). Due to the pervasive negative impact of pediatric obesity on both mental and physical health, research evaluating successful treatment of pediatric obesity is of paramount importance.

Family-Based Pediatric Obesity Treatment

Family-Based Pediatric Obesity Treatment (FBT) is currently the standard treatment for pediatric obesity (Epstein, Paluch, Roemmich, & Beecher, 2007; Wilfley et al., 2007b; Kitzmann & Beech, 2011; Sung-Chan, Sung, Zhao, & Brownson, 2013). FBT includes one hour of weekly group counseling in addition to one half hour of individual family behavioral coaching, and has been tested in protocols ranging from 12 to 20 weeks (Wilfley et al., 2007a; Wilfley et al., 2007b; Epstein et al. 2007; Kitzmann & Beech, 2011; Sung-Chan et al., 2013). FBT consists of three main types of intervention; nutrition education, physical activity, and behavioral therapy. Interventionists teach session topics during group sessions, and also encourage
families to learn from other families’ experiences. On the same day as group sessions, each individual family also receives behavioral coaching from a personal behavioral coach. This behavioral coach provides assistance with implementing the behavioral skills taught in FBT. During these sessions, behavioral coaches review the child and parent’s weight change, self-monitoring, and nutrition habits from the past week. The behavioral coach reviews information from that week’s group lessons and problem-solves any barriers to adherence to the recommendations. Additionally, behavioral coaches facilitate a motivation system for parents and children to provide reinforcement for healthy behavioral changes, to maintain family motivation throughout FBT.

The topics covered in FBT treatment focus on healthy weight loss and sustained behavioral change. Nutrition education includes a calorie goal and follows the traffic light diet that categorizes foods into red, yellow and green foods based on their nutritional value, fat, and sugar content (Epstein et al., 1984). The traffic light diet is designed to be simple enough for parents and eight-year old children to understand. National physical activity guidelines inform exercise recommendations in FBT (Epstein, 1996; Services, 2008): sixty minutes of vigorous physical activity five days a week for adults and ninety minutes of vigorous physical activity five days a week for children. Simultaneously, FBT encourages families to increase their lifestyle activity (i.e., physical activity that takes place during everyday life, such as putting away groceries, housecleaning, etc.) and to decrease sedentary behavior, as sedentary
behavior and physical activity are considered separate constructs (Epstein et al., 1995a; Epstein, Paluch, Gordy, & Dorn, 2000).

FBT also includes behavior therapy skills. Emphasis is placed on self-monitoring, by teaching parents and children to record daily caloric intake and physical activity in provided weekly “Habit Books,” which are returned to their behavioral coach each week. Parents also learn stimulus control, how to implement a behavioral reinforcement system, problem solving, and positive parenting skills. As part of stimulus control, FBT encourages significant changes to the home food environment, such as eliminating non-nutritious calorie dense foods and replacing them with nutritious, less calorie dense foods. Additionally, objects that encourage healthy activities (e.g., jump ropes, sneakers) are placed in plain view as part of the FBT home environment recommendations. Parents are taught to be consistent, as this is necessary to change eating and physical activity habits. Problem solving is an essential skill learned in FBT, focusing on strategies that encourage healthy lifestyles and solving family conflicts using straightforward methods. Finally, positive parenting is taught during FBT, and parents are encouraged to praise their children for any behaviors that align with program recommendations.

Although FBT is the gold standard treatment to date, success rates of FBT remain problematically low. Response rates immediately post-FBT are well below 50% (Ebbeling, Pawlak, & Ludwig, 2002). Additionally, ten-year follow-up of FBT shows only 30% of children who completed treatment are no longer obese in
adulthood (Epstein, Valoski, Wing, & McCurley, 1994). Thus, more research is needed to identify targets to improve treatment.

_Theoretical Models_

FBT is founded on two theoretical models of behavioral change: social cognitive theory and the self-regulatory model. Social cognitive theory describes interactions between behavior, personal factors, and environmental factors (Redding, Rossi, Velicer, & Prochaska, 2000; Connor & Norman, 2005; Dishman, Sallis, & Orestein, 1985; McAllister, Perry, & Parcel, 2008). In the context of FBT, personal factors may include the participating child’s gender, family dynamics, biological predisposition to obesity, etc. Environmental factors may include access to safe areas to participate in physical activity, access to healthy school lunches, home eating environment, etc. Both personal factors and environmental factors interact with the child’s behavior. The child’s behavior targeted in FBT includes daily calories consumed, level of physical activity, self-monitoring, and other behavior therapy skills. Appendix 1 includes a figure describing the social cognitive model of childhood obesity. Within social cognitive theory, there are several more specific components that enable behavioral change including knowledge, reinforcement of behaviors, observational learning of behaviors from others, self-regulation of behavior, outcome expectations for behaviors, goal setting, and perceived self-efficacy (Bandura, 1991; Bandura, 1997; Bandura, 2004; Redding et al., 2000; Connor & Norman, 2005). FBT targets each of the three domains included in the social cognitive model, mainly through parent training. Parent training includes reinforcement, observational learning
and self-monitoring to influence their child’s behaviors. FBT teaches parents to use stimulus control and positive parenting techniques to influence environmental factors. Through this multifaceted approach, FBT aims to influence each factor included in the social cognitive model through parent engagement in FBT.

FBT is also based on self-regulatory theory, which maintains that behavioral change manifests through the four-step feedback loop (Bandura, 1991; Israel, Guile, Baker, & Silverman, 1993; Appendix 2). The first step in self-regulation is goal setting, which provides a level of a specific behavior that the individual strives to accomplish. Goal setting assists in developing a focus on a specific behavioral problem, and by increasing levels of motivation. Goals are used in weekly meetings by behavioral coaches, and a reward system is used to reinforce parents and children for meeting goals. The second step of the self-regulatory feedback loop is self-monitoring. Self-monitoring increases self-awareness and focuses attention on personal behaviors (Scheier & Carver, 1977). FBT recommends that families track all of their calories consumed, their weekly weights, and all of their physical activity in Habit Books. Habit Books provide families with an accurate assessment of their current behavioral patterns, and informs the third step of self-regulation: self-evaluation. Self-evaluation consists of individuals comparing their current behavior (as measured by self-monitoring) to their external standards and individual goals (Kanfer & Karoly, 1972). Self-evaluation is incorporated in FBT through nutrition and exercise education (external indicators of standards) and weight change (personal goals) in addition to the review of self-monitoring data (internal indicators of standards). The fourth and final
The step of self-regulation is self-consequation. Self-consequation refers to the individual changing their behavior based on their self-evaluation (Carver & Schieier, 1981; Karoly, 1993). This process is important for motivation and appraisal to determine if the individual needs to re-start the feedback loop by returning to the goal-setting step. In FBT, behavioral coaches review self-monitoring and weekly weights on a weekly basis and help administer a rewards system based on families’ behavior; these strategies are a part of the self-consequation step. Once individuals complete the steps of self-regulation, theoretically they change their behavior, and have the option to start the process over again (Bandura, 1991).

Self-regulatory theory is highly related to the social cognitive theory of behavioral change, and provides a solid theoretical background for behavioral change strategies included in FBT. On a conceptual level, FBT utilizes self-regulatory theory to systematically implement change directed at the systems identified through the social cognitive theory of behavioral change. Self-regulatory theory provides a framework, behavioral benchmarks, and tools of change that can intervene across the multiple domains described in social cognitive theory of behavioral change (i.e., knowledge, reinforcement, observational learning of behaviors, self-regulation, outcome expectations, goal setting, and perceived self-efficacy). These two theories interact in a bidirectional manner throughout the FBT process. For example, social cognitive theory of behavioral change necessitates goal setting and self-regulation as intrinsic to successful change. While self-regulatory theory not only includes goals setting as a necessary activity for change, it also includes the need for self-monitoring,
self-evaluation, and self-consequation. FBT draws upon both theories to provide an in-depth and multifaceted approach to pediatric obesity treatment.

Research on FBT to date

Family-Based Pediatric Obesity Treatment is considered the gold standard for pediatric obesity treatment in the research literature (Epstein, Paluch, Roemmich, & Beecher, 2007). When compared to a waitlist control condition, FBT significantly reduces weight in children, independent of whether exercise is included in the protocol (Epstein et al., 1984). When implemented in a clinical setting, FBT shows larger reductions in weight when compared to usual care for pediatric obesity (Kalarchian et al., 2009). FBT groups demonstrate greater maintenance of weight reductions at one-year follow-up compared to control groups (Lochrie et al., 2013). FBT is superior to no treatment for pediatric obesity even when visits are monthly instead of weekly (Jiang, Xia, Greiner, Lian, & Rosenqvist, 2005). FBT combined with walking recommendations and cereal breakfast also yields better weight outcomes compared to no treatment (Rodearmel et al., 2006). Additionally, FBT is feasible to deliver in primary care settings, making it a practical intervention to disseminate to the general population (Riggs, Lozano, Mohelnitzky, Rudnick, & Richards, 2014; Quattrin et al., 2012). Overall, FBT is the most effective weight loss treatment available today based on empirical evidence (Sung-Chan et al., 2013; Wilfley et al., 2007b).

The role of parents

Parents play an important role in the treatment of childhood obesity. Parents model healthy eating patterns for their child, provide access to healthy/unhealthy food,
provide both discipline and support through authoritative parenting, and control their child’s physical activity schedule (Golan & Crow, 2004a). Research shows that treatments for obese children are more effective when other members of the family are involved with the child (Robinson, 1999; Berry et al., 2004; Epstein, Valoski, Wing, & McCurley, 1990; Golan & Crow, 2004b). Many participating children may not be developmentally ready to implement behavioral strategies on their own and must rely on parental assistance and reinforcement to carry out the necessary healthy behavior strategies such as problem-solving, self-monitoring, and maintaining motivation to lose weight (Epstein, 1996; Perri, 2000). Because children ages 8 to 12 do not independently choose and purchase groceries for themselves, they consequently have limited ability to change the home food environment without the help of their parents (Pettersson, Olsson, & Fjellström, 2004).

FBT involves behavioral changes for both parents and children, and studies suggest that changes in parent weight are associated with changes in child weight (Wrotniak, Epstein, Paluch, & Roemmich, 2004; Boutelle, Cafri, & Crow, 2012). Parent modeling of health habits are significantly related to obese children’s eating habits (Young, Fors, & Hayes, 2004), exercise habits (Trost, Kerr, Ward, & Pate, 2001), and weight outcomes across weight loss studies (Wrotniak, Epstein, Paluch, & Roemmich, 2005; Kalarchian et al. 2009). Research shows that parents who participate in their child’s obesity treatment program significantly change how they feed their child over the course of treatment (Burrows, Warren, & Collins, 2010). Furthermore, studies suggest that parent feeding practices impact child eating patterns
and eventually, rates of obesity (Faith, Scanlon, Birch, Francis, & Sherry, 2004; Matheson et al., 2015; Rhee, Lumeng, Appugliese, Kaciroti, & Bradley, 2006; Joyce & Zimmer-Gembeck, 2009; Savage, Fisher, & Birch, 2007). As part of the treatment, parents are assigned to change their child’s physical activity levels. FBT enlists parents in this goal because 8 to 12 year-old children may not have the resources to increase their vigorous physical activity on their own. This model of treatment increases parent involvement and does not allocate complete responsibility for change onto the child (Golan & Weizman, 2001; Golan & Crow, 2004a). Instead, the responsibility of providing safe environments for physical activity, managing unhealthy foods, and providing healthy foods falls mostly to parents. In summary, given the limitations and barriers that obese children face, parents are clearly a necessary element for successful execution of FBT.

Parent-based treatments

Considering the important role of parents, in recent years research has evaluated Parent-Based Pediatric Obesity Treatment (PBT), in which the parent attends treatment but the child does not (Golan, Fainaru, & Weizman, 1998a; Golan, Weizman, Apter, & Fainaru, 1998b; West, Sanders, Cleghorn, & Davies, 2010; Boutelle, Cafri, & Crow, 2011; Golan, 2006; Janicke, 2013; Janicke et al., 2008; Janicke et al., 2009). PBT may be an effective model for the treatment of obese children, as it can be disseminated more easily (partially because parents do not have to work around their child’s schedule) and may be more cost-effective. PBT involves teaching the same skills to families by solely engaging the parent(s) in treatment. PBT
shows significantly better long-term outcomes compared to FBT (Golan & Crow, 2004b). A 2006 study replicates these findings and demonstrates that PBT leads to superior weight loss outcomes compared to FBT, although the sample sizes were small (Golan, Kaufman, & Shahar, 2006). A more recent implementation in rural settings shows comparable weight loss for children in PBT and FBT interventions, both of which show superior weight loss compared to a waitlist control condition on post-treatment and 6-months post-treatment follow-up (Janicke et al., 2008). Furthermore, a randomized controlled trial shows that PBT is non-inferior to FBT as measured by child weight outcomes, parent weight outcomes, and child physical activity (Boutelle, Cafri, & Crow, 2011). However, in this study PBT did not demonstrate non-inferiority to FBT when measured by child calorie consumption (Boutelle, Cafri, & Crow, 2011). Based on the available research literature, PBT may be at a minimum, an efficacious treatment alternative to FBT.

PBT also may be superior to FBT in terms of cost-effectiveness (Janicke et al., 2009). Results indicate that treating more than one family member increases the overall cost of treatment; PBT costs 67% less per child compared to FBT (Janicke et al., 2009). In summary, the results of randomized controlled trials of PBT compared to FBT indicate that it is possible for parents to be the sole active participants and still obtain success in helping their child lose weight, while providing significant cost savings compared to FBT.
Success rates of FBT

Despite empirical evidence demonstrating the efficacy of FBT compared to treatment as usual or control conditions, response rates for FBT are well below ideal levels (Ebbeling, Pawlak, & Ludwig, 2002; Golan & Crow, 2004b; Ewald, Kirby, Rees, & Robertson, 2014). Pediatric obesity is difficult to treat due to the multiple factors that contribute to obesity status in children (e.g., home food environment, eating behavior, availability of food, screen time, genetics, and physical activity rates; Davison & Birch, 2001; Bouchard, 2008; Chaput, Perusse, Depres, Tremblay, & Bouchard, 2014; Hoelscher, Kirk, Ritchie, & Cunningham-Sabo, 2013). The treatment of pediatric obesity is further complicated because the problem spans across all three domains implicated in social cognitive theory: behavioral factors, personal factors, and environmental factors. Thus, pediatric obesity treatment must address each of these areas that may be contributing to the child’s obesity status. A further challenge is posed by the maintenance after initial weight loss associated with an intervention. Child weight-trajectories often follow the same pattern as adult weight loss trajectories, with initial weight loss due to lifestyle change, followed by a period of weight regain when treatment is discontinued (Ebbeling, Pawlak, & Ludwig 2002; Wilfley, Kolko, & Kass, 2011). While child obesity treatment outcomes are better than those found in adult obesity treatment (Epstein, Valoski, Kalarchian, & McCurley, 1995b), it is important to understand potential contributors to success in FBT in order to improve treatment outcomes.
Two factors associated with success in FBT

The literature shows that two of the best established predictors of successful weight loss in pediatric obesity treatment are attendance and self-monitoring during treatment (Denzer, Reithofer, Wabitsch, & Widhalm, 2004; Theim et al., 2013; Steele, Steele, & Hunter, 2009; Wrotniak et al., 2005; Jelalian et al., 2008; Mockus et al., 2011). By evaluating these factors, we may be able to identify barriers to success in FBT and develop interventions targeting these barriers.

Attendance

Treatment session attendance is directly related to higher weight loss in FBT. Attendance may have a particularly salient effect in this study of FBT due to the inclusion of behavioral coaching. Families who attend treatment receive one half-hour of individual behavioral coaching wherein the coach discusses their weight loss and self-monitoring, and provides individualized feedback and problem solving strategies for the family. Attendance at these behavioral coaching sessions increases the level of accountability experienced by families who attend FBT sessions compared to those families who do not attend all treatment sessions. Additionally, attendance to treatment in FBT is the avenue through which families obtain additional knowledge about healthy eating, physical activity, and behavioral change and learn how to integrate these skills into their lives, as well as receiving support from the other families. Therefore, if a family does not attend one or more sessions, its members are not held accountable, they miss the information, and they do not receive the support.
Research to date indicates session attendance predicts better outcomes for children in FBT (Theim et al., 2013; Steele et al., 2009; Lochrie et al., 2013) and for adults in behavioral weight loss (Byrne, Barry, & Petry, 2012; Pinto, Fava, Hoffmann, & Wing, 2013). One study reported better long-term weight loss outcomes for those who attended ≥75% of treatment sessions (Kalarchian et al., 2009). Studies of parent/child attendance for other treatments suggest that higher attendance in medical treatment relates to better outcomes in transplant medicine (De Geest, Dobbels, Fluri, Paris, & Troosters, 2005) and psychiatric treatment (Gopalan et al., 2010; Nix, Bierman, & McMahon, 2009). This effect is even more pronounced with non-medications and chronic diseases (DiMatteo, Giordani, Lepper, & Croghan, 2002). In psychological treatment, higher parent/child attendance rates are related to improved behavioral and emotional outcomes across behavioral, depression, and anxiety disorders (Angold, Gostello, Burns, Erkanli, & Farmer, 2000; Nock & Ferriter, 2005; Nix et al., 2009). To address the importance of attendance, some weight loss interventions have specifically targeted improvement in attendance to optimize treatment outcomes (Conduit, Byrne, Court, & Stefanovic, 2004; Ingoldsby, 2010; Carpentier et al., 2007; Liddle, Jackson-Gilfort, & Marvel, 2006).

Self-monitoring

Self-monitoring of food intake and physical activity is also an important factor in FBT. Self-monitoring, which refers to keeping track of food intake, exercise behavior, and goals, is one of the best predictors of weight loss in obesity and weight loss interventions across adult and child clinical trials (Forman, Butryn, Hoffman, &
Herbert, 2009; Elfhag & Rossner 2005; Wrotniak et al., 2005). Self-monitoring may specifically improve outcomes in FBT because families who successfully complete self-monitoring are able to have richer and more supportive behavioral coaching sessions because their behavioral coach will have data to use to shape recommendations for the family. Families who arrive at their behavioral coaching sessions with completed self-monitoring are able to receive individualized coaching and feedback based on their recordings from the previous week. Behavioral coaches are then able to problem-solve situations that are unique to each family (e.g., a family member who does not support the program, living in a neighborhood where outside physical activity is not safe). Beyond these effects, self-monitoring holds the family directly accountable for their actions over the previous week. This allows families to further engage in the self-regulation feedback loop. Families who do not complete self-monitoring could be less accountable for their actions, as neither the family nor the behavioral coach is able to concretely evaluate behavior. If a family arrives without complete self-monitoring for the week, the behavioral coaching session targets monitoring the past week rather than focusing on other skills that may be helpful for the family. Therefore, if a family attends a session without having self-monitored for the previous week, they may not receive the full benefit of behavioral coaching in FBT.

This relationship between self-monitoring and successful weight loss treatment is theoretically sound considering the self-regulatory theory of weight loss (Israel et al., 1993). Self-regulatory theory states that self-monitoring is necessary to complete
accurate self-evaluation, after which the individual can change their behavior (Karoly, 1993; Carver & Scheier, 1985). Without self-monitoring, it is extremely difficult to compare current behavior to internal or external goals. Better self-monitoring relates significantly to successful weight loss in adults (Burke, Wang, & Sevick, 2011; Boutelle & Kirschenbaum, 1998; Boutelle, Kirschenbaum, Baker, & Mitchell, 1999), and in children attempting to lose weight (Mockus et al., 2011; Germann, Kirschenbaum, & Rich, 2007). This literature may be further evidence of the necessity of self-monitoring to engage fully in self-evaluation, which will provide the basis of self-consequation and behavioral change. The effect of self-monitoring relating to successful weight loss remains unchanged in adults whether self-monitoring takes place on paper or through electronic media (Yon, Johnson, Harvey-Berino, Gold, & Howard, 2007). Additionally, adult weight loss maintenance is directly related to frequency and completeness of self-monitoring (Peterson et al., 2014). Self-monitoring in parents is related to child weight loss if both family members are participating in an intervention (Wrotniak et al., 2005; Kirschenbaum, Germann, & Rich, 2005).

Parent factors and success in FBT

Current empirical literature suggests that parent predictors of suboptimal attendance and self-monitoring may include the following: parent psychosocial stressors, parent motivation, and parent’s concern about future consequences for their child.

*Parent psychosocial stressors*
Several psychosocial stressors may contribute to attendance and self-monitoring problems, including parent psychiatric issues (depression), financial issues (low socioeconomic status (SES)), and ethno-racial minority status. Although stress was not directly assessed in this study, these variables were conceptualized by the researchers to be proxies for family psychosocial stress. These concerns are especially relevant for this study population because public health research shows a positive association between obesity and low SES (Wang & Beydoun, 2007), depression (de Wit et al., 2010; Luppino et al., 2010), and minority ethno-racial minority status (Wang & Beydoun, 2007). The role that psychosocial stressors may play in reducing the amount of time and energy that is needed to successfully complete treatment is documented in the literature (Kitzmann, Dalton, & Buscemi, 2008). The concept of psychosocial stressors is complex, and there are multiple types of psychosocial stressors described within the psychological literature (Blodgett Salafia & Lemer, 2012; Groesz et al., 2012; Boals & Banks, 2012). Psychosocial stressors are potential barriers to treatment that may be temporary (car troubles, financial troubles) or chronic (chronic depression, membership of a minority ethno-racial group; Kitzmann et al., 2008; Cohen, Doyle, & Baum, 2006; Chen et al., 2006; Strauss, MacLean, Troy, & Littenberg, 2006; DiMatteo, 2004; Kazdin, 2011; Nock & Ferriter, 2005). Thus, this study aims to evaluate the potential relationship between depression, SES, family ethno-racial minority status with treatment attendance and self-monitoring.

Depression may also be related to the family’s ability to attend treatment sessions and complete self-monitoring forms as part of FBT. A meta-analysis showed
that individuals coping with an illness are more likely to miss medical appointments to treat their condition if a member of the family is depressed (Gonzalez et al., 2008). The effects of depression on FBT are particularly relevant because rates of depression in obese men range from 30-47% depending on age, while rates of depression in obese women range from 45-49% depending on age (Pratt & Brody, 2014). These rates are significantly higher than the 12-month prevalence rates for depression in the general US population: 8.2% for women and 4.5% for men (Quality, 2015).

The symptoms of depression include diminished interest in activities, low mood, increased sleep, and decreased concentration, all of which can interfere with an individual’s ability to complete tasks (APA, 2013; Grenard et al., 2011). Depressive symptoms may make participation in FBT particularly difficult because the parent recommendations of FBT require significant time commitment, energy-consuming changes to family routine, travel time to treatment, and concentration on calorie and exercise goals. Because depression is characterized by feelings of hopelessness, low energy, lack of interest, and lack of motivation, the requirements of FBT and need for sustained motivation and self-monitoring may be challenging. Successful completion of FBT may be particularly challenging for parents with depression, as one symptom of depression is an increase in appetite and weight.

Low socioeconomic status (SES) is an additional barrier that affects a disproportionate number of families with obese children (Wang & Beydoun, 2007). It is important to study low SES status a potential contributing factor to difficulties with attendance and self-monitoring in FBT. Families coping with financial difficulties and
stress may feel a constant state of anxiety. This may mentally and physical fatigue the family, which would leave them with fewer resources to dedicate towards a highly involved intervention such as FBT. SES has been shown to contribute to multiple types of stressors for families, including financial hardship, limited opportunities, and living in neighborhoods with less overall prosperity (McEwen & Gianaros, 2010). The literature repeatedly shows the effects of low SES on attendance and involvement in treatment. Past findings indicate that stress in parenting is negatively related to income when the parent is responsible for the management of a medical condition (diabetes; Streisand, Swift, Wickmark, Chen, & Holmes, 2005). This same relationship may be present for parents of obese children who are participating in FBT. Lower SES is associated with lower attendance to treatment of medical conditions (Nock & Ferriter, 2005). Additionally, obesity research shows that an increased level of stress is associated with increased frequency of calorie consumption and drive to eat (Groesz et al., 2012), thus creating an additional challenge for families struggling with psychosocial stressors.

Being a member of an ethno-racial minority group in the United States is considered a source of chronic stress, which could interfere with participation in FBT. Individuals who must cope with chronic stress related to discrimination may have depleted levels of physical, mental or emotional energy to utilize towards the assignments and goals of FBT. For example, an individual who is coping with multiple micro-aggressions through their day, who also may face discrimination in the workplace or general society, may find the additive effect of these experiences
exhausting, and then be less likely to be able to attend all sessions or complete self-monitoring (Sue et al., 2007; Sue, Capodilupo, & Holder, 2008). Research suggests that perceived racial discrimination is reported by 35-58% of persons of color, depending on heritage (Chou, Asnaani, & Hofmann, 2012). Further research establishes that this type of stress is related to overall mental and physical health (Pieterse & Carter, 2007; Brondolo, Love, Pencille, Schoenthaler, & Ogedegbe, 2011; Hicken, Lee, Morenoff, House, & Williams, 2014). These findings are further bolstered by physiological evidence that shows that individuals who experience chronic perceived racial discrimination experience increased stress responses including altered allostatic load, cardiovascular reactivity, and increased cortisol levels (Pascoe & Richman, 2009). As stated before, these rates of increased stress are of concern for FBT clinicians not just because of the potential for lower rates of attendance (Nock & Ferriter, 2005), but also because stress may cause an increase in drive for food and frequency of caloric consumption (Groesz et al., 2012).

**Parent motivation**

Another variable that is incredibly important in FBT is parent motivation. Parent motivation is important because parent participation is vitally important to child success. Motivation is a key factor for successful change across various health interventions (Thompson et al., 2011; Channon et al., 2007; Christie & Channon, 2014). FBT uses a reward system to increase motivation throughout treatment and improve motivation for parents and children (Epstein, McKenzie, Valoski, Klein, & Wing, 1994). Previous results show that parent motivation is directly related to child
engagement with healthcare and mental healthcare treatment (Ellis, Berio, Carcone, & Naar-King, 2012). A few studies with children demonstrate that parent motivation plays a role in success of the child. In a guided self-help intervention for pediatric obesity, parent weekly motivation ratings completed by therapists related to reduction in BMI for parents and children, respectively (Accurso et al., 2014). Another FBT study shows one element of parent motivation – confidence – relates to improved weight loss outcomes and successful completion of FBT (Gunnarsdottir, Njardvik, Olafsdottir, Craighead, & Bjarnason, 2011).

Consideration of future consequences

An additional potential predictor of attendance and self-monitoring is a parent’s consideration of future consequences (CFC). CFC is important in FBT because the behaviors recommended in FBT require prioritizing long-term consequences over short-term rewards. The literature shows CFC is related to participation in treatment and completion of healthy behaviors including increased use of insulin for diabetes management, abstaining from nicotine use, and maintaining a more healthy weight (Louch, Dalkin, Bodansky, & Conner, 2012; Piko & Brassai, 2009; Adams & Nettle, 2009). Analysis of CFC in relation to healthy eating and exercise shows that individuals high in future-orientation and lower in immediate-orientation engage more in healthy eating and exercise compared to individuals low in future-orientation and high in immediate-orientation (Joireman, Shaffer, Balliet, & Strathman, 2012). Furthermore, studies show CFC affects how adults process
information about healthcare (Orbell, Perugini, & Rakow, 2004). To date, no study has evaluated the association between CFC and parent behaviors in FBT.

Purpose of this study

This study aims to assess parent factors that may influence self-monitoring and attendance throughout FBT. We chose parent rather than child factors because 8-12 year old children do not control many of the variables that contribute to eating and physical activity, such as purchasing food for the home, driving to clinic visits, or signing up for activities. Furthermore, very few children in this age range can self-monitor on their own without assistance from the parent. While adult psychosocial stressors, motivation, and CFC are shown to relate to attendance and self-monitoring in previous treatment literature, no study to date has evaluated the relationship between these variables with attendance and self-monitoring in FBT.

This study is based on the model that higher levels of family psychosocial stressors, lower motivation, and lower CFC will result in lower rates of attendance and self-monitoring (Kazdin, 2011). The next step in the scientific pursuit of understanding and combating pediatric obesity is to improve outcomes for treatment interventions. This study hopes to contribute information about specific factors that may act as barriers to successful completion and success in FBT. Depending on the outcomes, future studies may provide targeted interventions addressing family difficulties related to their demographics (e.g., providing more accessible interventions for low SES families), parent psychological factors (e.g., providing treatment for parent depression), consideration of future consequences (e.g., spending further time
turning parents’ attention to the long term effects of pediatric obesity), or motivation (incorporating motivational enhancement techniques to improve family motivation). Thus, this study aims not only to improve the scientific understanding of obesity, but inform future clinical innovations that may have an effect on the overall treatment of pediatric obesity in the community.

SPECIFIC AIMS

The overall objective of this study is to evaluate the relationship between psychosocial stressors, parent motivation, and parent consideration of future consequences (CFC) with treatment attendance and successful self-monitoring in FBT, in order to inform future interventions. The long-term goal of this program of research is to use the results of this study to develop a protocol intended to improve family attendance and self-monitoring in FBT, to ultimately improve parent and child weight loss.

Aim 1. To assess the relationship between psychosocial stressors, CFC, parent motivation at baseline, parent motivation over the course of treatment with attendance in FBT.

Hypothesis 1. Families with lower psychosocial stressors, higher rates of future orientation, higher motivation at baseline, and higher weekly motivation will have higher rates of attendance over the course of treatment than families with higher psychosocial stressors, lower rates of future orientation, lower motivation at baseline, and lower motivation over time.
Aim 2. To assess the relationship between psychosocial stressors, CFC, parent motivation at baseline, parent motivation over the course of treatment with child self-monitoring in FBT.

Hypothesis 2. Families with lower psychosocial stressors, higher rates of future orientation, higher motivation at baseline, and higher weekly motivation will have higher rates of child self-monitoring over the course of treatment than families with higher psychosocial stressors, lower rates of future orientation, lower motivation at baseline, and lower motivation over time.

Aim 3. To assess the relationship between psychosocial stressors, CFC, parent motivation at baseline, parent motivation over the course of treatment with parent self-monitoring in FBT.

Hypothesis 3. Families with lower psychosocial stressors, higher rates of future orientation, higher motivation at baseline, and higher weekly motivation will have higher rates of parent self-monitoring over the course of treatment than families with higher psychosocial stressors, lower rates of future orientation, lower motivation at baseline, and lower motivation over time.

Sections of Chapter 1 of this dissertation will be submitted for publication with co-authors, Boutelle, Kerri; Matheson, Brittany; Liang, June. The dissertation author was the primary investigator and will be the primary author on this publication.
CHAPTER 2: METHODS

Overview of Proposed Study

Baseline and treatment session data for this secondary analysis were obtained from a larger FBT trial at the University of California, San Diego (NIH R01DK075861, PI Boutelle). All participating parents signed informed consent for themselves and their children, and all participating children signed assents. The University of California, San Diego’s Internal Review Board approved all recruitment, consent and treatment materials for this study. One hundred fifty parent-child dyads enrolled in the study. Parents completed surveys that included psychosocial stressors, baseline motivation, and consideration of future consequences (CFC) at the study baseline assessment session. At each behavioral coaching session, both parents and behavioral coaches completed motivation ratings of the parents. Attendance and self-monitoring data were collected over the twenty treatment sessions. The primary purpose of the larger study was to evaluate the efficacy of PBT compared to FBT in a fully powered, randomized controlled trial over 24 months.

Sample/Participants and Inclusion Criteria

One hundred fifty overweight and obese children and their parent(s) participated in the randomized controlled trial comparing FBT to PBT (demographics shown in Table 1). Six waves of treatment were conducted to treat the sample in groups of 10-15. Participants were recruited through physician referrals, internet and television advertisements, direct mailings to physicians, flyers, and posts to social
media accounts. Parents and children completed assessments prior to randomization to determine whether they qualified for the relevant inclusion/exclusion criteria.

Inclusion criteria for this study were a family with an overweight or obese child ($85^{th}$% BMI – $99.9^{th}$% BMI) who was between the ages of eight and twelve years old, with one or more obese parent(s) in the home, and a parent willing to participate in randomization and treatment who could read at the eighth grade level. If more than one child in the family met inclusion criteria, one of the qualifying children was randomly chosen to participate. Exclusion criteria for parents and children included 1) involvement in another weight control program; 2) physical disease that affects eating, physical activity or weight; 3) medications that affect eating or weight; 4) psychiatric issues that could impact participation (substance dependence, suicidal ideation, intellectual disability, attention deficit disorder, eating disorder or other major psychiatric disorder); 5) dietary restrictions or food allergies that would influence following the dietary recommendations; and 6) non-English speaking. After a parent-child dyad successfully met all inclusion and did not meet exclusion criteria, and completed all baseline assessments, randomization was performed using random number generation to determine treatment arm assignment to PBT or FBT.

Intervention

Both PBT and FBT interventions consisted of twenty sessions over six months; each treatment session included one hour of group meetings as well as thirty minutes of behavioral coaching. In the FBT arm, both parent and child attended separate concurrent group sessions and individual family behavioral coaching
together; in the PBT arm, the parent attended group sessions and behavioral coaching; the child did not attend treatment. Parents in both arms received identical materials during group and behavioral coaching sessions and received identical instructions to work on these materials and activities with their child outside of group and behavioral coaching sessions.

In addition to treatment sessions, parents and children were expected to self-monitor their eating, physical activity, and sedentary activity every day of the week for the entire course of treatment. Parents and children were provided paper-and-pencil Habit Books in which to complete this self-monitoring. Although Habit Books were provided by study staff, families were allowed the alternative of using their own tracking system, including spreadsheets, websites, or mobile applications such as MyFitnessPal. Habit Books were provided to parents and children during each session, and families were assigned to complete the Habit Books or other tracking system and bring them back to their individual behavioral coaches the following week. This assignment was the same in the PBT arm, and parents were responsible for bringing in their child’s completed Habit Book. Behavioral coaches would then provide feedback for the family based on Habit Book data for the week. Due to the importance of self-monitoring in successful weight loss, families completed this assignment throughout treatment.

The FBT protocol used in this study was developed in previous randomized controlled trials (Wilfley et al., 2007a; Boutelle et al., 2011; Epstein et al., 1994). This manualized treatment included sixteen weekly sessions, followed by four biweekly
sessions for a total of 20 sessions provided over six months. Two Ph.D. level psychologists trained in weight control interventions led each parent group. Two advanced graduate students specializing in weight control interventions led each child group. Child groups utilized similar materials to those of the parent groups, presented in a developmentally appropriate manner, except for the parenting skills topic. During group session, parents and children were trained in dietary recommendations, problem solving, self-monitoring of eating and physical activity, self-weighing, increasing motivation through consistent and systematic rewards, stimulus control, parenting strategies, and positive reinforcement (Boutelle et al., 2011).

In addition to group treatment, participating families received thirty minutes of behavioral coaching each week on the same day their treatment group met. The purpose of behavioral coaching was to provide each family with more personalized application of the skills, to develop problem-solving techniques, to monitor self-monitoring and weight, and to receive general support from the program. Families maintained the same coach throughout the program in order to maximize rapport. Behavioral coaches aided parents in the implementation and execution of the motivation system. Additionally, behavioral coaches collected Habit Books and marked the participating families’ entries with encouraging and helpful comments. When families did not complete their Habit Books over the preceding week, behavioral coaches spent the majority of the behavioral coaching session completing the Habit Book with the family based on their best recall of the previous week. Regular session materials were discussed after the Habit Book was completed, if there
was time left in session. Behavioral coaches also maintained email correspondence with parents once per week for the duration of the program.

Quality Control of Intervention

Behavioral coaches and group leaders were clinical psychology graduate students, post-doctoral fellows, licensed clinical psychologists, medical doctors, or staff with experience working with obese populations. All interventionists were initially trained during two full-day training sessions by supervising collaborators. The intervention was manualized with detailed session-by-session protocols for behavioral coaches and group leaders. Additionally, all behavioral coaches attended a dedicated weekly supervision hour for the duration of the study. Fidelity checks on 10% of behavioral coaching sessions were used to ensure reliable implementation of the manualized treatment. These fidelity checks established that there were minimal and acceptable differences between treatment arms and treatment waves.

Independent assessors conducted all baseline and follow-up assessments. Assessors included staff, psychology graduate students, psychology post-doctoral fellows, and licensed clinical psychologists. Post-doctoral level staff conducted all training of assessors on relevant assessment protocols. Assessors were required to attend one hour of group assessment supervision every week.

Measures

*Parent Depression:* Participating parents in this study completed the depression subscale of the Brief Symptom Inventory (BSI) during the baseline assessment session to assess for depressive symptoms. The BSI has been shown to be
reliable and valid in a range of different clinical and non-clinical adult samples (Derogatis, 1993). The BSI yields a depression subscale based on six depression-related items that are included in the overall assessment (see Appendix 3). The depression subscale of the BSI has an established Cronbach’s alpha of .85 (Derogatis & Melisaratos, 1983). The Cronbach’s alpha for this study was .94 for the overall BSI and .69 for the depression subscale (see Table 3). While the cutoff for an acceptable level of internal consistency using Cronbach’s alpha is $\alpha = .70$ (Nunnally, 1978), this study utilized the BSI depression subscale provisionally due to its very close approximation of the standard acceptable Cronbach’s alpha level. Parent depression scores on the BSI in this sample ranged from 0 to 9. Parent overall scores on the BSI in this sample ranged from 36 to 121.

*Parent Consideration of Future Consequences Scale:* Participating parents in this study completed the Consideration of Future Consequences Scale (CFC). The CFC is a twelve-item self-report scale developed to ascertain an individual’s consideration of long-term goals and consequences versus short-term goals and consequences (Strathman, Gleicher, Boninger, & Edwards, 1994; Joireman, 1999; Appendix 5). The CFC has shown acceptable reliability and validity with a Cronbach’s alpha level of .80 (Strathman et al., 1994). CFC future-orientation is related to positive health behavior in adults and youth (Crockett, Weinman, Hankins, & Marteau, 2009; Piko, Luszczynska, Gibbons, & Tekozel, 2005). The Cronbach’s alpha for CFC total score was .82. The Cronbach’s alpha for the CFC future-orientation subscale was .71, and the Cronbach’s alpha for the CFC immediate-
orientation subscale was .81 (see Table 3). CFC total scores ranged from 0 to 42. CFC immediate-orientation scores ranged from 7 to 32. CFC future-orientation scores ranged from 11 to 25.

**Parent Motivation at Baseline:** Parents completed the Parent Motivation Inventory-Child Obesity (PMI-CO) self-report scale. The PMI-CO is an assessment of parent motivation and outlook on their child’s weight loss prior to beginning FBT. The original Nock and Photos PMI scale evaluated parents’ motivation for participation in their child’s mental health treatment (Nock & Photos, 2006). The study team adapted the original scale to include questions related to childhood obesity. The PMI-CO has not been formally validated. Individual items and responses for the PMI-CO are shown in Appendix 6. This measure yields a composite score ranging from 25 to 125. The original PMI scale has a Cronbach’s alpha of .96, indicating good internal consistency, in addition to good test-retest reliability $r(39) = .76, p < .001$ (Nock & Photos, 2006). The PMI-CO showed good internal consistency in this study, with a Cronbach’s alpha of .95 (see Table 3). In the current sample, total scores on this measure ranged from 25 to 125. Higher scores on the PMI-CO indicate higher levels of parent motivation.

**Weekly Parent Motivation Ratings – Behavioral Coaches:** Behavioral coaches assessed the level of parent motivation at each treatment session and completed motivation ratings for the parent (see Appendix 7). Although this measure has not been validated, similar measures have been published (Accurso, Norman, Crow, Rock, & Boutelle, 2014). Data from this study show strong internal consistency, with a
Cronbach’s alpha of .92 (see Table 3). In this sample, weekly parent motivation ratings conducted by behavioral coaches ranged from 1 to 5. Higher scores on each weekly item of the behavioral coach weekly motivation ratings of parents indicate higher levels of parent motivation.

*Weekly Parent Motivation Ratings – Parent:* Parents completed weekly motivation ratings to assess their own level of motivation at each treatment visit (see Appendix 8). Although not formally validated, this scale has also been used in other research studies (Accurso et al., 2014). This study sample shows good internal consistency for this measure, with a Cronbach’s alpha of .92 (see Table 3). In this sample, weekly ratings of parent motivation conducted by parents ranged from 1 to 5. Higher scores on each weekly self-report of motivation indicate higher levels of weekly parent motivation.

*Child Depressive Symptoms:* Participating children completed the Center for Epidemiological Studies Depression Scale for Children (CES-DC) during the baseline assessment session to assess for depressive symptoms. The CES-DC includes twenty developmentally appropriate items related to the frequency of various depressive symptoms in children (see Appendix 4). Research shows the CES-DC has good internal consistency when used in a large youth sample (Cronbach’s alpha = .84; Fendrich, Weissman, & Warner, 1990). In this study sample, the CES-DC had a Cronbach’s alpha of .82, indicating acceptable internal consistency (see Table 3). Higher scores on the CES-DC indicate higher levels of depressive symptomatology.
Demographics: Demographics for this study included ethno-racial minority status and socioeconomic status (SES), child age, and marital status. Participants completed self-report demographic measurements at baseline assessment sessions. Family ethno-racial minority status was captured in this study by utilizing the parent report of child ethno-racial minority status. Child ethno-racial minority status was used as a proxy for family ethno-racial minority status because parent self-report may not capture the multicultural nature of some families (i.e., one parent may not be a member of an ethno-racial minority group, but if the other parent is a member of an ethno-racial minority group, the child and family would experience the overall stress related to family ethno-racial minority status). Parent report of child ethno-racial minority status was used in lieu of child self-report because child self-report was found to be unreliable during the data cleaning process. Participating parents identified the ethno-racial group of their child based on the following categories: “White,” “Black or African American,” “Hispanic or Latino,” “Asian, Hawaiian or Pacific Islander,” “American Indian or Native American,” “Other.” SES information was collected at baseline using the Hollingshead Modified Measure of Social Status (Hollingshead; Cirino et al., 2002). The Hollingshead yields an SES score based on each parent’s education level – ranging from 7th grade and lower to graduate school – and occupation level – ranging from menial workers and farmers to executives, major professionals and owners of large businesses. The Hollingshead accounts for two-parent households versus one-parent households by averaging scores of both parents to account for two-parent households, while one-parent households maintain the original
score of the individual parent. If one parent is a full-time homemaker or student, or receives government assistance, that person’s information is not used to calculate the SES score (Cirino et al., 2002). Parents self-identified their marital status by selecting one of the following options: “Single (never married),” “Married,” “Living with someone in a ‘marriage-like’ relationship,” “Divorced,” “Separated,” “Widowed.”

*Anthropometrics:* Pediatric weight change is calculated by three different but related metrics, which capture weight status as a child grows in both height and weight. The most widely used measurement for adults is body mass index (BMI = weight in kilograms/height in meters$^2$; Must & Anderson, 2006). Since children are growing, BMI scores are translated into BMI z-scores and BMI percentile (BMI%). BMI can be transformed into BMI z-scores or BMI% using age and gender data based on national and international growth charts (Kuczmarski et al., 2000). BMI z-scores range from -3 to 3 and represent BMI as interpreted through standard distribution across the population. Statistical experts have noted the particular utility of BMI% when assessing weight status at one time point (Cole, Flegal, Nicholls, & Jackson, 2007). Additionally, this study’s inclusion criteria were based on BMI% and parents were given feedback based on their child’s BMI%. Therefore this study used BMI% for child participants throughout analysis.

For the current study, parent and child baseline measurements anthropometrics were collected during Session 1 of the treatment study. Assessors measured height of parents and children in triplicate based on standardized protocols using a portable Schorr height board (Schorr Inc., Olney, MD). Trained assessors measured weight of
parents and children in duplicate during the baseline assessment visit using the Tanita
digital Scale Model WB-110A (Tanita, Arlington, IL). Child BMI% for this sample
ranged from 86 to 99. Child BMI z-scores for this sample ranged from 1.09 to 2.98.
Parent BMI for this sample ranged from 21.2 to 52.9.

*Self-Monitoring:* In this study, participants used pocket-sized self-monitoring
booklets called Habit Books, in which families logged all food or drink they
consumed, the time when they consumed the food or drink, and the associated calories
every day for the duration of FBT. Families also kept track of their physical activity in
the Habit Books. At each session, behavioral coaches collected the Habit Books for
each parent and each child. Some families chose to use electronic self-monitoring
tools available via computers or smart phones instead. The two most popular programs
were Excel and MyFitnessPal. These families were asked to return printed copies of
their self-monitoring each week, so that the data could be analyzed in the same manner
as that of the families using the provided Habit Books. Parents were required to submit
their child's Habit Books or electronic records in both FBT and PBT. Each weekly
Habit Book/electronic record was assigned a weekly score according to the following
criteria: number of days the participant recorded everything (2), number of days the
participant recorded anything (1), and number of days the participant recorded nothing
(0). Thus the maximum score that could be obtained for one weekly Habit
Book/electronic record was 14, while the lowest possible score was 0. For this study,
composite weekly scores for self-monitoring were calculated by summing all of the
weekly Habit Book/electronic record scores for each participant. Assessors rated each
Habit Book/electronic record weekly for completeness, and participants’ scores were summed across weeks. In addition to the initial rating, a separate assessor performed a 10% fidelity check on all Habit Book/electronic record ratings to assure accuracy. Habit Books were double rated and indicated over 95% agreement across scoring.

Two analyses used self-monitoring data. The first utilized overall self-monitoring, which was a total self-monitoring score over the 20 weeks of intervention. Additionally, self-monitoring was evaluated simultaneously with parent motivation, such that parent motivation was assessed for a relationship with self-monitoring during the same week (self-monitoring was rated as none, partial, or complete for each week). Self-monitoring was analyzed separately for parents and children.

Attendance: Research staff collected attendance data for each parent or parent-child dyad at every treatment session. The study coordinator recorded attendance at the group sessions, and behavioral coaches recorded attendance data during the behavioral coaching session. This duplicate measurement of attendance reduced the chance of error if a family needed to leave early or arrived to treatment late. In statistical analysis for this study, attendance was utilized as a longitudinal variable, defined as either “attended session = 1” or “did not attend session” = 0 for each study session. This longitudinal attendance variable was lagged such that the analysis could assess whether motivation from a given week predicted attendance for the subsequent week.
DATA ANALYTIC PLAN

Covariates

Covariates were chosen a priori on a theoretical basis. Higher parent BMI (Jelalian et al., 2008), older child age (Zeller et al., 2004), higher child BMI% (Zeller et al., 2004; Jelalian et al., 2008), and higher child depressive symptoms (Jensen, Aylward, & Steele, 2012; Zeller et al., 2004) have all been shown to be negatively associated with attendance and successful completion of a pediatric weight treatment program and were included as covariates in all models.

Power Analysis

Power analysis was performed using G*Power software version 3.1 (Faul, Erdfelder, Lang, & Buchner, 2007). Due to the lack of established effect sizes for FBT studies that include all relevant variables of interest for this study, power analysis was performed using a small effect size of $\eta^2 = .15$. The number of predictors included in the different statistical models varied by aim of the analysis. We conducted a preliminary power analysis using six independent variables relating to one dependent variable – the maximum number of variables that were used in any given analysis for this study – suggesting that this study will require 146 participants to detect a small effect (.15) while maintaining an alpha level of .05. Thus, this study’s $N = 150$ was sufficient for all study analysis.

Differences between treatment arms

In order to improve statistical power, we evaluated for differences in independent variables between treatment arms. No significant differences were found
between the PBT and FBT arms on parent depression, ethno-racial minority status, SES, CFC, baseline motivation, and weekly motivation, allowing for analysis of the full sample of 150 parent-child dyads (see Table 2). Of note, the lack of statistical differences between PBT and FBT is not the same as demonstrating that the two arms are equivalent. However, for the purpose of this analysis, we collapsed the two arms and evaluated the relationships between parent variables and self-monitoring and attendance (see below).

Differences between treatment sites

Similar to the process above, in order to improve statistical power, researchers evaluated potential differences in independent variables between the two treatment sites: La Jolla and City Heights. No significant differences were found between the La Jolla treatment site and City Heights treatment site on parent depression, ethno-racial minority status, SES, CFC, baseline motivation, or weekly motivation (see Table 2). Thus the researchers used the full sample of 150 parent-child dyads.

Preliminary correlation analyses

Prior to conducting generalized linear mixed models, parent variables were correlated (using Pearson correlations) to evaluate initial relationships with the outcome variables. Only those independent variables that showed a significant correlation with the specific dependent variables of interest were included in the statistical models (see Table 4).

Generalized linear mixed model approach
A generalized linear mixed model (GLMM) approach was chosen for this study because GLMM allows for analysis of data that may otherwise violate assumptions of traditional regression. GLMM can address three specific types of data concerns; 1) GLMM allows for non-normal distribution of outcome variables, 2) GLMM accounts for outcome variables linearly related to independent variables and covariates using a specified link function, and 3) GLMM accommodates observations that are correlated, as in repeated measures datasets (McCullagh & Nelder, 1989; Breslow & Clayton, 1993). GLMM is an appropriate statistical approach for datasets with outcome variables with various types of distributions including normal, binary, multinomial, ordinal, or Poisson and utilizes a link function based on the outcome variable distribution to accommodate the assumption of linearity. GLMM can control for dependence of observation in hierarchical or nested data (including time nested within participants) to reduce the chances of biased estimates and improve standard error estimates. GLMM was specifically chosen for this analysis because it allows for repeated measures (non-independent observations), which are utilized in this longitudinal dataset.

Model fit statistics

The model fit statistics used for this dissertation are the corrected Akaike information criterion (AICC) and the Bayesian Information Criterion (BIC). The Akaike information criterion (AIC) provides a measure of the relative quality of a given statistical model, and a relative estimate of the information that may have been lost through a given model (Akaike, 1973; Akaike, 1974; Burnham & Anderson,
Because AIC is not an absolute measure of model fit, AIC scores must be compared across models to determine which model provides the best fit. The AIC guards against overfitting the model by restricting the maximum value likelihood function for the model based on the number of parameters. The corrected Akaike information criterion (AICC), which was used for this study, corrects for sample size in addition to the number of parameters in the model. When comparing AICC scores across models, the lower AICC score is indicative of the better fitting model. The BIC, also used in this study, is an extension of the AIC that is also used to compare model fit across multiple models. Lower BIC scores are indicative of better model fit. The BIC is considered the more conservative of the two types of model fit statistics for GLMM, as it further penalizes the model fit based on the number of parameters in the model. Both AICC and BIC were generated for each model in this study.

Aim 1 Statistical Analysis

Aim 1: To assess the relationship between parent psychosocial stressors, CFC, parent baseline motivation, parent motivation over time, with treatment attendance. Initial correlational analysis showed that SES, parent self-rating of weekly motivation and behavioral coach rating of parent weekly motivation were associated with attendance, while other variables were not significantly correlated with the outcome variable (see Table 4). Therefore SES and parent weekly motivation were included in the final models, but other psychosocial stressors, CFC, and parent baseline motivation were not included in these models. A GLMM approach was used to assess the time-varying relationship between weekly motivation ratings provided by the
behavioral coach with weekly attendance. Another GLMM model was used to assess
the time-varying relationship between weekly motivation ratings provided by the
parent and weekly attendance. These two GLMMs included SES and weekly
motivation ratings as fixed effects predicting attendance at each subsequent weekly
session. The data used to assess the time-varying relationship between motivation and
attendance was time lagged such that motivation from a given session predicted
attendance at the subsequent session.

Aim 2 Statistical Analysis

_Aim 2: To assess the relationship between parent psychosocial stressors, CFC,
parent baseline motivation, parent motivation over time, with child self-monitoring._

Initial correlational analysis showed that family ethno-racial minority status, parent
self-rated weekly motivation, and behavioral coach rating of weekly parent motivation
were the only variables associated with child self-monitoring (see Table 4). Therefore
family ethno-racial minority status and parent weekly motivation were included in the
final models, but other psychosocial stressors, CFC, and parent baseline motivation
were not included in these models. To assess the potential longitudinal effects of
parent weekly motivation ratings on child self-monitoring, a GLMM model was used
to assess the time-varying relationship between behavioral coach rating of weekly
parent motivation and family ethno-racial minority status with weekly child self-
monitoring. A second GLMM model was used to assess the time-varying relationship
between parent self-rating of weekly motivation and family ethno-racial minority
status with weekly child self-monitoring. These two GLMMs utilized time, family
ethno-racial minority status and weekly motivation ratings as fixed effects relating to child self-monitoring at each weekly session. The time-varying relationship between motivation and self-monitoring was analyzed simultaneously in time such that motivation related to self-monitoring at the same session.

Aim 3 Statistical Analysis

Aim 3: To assess the relationship between parent psychosocial stressors, CFC, parent baseline motivation, parent motivation over time, with parent self-monitoring. Initial correlational analysis showed that only longitudinal parent motivation variables were associated with parent self-monitoring (see Table 4). Therefore, only longitudinal parent motivation variables were included in the final models for this aim. A GLMM approach was used to assess the time varying relationship between behavioral coach ratings of weekly parent motivation with weekly parent self-monitoring. A separate GLMM model was used to assess the time-varying relationship between parent self-rating of weekly motivation with weekly parent self-monitoring. These two GLMMs utilized time and weekly motivation ratings as fixed effects relating to weekly rates of parent self-monitoring. Analysis of the time varying relationship between motivation and self-monitoring was assessed such that session motivation related to self-monitoring at the same session.

Exploratory Aim Statistical Analysis

Exploratory Aim 1: To evaluate the relationship between parent self-monitoring, significant independent study variables, with child self-monitoring. Based on published literature (Kirschenbaum et al., 2005; Germann et al., 2007), a model
was conducted to include the relationship between parent self-monitoring with child self-monitoring. This GLMM assessed the time-varying relationship among parent self-monitoring, significant independent variables from this study, with child self-monitoring. Independent variables found to be related to child self-monitoring in this study included family ethno-racial minority status, parent self-rating of weekly motivation, and behavioral coach rating of weekly parent motivation. As two of the independent variables that met criteria were correlated above .7 (parent self-rating of weekly motivation and behavioral coach rating of weekly parent motivation), and measured the same construct, we chose to include only parent self-rating of weekly motivation because motivation is an internal state that is potentially complex for a behavioral coach to assess and to make the model as parsimonious as possible. The same covariates that were used for the main study’s primary aims were included (parent BMI, child BMI%, child depressive symptoms and child age). This exploratory GLMM assessed the relationship between family ethno-racial minority status, parent self-rating of weekly motivation, and parent self-monitoring with child self-monitoring.

Sections of Chapter 2 of this dissertation will be submitted for publication with co-authors, Boutelle, Kerri; Matheson, Brittany; Liang, June. The dissertation author was the primary investigator and will be the primary author on this publication.
CHAPTER 3: RESULTS

Aim 1: To assess the relationship between psychosocial stressors, consideration of future consequences (CFC), parent motivation at baseline, parent motivation over treatment with attendance in FBT.

Model 1 for this aim included study covariates (child BMI, parent BMI, child depressive symptoms, and child age), SES, and behavioral coach weekly ratings of parent motivation, with lagged attendance. Predictors were entered into the model as fixed effects. Results from this model showed a corrected Akaike information criteria (AICC) of 4041.91 and a Bayesian information criteria (BIC) of 4051.44 (see Table 6). Because BIC and AICC do not have cut-offs for statistical significance, and are relative fit statistics, the BIC and AICC from Model 1 will be the baseline comparison against which other models will be evaluated. Model 1 showed behavioral coach ratings of weekly parent motivation related to treatment attendance such that for each increase in motivation, the family was 1.50 times less likely to attend the subsequent treatment session \( (OR = .67; 95\% \text{ CI } [-.58, -.23]; p < .001; \text{ see Table 6}) \). Additionally, Model 1 showed SES was significantly related to treatment attendance such that as a family’s SES increased, the family was 1.02 times more likely to miss a subsequent treatment session \( (OR = .98; 95\% \text{ CI } [-.04, -.01]; p < .005) \). Finally, Model 1 showed that child depressive symptoms related to weekly attendance such that as a child’s depressive symptoms increased, the family was 1.04 times more likely to attend a subsequent treatment session \( (OR = 1.04; 95\% \text{ CI } [.01, .07]; p < .05; \text{ see Table 6}) \).
Thus Model 1 demonstrated a relationship between behavioral coach weekly ratings of
parent motivation, SES, child depressive symptoms, with lagged attendance.

Model 2 included study covariates (child BMI, parent BMI, child depressive
symptoms, and child age), SES, and parent self-rated weekly motivation, with lagged
attendance. Predictors were entered into the model as fixed effects. Results from this
model showed an AICC of 4506.83 and a BIC of 4516.53 (see Table 7). Compared to
Model 1, Model 2 did not fit the data as well. Model 2 revealed significant
relationships between parent self-rating of weekly motivation, SES, child depressive
symptoms, with weekly attendance. Results indicated that parent self-rating of weekly
motivation had a significant relationship with attendance such that as parental
motivation increased, the family was 1.47 times less likely to attend the subsequent
treatment session ($OR = .68; 95\% \text{ CI} [-.56, -.21]; p < .001; \text{ see Table 7}$). In this model,
SES was significantly related to weekly attendance such that as a family’s SES
increased, the family was 1.02 times less likely to attend a subsequent session ($OR = .98; 95\% \text{ CI} [-.03, -.01]; p < .05; \text{ see Table 7}$). Child depressive symptoms showed a
positive relationship with attendance such that as a child’s depressive symptoms
increased, the family was 1.03 times more likely to attend a subsequent treatment
session ($OR = .10; 95\% \text{ CI} [.01, .06]; p < .05; \text{ see Table 7}$).

Aim 2: To assess the relationship between psychosocial stressors, CFC, parent
motivation at baseline, parent motivation over the course of treatment with child self-
monitoring in FBT.
Model 3 included study covariates (child BMI, parent BMI, child depressive symptoms, and child age), family ethno-racial minority status, and behavioral coach weekly rating of parent motivation, with child self-monitoring. The AICC for this model was 2695.46, and the BIC was 2703.98, both indicating a better model fit compared to Model 1 (see Table 8). Results indicated that family ethno-racial minority status was significantly related to lower rates of child self-monitoring, such that if a family identified as being from an ethno-racial minority background, there was a .38 standard deviation decrease in the rates of child self-monitoring for that family \( \beta = - .38 \) \( [SE = .65]; p < .05; \) see Table 8). Therefore, if a family identified as being from an ethno-racial minority background, the child in that family would complete -.71 fewer days of self-monitoring per week compared to a child from a family from a non-Hispanic Caucasian background. Further results showed that higher levels of behavioral coach ratings of weekly parent motivation related to higher rates of child self-monitoring, such that a one standard deviation increase in behavioral coach rating of parent motivation corresponded to a .09 standard deviation increase in child self-monitoring \( \beta = .09 \) \( [SE = .16]; p < .05; \) see Table 8). This is equivalent to an increase of .17 days of self-monitoring per week for each standard deviation increase in behavioral coach rating of parent weekly motivation (SD = .90).

Model 4 included study covariates (child BMI, parent BMI, child depressive symptoms, and child age), family ethno-racial minority status, and parent self-rated weekly motivation, with child self-monitoring. The AICC for this model was 3020.47, and the BIC was 3029.22 (see Table 9). Compared to the prior model within Aim 2,
this model did not fit the data as well. Results showed that family ethno-racial minority status was significantly related to lower rates of child self-monitoring ($\beta = -.38 \ [SE = .62]; \ p < .05; \ see \ Table \ 9$). These results indicated that if a family identified as being from an ethno-racial minority background, there was a .38 standard deviation decrease in child self-monitoring for that family. Thus, families from ethno-racial minority backgrounds would show a decrease of .71 days per week of child self-monitoring. Further results showed that higher levels of parent self-rated weekly motivation related to higher rates of child self-monitoring ($\beta = .10 \ [SE = .18]; \ p < .05; \ see \ Table \ 9$). This suggests that for one standard deviation increase in parent self-report of motivation, there was a .10 standard deviation increase in child self-monitoring. This is equivalent to a .19 day increase in child self-monitoring for each standard deviation increase in parent self-rated weekly motivation (SD = .83).

**Aim 3:** To assess the relationship between psychosocial stressors, CFC, parent motivation at baseline, parent motivation over the course of treatment with parent self-monitoring in FBT.

Model 5 included study covariates (child BMI, parent BMI, child depressive symptoms, and child age), and behavioral coach weekly rating of parent motivation, with parent self-monitoring. The AICC for this model was 2551.66, and the BIC was 2560.70; these statistics both indicate that Model 5 has a better model fit compared to all previous models (see Table 10). Results indicated that higher levels of behavioral coach ratings of weekly parent motivation related to higher rates of parent self-monitoring, such that one standard deviation increase in behavioral coach rating of
parent motivation increased parent self-monitoring by .11 standard deviations ($\beta = .11$ [SE = .22]; $p < .05$; see Table 10). This is equivalent to an increase of .11 days of parent self-monitoring for each standard deviation increase in behavioral coach rating of parent weekly motivation (SD = .90).

Model 6 included study covariates (child BMI, parent BMI, child depressive symptoms, and child age), and parent self-rated weekly motivation with parent self-monitoring. The AICC for this model was 2809.10, and the BIC was 2817.71, indicating that Model 6 did not have as good a fit compared to Model 5 (see Table 11). Within this model, none of the covariates or parent self-rating of weekly motivation related to parent self-monitoring (see Table 11).

Exploratory Aim 1: To evaluate the relationship between parent self-monitoring, significant independent study variables, with child self-monitoring in FBT.

Model 7 included study covariates (child BMI, parent BMI, child depressive symptoms, and child age), family ethno-racial minority status, parent self-rating of weekly motivation, and parent self-monitoring with child self-monitoring. The AICC for this model was 2348.77 and the BIC was 2357.20, thus indicating that Model 7 had the best overall model fit compared to all other models (see Table 12). This model showed that parent self-monitoring significantly related to child self-monitoring such that a one standard deviation increase in parent self-monitoring corresponded to an increase in child self-monitoring by .65 standard deviations ($\beta = .65$ [SE = .05]; $p < .001$; see Table 12). This was the largest effect found in this study. These results indicate an increase of 1.2 days of child self-monitoring for every standard deviation
increase in parent self-monitoring (SD = 3.71). Results further indicated that higher levels of parent self-rating of weekly motivation related to higher rates of child self-monitoring, such that one standard deviation increase in parent self-rating of weekly motivation increased child self-monitoring by .10 standard deviations ($\beta = .10$ [SE = .22]; $p < .05$; see Table 12). This is equivalent of an increase of .18 days of child self-monitoring for every standard deviation increase in parent self-rating of weekly motivation (SD = .83). This finding replicates the results in the previous model of parent motivation and child self-monitoring. Final results indicated family ethno-racial minority status was not related to child self-monitoring in this model (see Table 12). 

Exploratory Aim 2: To explore whether motivation changes over time during FBT.

The findings from the primary aims identified significant relationships between parent motivation as measured over time and outcome variables; however, this relationship was not found between baseline parent motivation and outcome variables. One hypothesis is that motivation is dynamic, and can change over time. Parent motivation may change from the first visit to following treatment visits. To explore this hypothesis, paired t-tests were run to establish whether there was a significant change in motivation between session 1 and session 2. Session 1 motivation was used instead of baseline because the motivation scales were not comparable between baseline measures and session measures. Parents rated their motivation at the beginning of each session, therefore a motivation rating. Analysis showed that, from session 1 to session 2, behavioral coach ratings of parent motivation dropped significantly (session 1 $M = 4.60$ (.66); session 2 $M = 4.36$ (.84), $p < .001$). A similar
analysis for parent self-rating of motivation showed that parent motivation
significantly dropped from session 1 to session 2 (session 1 $M = 4.73 \, (.57)$; session 2
$M_{\text{parent}} = 4.63 \, (.64)$, $p < .001$).

Sections of Chapter 3 of this dissertation will be submitted for publication with
co-authors, Boutelle, Kerri; Matheson, Brittany; Liang, June. The dissertation author
was the primary investigator and will be the primary author on this publication.
CHAPTER 4: DISCUSSION

The overall findings of this study provide important information regarding factors that may influence attendance and self-monitoring in family-based treatment for pediatric obesity (FBT). Results from this study show that lower parent motivation, lower socioeconomic status (SES) and higher child depressive symptoms increased the likelihood of attending a treatment session. In terms of child self-monitoring, ethno-racial minority backgrounds and lower parent motivation were related to lower rates of child self-monitoring. However, when parent self-monitoring was entered into the model, higher parent self-monitoring and higher parent-motivation related to higher rates of child self-monitoring. Finally, families with higher behavioral coach ratings of weekly parent motivation were significantly more likely to have higher parent self-monitoring. These findings provide important information regarding factors related to family attendance and self-monitoring in FBT. This study suggests that additional support and care for families from ethno-racial minority backgrounds, lower parent motivation, and higher SES backgrounds could improve attendance and self-monitoring rates in FBT.

This study showed that family attendance at FBT was associated with SES, child depressive symptoms and parent motivation. We initially hypothesized that families from lower SES backgrounds would attend fewer sessions over the course of treatment. Published research shows that low SES families have higher levels of everyday living stress and transportation difficulties. (Santiago, Wadsworth, & Stump, 2011; Rothwell & Han, 2010) and that that low SES families struggle to attend as
many psychological treatment sessions as their high SES counterparts (Arnold et al., 2003; Slesnick & Prestopnik, 2004; Nock & Ferriter, 2005). Research on low SES families and mental health treatment attendance difficulties shows the importance of “intangible barriers” (e.g., lack of trust in healthcare system, fear of stigma) in addition to “tangible barriers” (e.g., transportation, practical concerns about obtaining care for the child; Larson, Stewart, Kushner, Frosch, & Solomon, 2013). Interestingly, in this study, the opposite relationship was found between attendance and SES. There are many potential explanations of these counter-intuitive findings. It is possible that lower SES families may be in greater need of services and lack access to intensive weight loss treatments outside of the study. Such families may prioritize attendance more than their higher SES counterparts. It is possible that higher SES families have more resources outside of the treatment study (e.g., summer camps, extracurricular sports, better access to healthy food) and therefore do not need to depend on the treatment study as the only weight loss resource for their child. Relatedly, it is also possible that other unmeasured variables, such as weight loss rates, influence attendance which may account for the differences in attendance between lower and higher SES families. However, weight loss was not assessed in this study. While there was a large range of scores for the measure of SES (11-64) there is not an official cut-off score that indicates low SES using the Hollingshead (Cirino et al., 2002). Therefore, it is unclear whether any of the participating families in this study were “low SES” versus “lower SES.” It is possible that low SES families who may have had trouble with attendance may have been screened out by heavy assessment burden
required by this study prior to randomization. A final consideration is that this
treatment study was designed with particular sensitivity to the needs of lower SES
families, including evening treatment sessions (family sessions as late as 8pm). The
finding that lower SES families are more likely to attend treatment over time is a novel
finding in the literature, and should be assessed in future studies to further understand
this relationship.

Child depressive symptoms were positively related to treatment attendance in
this study. These results are contrary to published literature which suggests that higher
levels of child psychopathology are associated with less family engagement in weight
loss treatment (Zeller et al., 2004; Skelton & Beech, 2011). Of note, this effect was of
a small magnitude, indicating that the effect of child depressive symptoms may not
have a large impact on attendance. This finding could be influenced by the
inclusion/exclusion criteria, as children with severe psychological difficulties (e.g.,
suicidal ideation, eating disorders) were excluded from this study, potentially
restricting the range of depressive symptoms included in the study. The range of child
depressive symptom scores for this sample was 0-27, while the measure (CES-DC)
has a maximum score of 60. Thus, it is important to note that results from this study
may not generalize to samples that include children with a full range of depressive
symptoms. Additionally, parents of children with depressive symptoms might be more
motivated to attend treatment because they are concerned about their child’s mental
health in addition to their child’s overweight status or they may believe that their
child’s overweight status is directly causing their child’s depressive symptoms.
Research suggests that childhood obesity is associated with social stigma and depression (Strauss, 2000; Madowitz et al., 2012; Puhl & Luedicke, 2012; Puhl & King, 2013). Therefore, parents of children with depressive symptoms may attend more sessions to try to alleviate their child’s weight problem, in an attempt to also influence their depressive symptoms. Furthermore, depressive symptoms can include increases in appetite and weight gain (APA, 2013), which may further increase parental concern over their child’s weight and influence attendance. Further research may be necessary to fully understand the relationship between child depressive symptoms and family attendance to FBT.

The negative relationship between parent weekly motivation (parent self-report and behavioral coach rating) and attendance was perhaps the most surprising result of this study. Published research suggests that low parent motivation is associated with lower rates of attendance (Ellis et al., 2012; Gunnarsdottir et al. 2011). However, the reverse was found in this study. This finding could be explained by inaccurate assessment of motivation at the session prior to a skipped session, social desirability bias, or a lack of a genuine positive relationship between parent motivation and treatment attendance. It is possible that parents and/or behavioral coaches may not be able to accurately rate parent motivation. In terms of parents, this could be due to social desirability bias (Podsakoff et al., 2003; Furnham, 1986), because parents may be concerned about the behavioral coach seeing their ratings. Of note, parents completed their motivation self-ratings during their family session and handed them in to the behavioral coach during the session. Parents may have wanted to appear
motivated to help their child, even when they may have felt exhausted or overwhelmed by the program. Relatedly, behavioral coaches may not have properly gauged parent motivation each week, which could be due to the inherent challenges in assessing another individual’s internal motivation. A further consideration is that the motivation measurement was limited as it included only one item. Motivation is a complex construct, and future research in this area may benefit from the use of a longer, more in-depth longitudinal assessment of motivation. Finally, it is possible that a positive relationship between parent motivation and attendance does not truly exist. It is possible that missing treatment sessions may not be under the parent’s control, i.e., child illness, car trouble, and last minute homework assignments. In these circumstances, a parent’s motivation to attend FBT may not be relevant to whether they attend the following week. Overall, future studies should further assess specific reasons why families do not attend treatment sessions.

In this study, child self-monitoring was related to ethno-racial minority status and parent motivation. The results between family ethno-racial minority status and lower rates of child self-monitoring supported the original hypothesis and replicate published findings in the literature (Zeller et al., 2004; Jelalian et al., 2008, Williams et al., 2010). We conceptualized family ethno-racial minority status as a psychosocial stressor that may have a negative influence on a family’s ability to participate in self-monitoring. In the broader literature, research shows that membership of an ethno-racial minority group in the United States is related to increased rates of stress, mental health, and physical health problems (Sue et al., 2007; Pieterse & Carter, 2007;
Brondolo et al., 2011; Hicken, Lee, Morenoff, House, & Williams, 2014). It is possible that families coping with the stress of being from an ethno-racial minority background in the United States would have depleted energy to dedicate towards child self-monitoring. This is particularly concerning because epidemiological research shows higher rates of obesity in ethno-racial minority populations compared to non-Hispanic Caucasian populations are differentially affected by obesity (Wang & Beydoun, 2007; Ogden et al., 2014) and that self-monitoring is significantly related to weight loss in FBT (Denzer et al., 2004; Mockus et al., 2011; Wrotniak et al., 2005).

Due to the higher rates of obesity in ethno-racial minority populations, it is especially important to identify reasons why children in these families self-monitor less in order to synthesize possible solutions to assist these families.

This study also found that higher parent weekly motivation was associated with increased child self-monitoring. This relationship held true whether parent weekly motivation was assessed via behavioral coach rating or parent self-rating. This is consistent with published research showing that motivation is associated with success in interventions targeting child and adult obesity and diabetes (Channon et al., 2007; Christie & Channon, 2014), parent engagement in child diabetes treatment (Ellis et al., 2012), and child self-monitoring in FBT (Gunnarsdottir et al., 2011). FBT is a child weight loss program, and although parents are provided education about the importance of modeling healthy behavior and self-monitoring for their children, parents participate in FBT to help improve their children’s weight status (Epstein et al., 1996). It is therefore possible that parents who are very highly motivated may not
be focused on their own self-monitoring, but instead concentrate on assisting their children with self-monitoring. Self-monitoring in FBT is quite complicated, including measurement of foods, calculation of calories, and assessment of “combination foods” that have multiple ingredients, in addition to logging physical activity (Epstein, 1996). Because of the complexity of self-monitoring, it is inevitable that the vast majority of children need assistance from their parent(s) in order to accurately complete self-monitoring. Anecdotal information from families in this study suggests that some families relied on children to complete all of their own self-monitoring while others reported completing all of the self-monitoring for their children. However, this study did not formally assess whether the parent or child completed the child Habit Books. Considering that self-monitoring is one of the best predictors of weight loss in adults and children (Forman et al., 2009; Elfhag & Rossner, 2005; Wrotniak et al., 2005; Baker, Boutelle, & Kirschenbaum, 1998), families must prioritize child self-monitoring in FBT. Future studies could consider an assessment of parent effort required for child self-monitoring and whether parents or children completed the child’s Habit Books.

We conducted an additional analyses evaluating whether parent-self-monitoring was related to child self-monitoring, since parent self-monitoring related to child self-monitoring in published literature (Kirschenbaum et al., 2005; Germann et al., 2007). Overall, our data were consistent with the published literature and showed that higher parent self-monitoring was associated with higher child self-monitoring. This was the largest effect found in this study. Parent motivation was also significantly
associated with child-self monitoring in this model. These results support the need for parents to be actively involved in FBT and to model healthy weight loss behaviors to optimize their children’s success in the program. In this study, parent self-monitoring related to child-self monitoring, and parent self-monitoring related to parent motivation. It is possible parent motivation could be targeted to improve child outcomes in FBT. Potential ways to improve parent motivation include motivational interviewing techniques (reflective listening, eliciting change talk; Rollnick, Heather, & Bell, 1992), or further enhance reward systems already in place (Epstein, McKenzie, Valoski, Klein, & Wing, 1994; Boutelle et al. 2011). Multi-level modeling could provide further understanding of the contributors to child self-monitoring across parent and child factors. Unfortunately, child motivation was not included in this study, so it is impossible to evaluate whether child motivation played a role in child self-monitoring. Future research could include measures of child motivation and include methods to improve parent motivation (such as motivational interviewing) in FBT interventions.

Results evaluating predictors of parent self-monitoring partially supported the initial hypotheses. As hypothesized, higher behavioral coach ratings of parent weekly motivation related to higher levels of parent self-monitoring. However, parent self-rating of weekly motivation was not related to parent self-monitoring. The significant association between behavioral coach rating of parent motivation and parent self-monitoring builds upon published research showing that higher adult motivation relates to more successful behavioral change in health interventions (Channon et al.,
The lack of relationship between parent self-rating of weekly motivation and parent self-monitoring was perhaps the most surprising null result of this study. The researchers hypothesized that low parent motivation one week would be related to lower rates of parent self-monitoring that same week. There are a number of reasons that parent self-rating of weekly motivation could have null results with parent self-monitoring while behavioral coach rating of parent motivation showed a positive relationship with parent self-monitoring. GLMM is a complex model, and parent motivation may relate differently to parent self-monitoring across different models with different measurements of motivation (parent self-rating versus behavioral coach rating). For example, child age may have contributed more to the overall model including parent self-rating compared to behavioral coach rating of weekly parent motivation, as child age may be more closely linked to parent self-report of weekly motivation compared to behavioral coach rating of weekly parent motivation. This lack of relationship may also be related to inaccuracy of the parents’ assessment of their motivation, or a genuine lack of relationship between parent motivation and parent self-monitoring. The first explanation is that parents do not accurately represent their motivation during in-session assessment. As mentioned earlier, this could be due to social desirability bias because they may be concerned about the behavioral coach seeing their ratings (Podsakoff et al., 2003; Furnham, 1986). This study’s assessment of parent motivation was less than ideal, given that parents filled out their self-rating.
motivation assessments in front of behavioral coaches, and thus could have felt pressure to endorse higher levels of motivation. Therefore, it is possible that behavioral coach rating of parent motivation may be more accurate, and this may account for the significant positive findings between behavioral coach rating of parent weekly motivation with parent self-monitoring. A further consideration is that the motivation measurement used for these analyses was only one item; further research using more in-depth longitudinal assessments of motivation may be necessary. An alternative explanation is that there truly is not a relationship between parent motivation and parent self-monitoring. Because this is a child weight loss treatment program, motivated parents may focus their energy on helping their child self-monitor rather than work on their own self-monitoring. This study’s findings that parent self-report of motivation is positively related to child self-monitoring provides further support for this explanation. While higher parent self-rating of weekly motivation was not related to higher rates of parent self-monitoring in this study, is it important to continue to encourage parents to model self-monitoring to increase their child’s likelihood of success in FBT. Future FBT studies may benefit from further assessment of the relationship between parent motivation and parent self-monitoring over the course of treatment, possibly using a more in-depth measure of motivation.

There were a number of null results that were counter to the initial study hypothesis. Our results showed a lack of relationship between parent depression, consideration of future consequences (CFC), and parent motivation at baseline, with outcome variables (attendance, child self-monitoring, parent self-monitoring). Many
of these results were surprising considering the published literature which suggests significant relationships between these variables of interest and study outcomes of attendance and self-monitoring (Gonzalez et al., 2008; Streisand, Swift, Wickmark, Chen, & Holmes, 2005; Gunnsdottir et al., 2011 Channon et al., 2007; Christie & Channon, 2014). However, it is important to note that null findings do not necessarily indicate that a relationship does not exist, only that the relationship was not demonstrated in this study sample.

Parent depression was not related to any outcome variables in this study (attendance, child self-monitoring, parent self-monitoring). There are several potential explanations for these null findings. It is possible that the depression subscale of the BSI is not sensitive enough to evaluate parent depression status within this sample. The BSI depression subscale consists of only six items, and only evaluates symptoms within the past seven days. Although previous studies show that the BSI is adequate as a general measure of psychological distress (Derogatis, 1993), researchers also state that the BSI is not sufficient for diagnosis (Boulet & Boss, 1991; Endermann, 2005) and has mixed validity when evaluated compared to other depression instruments (Khalil, Hall, Moser, Lennie, & Fraizer, 2010). In this study, the BSI depression subscale may not have been a reliable assessment, as demonstrated by the borderline Cronbach’s alpha (.69; traditional cutoff for an acceptable Cronbach’s alpha level is .7 (Nunnally, 1978)). Additionally, this study sample showed limited variability in BSI depression scale scores ($M = 0.39, SD = 1.21, range = 0-9$). Eight-six percent of the sample did not endorse any depressive symptoms. This low rate of depressive
symptoms may be related to the study’s exclusionary criteria and the assessment burden to enroll, which may have been prohibitory for parents with significant depressive symptoms. Finally, it is possible that there may not be a true relationship between parent depression and the outcome variables of interest. This would conflict with literature showing parent depression is negatively related to child psychological treatment participation and success (Mennen et al., 2015; Nock & Kazdin, 2001; Weems & Scheeringa, 2013), and that child outcomes improve when parent psychopathology improves (Kazdin & Whitley, 2003; Gunlicks & Weissman, 2008; Weissman et al., 2015). However, there is always the possibility that the literature is not fully representative due to bias against publishing null findings (Rosenthal, 1979). Further studies are needed to evaluate the effects of parent depression on child outcomes in FBT. These studies would preferably consist of large sample sizes, more variability in parent depression symptoms, and more in-depth assessment tools, such as the Beck Depression Inventory (Beck, Steer, & Garbin, 1988), or the Structured Clinical Interview for DSM-5 (First, Williams, Karg, & Spitzer, 2015).

This study also showed a lack of a relationship between the Consideration of Future Consequences questionnaire (CFC) and the outcome variables (attendance, child self-monitoring, parent self-monitoring) measured in this study. To our knowledge, this is the first study that evaluates the potential relationship between CFC with FBT attendance and self-monitoring. As noted earlier, these null findings do not necessarily mean that there is not a relationship between CFC and outcome variables but that this relationship was not significant in this study. There are several potential
reasons why the CFC did not relate to study outcomes, some of which are related to the CFC measure itself. Although the CFC has been validated and is related to healthy behaviors in adults (Adams & Nettle, 2009) and undergraduate populations (Joireman, 1999; Joireman et al., 2012; Ouellette, Hessling, Gibbons, Reis-Bergan, & Gerrard, 2005), studies have not evaluated the relationship between CFC and child FBT outcomes. It is possible that CFC may be an accurate portrayal of parents’ future or present-orientation, but that this orientation may not be enough to predict family behavior throughout the six months of FBT. FBT is an intensive and long behavioral treatment that requires significant commitment and time from participants. This study required 1.5 hour weekly treatment sessions over the course of 6 months, in addition to assignments completed at home. It is possible that the CFC is a good reflection of parents’ future or present-orientation at the time that it is completed (prior to treatment), but that CFC waxes and wanes throughout treatment, similar to the construct of motivation (Webber, Tate, Ward, & Bowling, 2010). The third possibility is that self-report measurements of CFC may not be reflective of real world behavior in this treatment-seeking population. Additionally, the CFC is considered to be vulnerable to the social desirability bias (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003; Furnham, 1986). Future studies of FBT should assess CFC as a dynamic construct and include an assessment of social desirability to address these concerns.

The lack of a relationship between the baseline measure of parent motivation, and variables of interest (attendance, child self-monitoring, parent self-monitoring) may seem counter to the significant results between weekly motivation and outcome
variables. There are a number of hypotheses that could explain this lack of results, including concerns about reliance on a baseline measure for information about motivation throughout treatment. The study’s baseline measure of motivation, the PMI-CO, asks more broadly about motivation to participate in weight loss treatment for the child, and was adapted for this study. Parents respond to how much they agree with items such as “My child will experience many negative outcomes in life if he/she does not lose weight,” “I want my child to lose weight,” and “I believe that I can learn to help my child lose weight.” While these are valuable data points, they may not be reflective of the motivation needed to follow through with the everyday tasks required of FBT. By contrast, the weekly motivation ratings filled out by behavioral coaches and parents may represent motivation in a more state dependent manner. It is possible that the baseline PMI-CO may be assessing a parent’s motivation as measured through their intellectual understanding that the child must lose weight, at the beginning of treatment, while the weekly motivation ratings are more indicative of a parent’s willingness to manage the day-to-day parent responsibilities and burden associated with the program. Additionally, while the baseline PMI-CO asks about parents’ motivation to participate in treatment, it is possible that parents may not fully understand the commitment required by FBT prior to starting treatment. As this was an entirely treatment-seeking sample, one would expect motivation ratings to be high for this sample at baseline. While the scores on the PMI-CO for this sample had a sizeable range (77-125), this range was on the higher end of the motivation scale. It is possible that this high initial level of motivation may not be maintained over time. One
final consideration, as in the other self-report measures, is the role of social-desirability bias (Podsakoff et al., 2003; Furnham, 1986). Parents may want to portray themselves as having very high levels of motivation to help their children when presenting for a treatment study. It is possible that this bias changed over time as parents became comfortable with study staff and knew that they had been accepted into the treatment study.

To further evaluate potential changes in motivation early in treatment, we evaluated potential motivation changes between session 1 and session 2 of FBT. Parents receive education about self-monitoring and other treatment commitments in week 1. Parents are assigned to complete these activities between session 1 and session 2. Anecdotally, parents often reported that they only understood the commitment requirements for FBT after completing this first week of self-monitoring. Results showed a significant decrease in motivation from session 1 to session 2 of treatment. These results provide further evidence that 1) parent motivation is dynamic and changes over time, and 2) parent report of motivation prior to beginning treatment may be falsely inflated. The reduction in parent motivation between session 1 and session 2 indicates that motivation drops once at-home treatment assignments are completed. This may be an indication that home assignments and self-monitoring may be overwhelming for families when they are assigned during session 1. This drop in motivation may be avoidable if families started at-home FBT assignments more gradually. These results also indicate a need for further motivational enhancement in session 2. Overall, these findings are consistent with the long-established literature
showing that motivation during weight loss treatment is a dynamic construct that changes over time (Mahoney, 1974; Teixeira, Silva, Mata, Palmeira, & Markland, 2012; Webber et al., 2010).

The lack of a relationship between SES and self-monitoring for both parents and children is surprising given that SES was associated with lower rates of attendance in this study. We conceptualized lower SES as a source of stress, which would impact attendance, although stress was not directly assessed in this study. Because stress was not directly measured in this study, it is not established that there is an association between lower SES and stress in this sample. However, we hypothesized that self-monitoring would be an increased burden on theoretically stressed lower SES families. Published research shows that low SES families cite many difficulties that affect their treatment participation, including distance from treatment center (Kitscha, Brunet, Farmer, & Mager, 2009), child care (Toth-Capelli, Brawer, Plumb, & Daskalakis, 2013), children not wanting to attend treatment sessions (Skelton, Irby, & Geiger, 2014), time commitment and time away from work (Bishop, Irby, & Skelton, 2015; Skelton & Beech, 2011). Furthermore, low SES is associated with parent stress across urban and rural settings (Evans & English, 2002; Morrison Gutman, McLoyd & Tokoyawa, 2005) and with lower family psychotherapy treatment attendance (Arnold et al., 2003; Slesnick & Prestopnik, 2004; Nock & Ferriter, 2005). While the relationship between SES and attendance remains surprising, SES does not appear to influence self-monitoring rates in this study, which is clinically encouraging. These results will need to be confirmed in future studies.
Family ethno-racial minority status showed no relationship with attendance or parent self-monitoring, but did show a negative relationship with child self-monitoring. Published literature shows that ethno-racial minority status is a psychosocial stressor (Sue et al., 2007; Pieterse & Carter, 2007; Brondolo et al., 2011; Hicken et al., 2014) which contributes to engagement difficulties in child and family psychological treatment (Kitzmann et al., 2008; Nock & Ferriter, 2005) and weight loss programs for youth (Zeller et al., 2004; Jelalian et al., 2008, Williams et al., 2010). However, these null results are somewhat encouraging since this potential source of stress did not have a negative effect on attendance or parent self-monitoring in this study sample. There are several potential explanations for these null findings. This study utilized parent report of child ethno-racial minority status as the determinant of family ethno-racial minority status, which may not actually represent the stress hypothesized. It is also possible that parent ethno-racial minority status could have differed from the child’s. However, when parent ethno-racial minority status was evaluated using the same models, the overall results did not change. Additionally, the ethno-racial minority status of the participants in this study are different than in other published studies (e.g., low percentage of African American participants), which may have contributed to these null findings. It is also possible that there is no true relationship between ethno-racial minority status and treatment participation and success. Furthermore, it is possible that individuals living in the study’s location (San Diego) may not experience the same stressors related to ethno-racial minority status as individuals living in more highly segregated, stressful
environments. Since San Diego is 0.9% American Indian or Alaskan Native, 10.9% Asian, 5.1% Black or African American, 64% Caucasian, 0.5% Native Hawaiian or Other Pacific Islander, 5.1% Other racial identification (including multiracial), 13.6% Unknown and not reported, and 32% Hispanic (U.S. Census Bureau, 2010), ethno-racial minority status may not be relevant as in other studies conducted in different geographic regions. These encouraging findings are especially important due to the higher rates of obesity found in ethno-racial minority populations compared to non-Hispanic Caucasian populations (Wang & Beydoun, 2007). Future research is necessary to further understand how FBT attendance and self-monitoring may be different for families from ethno-racial minority backgrounds.

There were many null findings in this study. These null findings could be influenced by study sample size, sampling bias due to exclusion/inclusion criteria, and measurement difficulties. Several of the independent variables, such as motivation and CFC, are complex constructs that may be fundamentally difficult to measure. As in all studies, when taking into account participant burden and feasibility, assessments must often be altered to fit within study confines. Future studies of predictors of attendance and self-monitoring would benefit from larger sample sizes, less stringent inclusion/exclusion criteria and in-depth longitudinal assessments, especially of variables that are more dynamic.

Strengths of this study

There were a number of notable strengths in this study, including study design, study sample, and study completion rates. One major strength of this study was the
amount of data collected on parents of participating children. This broader focus on the overall family in FBT, and not just the participating child, allows for further investigation of the role of parent psychosocial stressors, CFC, and motivation in FBT. In terms of design, this study utilized both baseline assessment and longitudinal assessments of constructs. As is demonstrated in the analyses of both parent baseline and longitudinal motivation data, some of the constructs measured in this study are dynamic and the understanding of parent motivation is enhanced by collecting data at baseline and over time. This study included novel measures, such as the CFC and PMI-CO. This is the first study known to the researchers to evaluate these measures in an FBT randomized controlled trial. Although some variables were only measured at baseline (parent depression, CFC), these variables allowed researchers to collect relevant data on a large study sample with minimal participant burden. Although previous studies have assessed attendance to pediatric obesity treatment studies, no other studies to the researchers’ knowledge have done so using this in-depth look at motivation and attendance on a weekly basis.

Compared to other pediatric randomized controlled weight loss trials, this study had a large study sample \((N = 150)\). The sample was made up of ethno-racially diverse families (Hispanic = 28.4\%, Non-Hispanic = 70.8\%; Caucasian = 62.9\%, Other race/multiracial/unknown = 14.5\%, Black or African American = 8.6\%, Asian = 7.3\%, American Indian/Alaskan Native =2.0\%, Native Hawaiian/Pacific Islander = 2.0\%) who were representative of the demographics of the San Diego area. As a large study with a diverse study sample, this study’s results may be more generalizable
compared with previous studies of FBT that used smaller less racially diverse samples (Boutelle et al., 2011; Golan et al., 2006; Janicke et al., 2009; West et al., 2010).

The treatment provided in this study was made as convenient as possible by providing treatment at two treatment sites that were seventeen miles apart (La Jolla and City Heights) and were in vastly different demographic areas of San Diego. Providing treatment across these different settings made treatment more logistically convenient for many participants. Additionally, the two treatment sites allowed more participants to receive treatment closer to their own community, rather than traveling to a university setting that some families may find uncomfortable or unfamiliar. A further strength of this study is the low attrition rate of 27%, compared to attrition rates of up to 50% in other pediatric weight loss trials (Lettikhuis, Baur, & Jansen, 2009; Skelton & Beech, 2011). The novel measures included in this study added to the study’s strengths. Additionally, study treatment was manualized and supervised with fidelity checks throughout the clinical trial to assure consistent and valid treatment. These overall strengths allowed for a large scale randomized controlled trial of FBT that had adequate power to evaluate this study’s aims.

Study limitations

As with all studies, there are limitations that need to be considered, including the restricted age range of child participants, the low level of psychopathology in the sample, and the use of baseline measures to gather information about potentially dynamic constructs. This sample only included children who were 8-12 years old at enrollment, and these findings may not generalize to children of other ages.
Additionally, this study did not include families with significant psychopathology. Families were excluded if they endorsed substance dependence, suicidal ideation, intellectual disability, attention deficit disorder, eating disorder or other major psychiatric disorder. Therefore results may not be generalizable to populations that include children or parents with higher levels of psychopathology.

Several of the measures in this study were only administered at baseline. The only variables assessed over time were attendance, motivation, and self-monitoring. Single time point measurements at baseline assume that the variable of interest is trait dependent and does not change over time. It is possible that CFC and depressive symptoms change over time. The BSI depression subscale may be particularly limited due to its brevity and borderline alpha score indicating questionable internal consistency in this sample. The baseline parent motivation measure used (PMI-CO) was adapted for this study and therefore we do not have validation and reliability data at this time. Additionally, it is possible that the specificity and sensitivity of the CFC may not generalize to this parent population. In future studies, more accurate and in-depth assessments of these baseline measures, in particular parent depression, CFC, and parent motivation, is warranted.

Conclusion and Future Directions

Findings from this study could have significant implications for FBT research programs and clinical work. Although FBT is the gold standard treatment, only 30% of children are no longer overweight in adulthood, suggesting that individual-level variables influence FBT engagement and outcomes. Based on study results, baseline
and longitudinal variables both influence attendance and self-monitoring in FBT. Additionally, this study demonstrates the dynamic nature of one variable (motivation), and illustrates the importance of longitudinal assessment over the course of FBT. This is especially important, as some cutting-edge weight loss protocols have durations of up to one year (Pekkarinen, Kaukua, & Mustajoki, 2015; Bischoff et al., 2012).

Implications for future research and clinical work in FBT are discussed below.

**Research Implications**

The results of this study reveal the importance of several variables and their potential use to improve research outcomes in FBT. Firstly, parent motivation could have implications for both child and parent self-monitoring in FBT. The positive relationship between parent motivation and self-monitoring indicates that researchers should evaluate the use of motivational interviewing in FBT. The research literature on the potential benefit of motivational interviewing in weight loss treatment is currently growing (West, DiLillo, Bursac, Gore, & Greene, 2007; DiLillo, Siegfried, & West, 2003; Armstrong et al., 2011). Motivational interviewing has also been shown to be effective in other long-term behavioral lifestyle change programs, such as smoking cessation (Heckman, Egleston, & Hofmann, 2010; Rubak, Sandbaek, Lauritzen, & Christensen, 2005). Although case studies and primary care studies of motivational interviewing are emerging, large-scale clinical trials of motivational interviewing and FBT have not yet been completed to date (Resnicow et al., 2015; Irby, Kaplan, Garner-Edwards, Kolbash, & Skelton, 2010; Naar-King et al., 2015). Beyond the use of motivational interviewing, further consideration of assessment
strategies must be undertaken, and are discussed below. Regarding the negative relationship between parent motivation and attendance, further research is necessary to clarify why parents with higher levels of motivation attended fewer subsequent weekly sessions in this study.

Surprisingly, results from this study may have research implications in terms of how to engage higher SES families. Published literature has shown that lower SES families have a number of challenges to attending treatment, including distance to treatment location (Kitscha et al., 2009), access to child care (Toth-Capelli et al., 2013), and time away from work and general time commitment of treatment (Bishop et al., 2015; Skelton & Beech, 2011). However, in this study, lower SES families attended more sessions than their higher SES counterparts. Future studies should explore potential explanations for lower treatment attendance among high SES families. Future studies, for example, may assess whether higher SES families depend on other resources outside of study treatment to help their children lose weight (e.g., personal trainer, summer camps, meal planning) and therefore attend fewer study sessions. Two alternative explanations that should be evaluated are 1) whether higher SES families experience more rapid child weight loss at the beginning of treatment and then attend fewer sessions, or 2) if higher SES families do not see rapid weight loss and become frustrated with the program, resulting in fewer sessions attended. At present, it remains unclear why lower SES families had higher rates of attendance than higher SES families in this sample; future studies would be necessary to further establish this relationship.
This study’s finding that ethno-racial minority status families have lower rates of child self-monitoring has implications that are highly important for future research. Researchers are concerned with the high rates of obesity in ethno-racial minority populations compared to non-Hispanic Caucasian populations (Wang et al., 2007). Researchers previously recognized the need to customize interventions based on culture (Carpentier et al., 2007) and have more recently begun to design weight loss programs with the specific goal of treating specific ethno-racial minority youth (Naar-King et al., 2015; Mirza et al., 2013). The results from this study are further indication of the importance of obesity researchers gaining knowledge about how to produce culturally sensitive interventions for youth from diverse ethnic, racial, and cultural backgrounds.

Further research implications of this study are relevant to how variables of interest should be measured in FBT. The first variable that should be measured differently is parent motivation. This study showed that parents who self-identify as more motivated in one session may not follow through by attending subsequent weekly sessions. It is possible that parents feel uncomfortable endorsing low motivation to the treatment staff. Future research studies could minimize this bias by allowing parents to fill out these forms anonymously using their study identification number, in a separate room from the behavioral coach. Researchers should spend time ensuring that parents are comfortable filling out motivation ratings as accurately as possible. A potential first step is for researchers to provide parents with a level of comfort and privacy prior to administering motivation surveys. Additionally,
motivation surveys used to collect longitudinal data should consist of more than one item. Because motivation is a complex construct, researchers should consider the use of more in-depth measures, such as the PMI-CO, for longitudinal data as well as baseline data. The second variable that should be measured differently is parent depression. This study utilized the depression subscale of the BSI, which is brief and yielded a borderline internal consistency statistic in this sample. In future studies, parents should complete a more in-depth assessment of depression, whether via self-report (e.g., Beck Depression Inventory) or standardized interview (Structured Clinical Interview for DSM-5). The final variable that should be measured differently in FBT is CFC. While CFC is a novel and interesting construct that may be relevant to FBT, CFC may not be fully captured with the current CFC scale given at baseline. Researchers may consider updating this measure for use with parents of children undergoing behavioral health treatment. Researchers may also choose to administer the CFC at multiple time points over the course of treatment to capture whether CFC may be a dynamic construct.

Although this study provided several insights regarding variables related to attendance and self-monitoring, future research may benefit from assessing other constructs that may influence outcome variables of interest. This study used parent depression, ethno-racial minority status, and SES as proxy measures for psychosocial stress. However, researchers may obtain better insight into families’ difficulties with FBT via direct measurements of parent stress and child stress. Although parent motivation was measured extensively throughout this study, future research would
benefit from assessment of child motivation as well, as it is possible that child motivation drives attendance and self-monitoring in FBT as much or more than parent motivation. Finally, future studies would benefit from collecting data regarding whether or not parents help their child self-monitor. Results from this study show that parent motivation is highly related to child self-monitoring. Researchers would benefit from knowing to what extent parents are involved in helping their children complete Habit Books in FBT in order to maximize child self-monitoring.

Clinical Implications

The results from this study have significant clinical implications that could potentially impact the success of families undergoing FBT in the future. This study’s findings showed a direct positive association between parent motivation and self-monitoring for both children and parents. One clinical strategy for combatting low motivation over time may be to provide more education regarding the treatment expectations prior to treatment starting. Families in weight loss treatments may find the amount of material they are expected to complete and master as part of a weight loss program challenging (Kitscha et al., 2009; Skelton & Beech, 2011). Clinicians may be able to manage parents’ expectations regarding the amount of work required to achieve success in a weight loss program, which could be done through initial counseling prior to the beginning of a formal weight loss program. Treatment providers may use motivational strategies, such as pros-cons lists with accurate estimates of time spent completing intervention assignments prior to the family’s enrolling in treatment. This strategy would allow parents to ascertain the level of
engagement that is necessary for success in weight loss treatment. Motivational interviewing may be helpful for clinicians to utilize throughout treatment in order to keep families’ motivation high and optimize self-monitoring.

This study’s findings have clinical implications for working with families from ethno-racial minority backgrounds. In the current study, family ethno-racial minority status was related to lower rates of child self-monitoring over the course of treatment. Clinicians may see their diverse clients benefit from greater cultural sensitivity and customization of the FBT program. For example, clinicians may see improved results if they are able to provide diverse clients with nutrition information for culturally-relevant foods, accommodate different culture’s timing of meals and snacks, and sensitivity to such practices as fasting for Ramadan. With heightened awareness and sensitivity to the individuality of families from ethno-racial minority backgrounds, clinicians may improve clinical outcomes in FBT.

While results showed a negative relationship between parent motivation and SES with treatment attendance, clinicians should monitor these variables as they relate to treatment attendance over time. Clinicians should work to ensure that parents are accurately reporting their own motivation and provide motivational enhancement if motivation or attendance rates are dropping. Based on this study’s results, clinicians should especially monitor their higher SES clients’ attendance rates to ensure these clients continue to attend treatment regularly. Clinicians are in a unique position to tailor FBT to properly accommodate families who are struggling with attendance issues. An open and non-judgmental clinical stance may be helpful for clinicians
hoping to make a positive impact on higher SES or highly motivated families who may still struggle with treatment attendance.

This study’s results regarding child depressive symptoms and treatment attendance may also have relevant clinical implications. One interpretation of this finding is that parents of children with more depressive symptoms attend more treatment sessions because they are concerned about their children’s depressive symptoms and feel that weight loss might improve their children’s quality of life. This information is clinically relevant because many parents may not fully understand the connection between childhood obesity, teasing, and depression (Strauss, 2000; Madowitz et al., 2012; Puhl & Luedicke, 2012). Tapping into parents’ concern for their child’s mental health and social wellbeing could increase families’ level of attendance to weight loss treatment. There is potential for clinicians to provide psychoeducation regarding the connection between child obesity, mood, and social stigmatization to increase rates of attendance in FBT.

Exploratory analysis replicated previous findings that higher parent self-monitoring relates to higher child self-monitoring. The clinical implications of this finding are incredibly important for pediatric obesity treatment. Parents may believe that their primary responsibility is to recognize their child has an obesity problem and to enroll their child in a weight loss program. Many of these programs are now available through primary care (Berkowitz et al., 2013; Quattrin et al., 2012). It is critical, however, for parents to understand the clinical importance of modeling healthy behavior for their children and making healthy changes within the home (e.g.,
keeping unhealthy foods out of sight, using portion control). Self-monitoring is an integral part of any type of weight loss program. Based on this study’s results, if the clinician does not engage the parent in self-monitoring, it is unlikely that children will successfully self-monitor and lose weight themselves.

Finally, the null findings for parent baseline depression, CFC, and parent motivation at baseline are also relevant to clinical practice. For example, there may be little clinical benefit of assessing families for parent depression, CFC, or PMI-CO at baseline. Instead, clinicians should consider assessing these variables during treatment, or to focus on more relevant clinical indicators of treatment attendance and self-monitoring (i.e., parent motivation over time, SES, child depressive symptoms, family ethno-racial minority status, and parent self-monitoring).

Families continue to struggle to succeed in FBT, as evidenced by study outcome data (Ebbeling et al., 2002; Sung-Chan et al., 2013; Wilfley et al., 2007b). This study provides a number of suggestions for improving clinical treatment, including increasing parent motivation over time, educating parents about child depressive symptoms and obesity, and providing culturally sensitive care. Clinicians should consider the use of motivational interviewing, flexible treatment schedules and locations, screening and psychoeducation protocols for children with depressive symptoms, and increased cultural sensitivity. Future research studies should consider evaluating overall parental stress, parent CFC over time, child motivation over time, the amount of parent help required to complete child self-monitoring, and more in-depth assessment of parent motivation in order to enhance success in FBT.
Sections of Chapter 4 of this dissertation will be submitted for publication with co-authors, Boutelle, Kerri; Matheson, Brittany; Liang, June. The dissertation author was the primary investigator and will be the primary author on this publication.
APPENDICES

Appendix 1: Tables

Table 1: Demographics of the study sample

<table>
<thead>
<tr>
<th>Demographic</th>
<th>Mean</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent BMI</td>
<td>32.3</td>
<td>-</td>
</tr>
<tr>
<td>Parent % Female</td>
<td>-</td>
<td>87.4</td>
</tr>
<tr>
<td>Parent Age</td>
<td>43.4</td>
<td>-</td>
</tr>
<tr>
<td>Child Age</td>
<td>9.8</td>
<td>-</td>
</tr>
<tr>
<td>Child % Female</td>
<td>-</td>
<td>68.0</td>
</tr>
<tr>
<td>Child BMI</td>
<td>26.4</td>
<td>-</td>
</tr>
<tr>
<td>Child Race %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>American Indian or Alaskan Native</td>
<td>-</td>
<td>2.0</td>
</tr>
<tr>
<td>Asian</td>
<td>-</td>
<td>7.3</td>
</tr>
<tr>
<td>Black or African American</td>
<td>-</td>
<td>8.6</td>
</tr>
<tr>
<td>Caucasian</td>
<td>-</td>
<td>62.9</td>
</tr>
<tr>
<td>Native Hawaiian or Other Pacific Islander</td>
<td>-</td>
<td>2.0</td>
</tr>
<tr>
<td>Other racial identification (including multiracial)</td>
<td>-</td>
<td>14.5</td>
</tr>
<tr>
<td>Unknown or not reported</td>
<td>-</td>
<td>2.6</td>
</tr>
<tr>
<td>Child Ethnicity %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Hispanic</td>
<td>-</td>
<td>28.4</td>
</tr>
<tr>
<td>% Non-Hispanic</td>
<td>-</td>
<td>70.8</td>
</tr>
<tr>
<td>Unknown or not reported</td>
<td>-</td>
<td>2.6</td>
</tr>
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Table 2: Independent Samples t-tests comparing the two arms of the study (Parent-based therapy (PBT) and Family-based therapy (FBT)) and the two treatment sites (La Jolla and City Heights) across independent variables

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>PBT M (SD)</th>
<th>FBT M (SD)</th>
<th>t</th>
<th>La Jolla M (SD)</th>
<th>City Heights M (SD)</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consideration of Future Consequences at Baseline</td>
<td>44.71 (7.53)</td>
<td>44.49 (6.54)</td>
<td>-.20</td>
<td>44.70 (6.65)</td>
<td>44.49 (7.50)</td>
<td>.18</td>
</tr>
<tr>
<td>Parent Depression at Baseline (BSI Depression Subscale)</td>
<td>.42 (1.18)</td>
<td>.35 (1.25)</td>
<td>-.37</td>
<td>.42 (1.38)</td>
<td>.38 (1.01)</td>
<td>.29</td>
</tr>
<tr>
<td>Parent-Identified Race of Child (Dichotomized into ethno-racial minority group and non-Hispanic Caucasian)</td>
<td>.74 (.44)</td>
<td>.63 (.49)</td>
<td>-1.37</td>
<td>.62 (.49)</td>
<td>.75 (.43)</td>
<td>-1.64</td>
</tr>
<tr>
<td>Socioeconomic Status (Hollingshead)</td>
<td>38.85 (14.41)</td>
<td>40.85 (13.46)</td>
<td>.85</td>
<td>40.03 (14.63)</td>
<td>39.72 (13.19)</td>
<td>.13</td>
</tr>
<tr>
<td>Behavioral Coach Average Weekly Motivation Rating of Parent</td>
<td>4.15 (.66)</td>
<td>4.20 (.58)</td>
<td>.22</td>
<td>4.20 (.65)</td>
<td>4.18 (.56)</td>
<td>.19</td>
</tr>
<tr>
<td>Parent Average Weekly Motivation Self-Rating</td>
<td>4.29 (.61)</td>
<td>4.32 (.66)</td>
<td>-.24</td>
<td>4.27 (.67)</td>
<td>4.35 (.60)</td>
<td>-.73</td>
</tr>
<tr>
<td>Parent Motivation Inventory – Child Obesity at Baseline</td>
<td>110.93 (10.65)</td>
<td>109.80 (14.65)</td>
<td>-.56</td>
<td>110.70 (14.36)</td>
<td>109.97 (10.77)</td>
<td>.34</td>
</tr>
</tbody>
</table>

* p < .05
** p < .001
Table 3: Internal consistency statistics for study measures

<table>
<thead>
<tr>
<th>Measure</th>
<th>Cronbach’s alpha</th>
<th>Number of Items</th>
<th>Meets Internal Consistency Threshold</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consideration of Future Consequences</td>
<td>.82</td>
<td>12</td>
<td>Yes</td>
</tr>
<tr>
<td>Consideration of Future Consequences Immediate-Orientation Subscale</td>
<td>.71</td>
<td>6</td>
<td>Yes</td>
</tr>
<tr>
<td>Consideration of Future Consequences Future-Orientation Subscale</td>
<td>.81</td>
<td>6</td>
<td>Yes</td>
</tr>
<tr>
<td>Parent Motivation Inventory – Child Obesity Baseline</td>
<td>.95</td>
<td>25</td>
<td>Yes</td>
</tr>
<tr>
<td>Behavioral Coach Weekly Rating of Parent Motivation</td>
<td>.92</td>
<td>19</td>
<td>Yes</td>
</tr>
<tr>
<td>Parent Weekly Rating of Self-Motivation</td>
<td>.92</td>
<td>19</td>
<td>Yes</td>
</tr>
<tr>
<td>Center for Epidemiological Studies Depression Scale for Children</td>
<td>.82</td>
<td>20</td>
<td>Yes</td>
</tr>
<tr>
<td>Brief Symptom Inventory</td>
<td>.94</td>
<td>53</td>
<td>Yes</td>
</tr>
<tr>
<td>Brief Symptom Inventory Depression Subscale</td>
<td>.69</td>
<td>6</td>
<td>Yes (provisional)</td>
</tr>
</tbody>
</table>
Table 4: Pearson correlation analysis of independent with dependent variables

<table>
<thead>
<tr>
<th></th>
<th>Attendance</th>
<th>Total Parent Self-Monitoring</th>
<th>Total Child Self-Monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child BMI%</td>
<td>.030</td>
<td>.057</td>
<td>.067</td>
</tr>
<tr>
<td>Parent BMI</td>
<td>.041</td>
<td>.034</td>
<td>.029</td>
</tr>
<tr>
<td>Child Depressive symptoms</td>
<td>-.219*</td>
<td>.151</td>
<td>.164</td>
</tr>
<tr>
<td>Child Age</td>
<td>.092</td>
<td>.057</td>
<td>.067</td>
</tr>
<tr>
<td>SES</td>
<td>.226*</td>
<td>-.020</td>
<td>-.041</td>
</tr>
<tr>
<td>Child Ethnoracial Minority Status</td>
<td>-.155</td>
<td>-.139</td>
<td>-.213**</td>
</tr>
<tr>
<td>Parent Depression</td>
<td>-.012</td>
<td>-.076</td>
<td>-.120</td>
</tr>
<tr>
<td>CFC Total</td>
<td>.141</td>
<td>.141</td>
<td>.082</td>
</tr>
<tr>
<td>CFC Immediate Scale</td>
<td>.061</td>
<td>.107</td>
<td>.052</td>
</tr>
<tr>
<td>CFC Future Scale</td>
<td>.130</td>
<td>.045</td>
<td>.046</td>
</tr>
<tr>
<td>PMI-CO Total Baseline</td>
<td>-.084</td>
<td>-.068</td>
<td>-.069</td>
</tr>
<tr>
<td>PMI-CO Factor 1</td>
<td>-.071</td>
<td>-.043</td>
<td>-.079</td>
</tr>
<tr>
<td>PMI-CO Factor 2</td>
<td>-.099</td>
<td>-.101</td>
<td>-.030</td>
</tr>
<tr>
<td>PMI-CO Factor 3</td>
<td>-.037</td>
<td>-.046</td>
<td>-.045</td>
</tr>
<tr>
<td>Average Parent Weekly Self-Rated Motivation</td>
<td>.192**</td>
<td>.179**</td>
<td>.147**</td>
</tr>
<tr>
<td>Average Behavioral Coach Weekly Rating of Parent Motivation</td>
<td>.183**</td>
<td>.225**</td>
<td>.260**</td>
</tr>
</tbody>
</table>

* $p < .05$
** $p < .001$
Table 5: Pearson correlation exploratory analysis including parent weekly self-rating of motivation and behavioral coach weekly rating of parent motivation over 19 sessions

<table>
<thead>
<tr>
<th>Session</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Session 1</td>
<td>.476**</td>
</tr>
<tr>
<td>Session 2</td>
<td>.187*</td>
</tr>
<tr>
<td>Session 3</td>
<td>.259*</td>
</tr>
<tr>
<td>Session 4</td>
<td>.411**</td>
</tr>
<tr>
<td>Session 5</td>
<td>.433**</td>
</tr>
<tr>
<td>Session 6</td>
<td>.317**</td>
</tr>
<tr>
<td>Session 7</td>
<td>.354**</td>
</tr>
<tr>
<td>Session 8</td>
<td>.391**</td>
</tr>
<tr>
<td>Session 9</td>
<td>.429**</td>
</tr>
<tr>
<td>Session 10</td>
<td>.318**</td>
</tr>
<tr>
<td>Session 11</td>
<td>.419**</td>
</tr>
<tr>
<td>Session 12</td>
<td>.309*</td>
</tr>
<tr>
<td>Session 13</td>
<td>.220</td>
</tr>
<tr>
<td>Session 14</td>
<td>.427**</td>
</tr>
<tr>
<td>Session 15</td>
<td>.552**</td>
</tr>
<tr>
<td>Session 16</td>
<td>.418**</td>
</tr>
<tr>
<td>Session 17</td>
<td>.385**</td>
</tr>
<tr>
<td>Session 18</td>
<td>.550**</td>
</tr>
<tr>
<td>Session 19</td>
<td>.459**</td>
</tr>
</tbody>
</table>

* $p < .05$
** $p < .001$
Table 6: Summary of Generalized Linear Mixed Model Analysis Using Behavioral Coach Motivation Rating and SES with Attendance (Covariates Included Parent BMI, Child BMI%, Child Age, Child Depressive symptoms)

<table>
<thead>
<tr>
<th>Model term</th>
<th>Unstandardized</th>
<th>OR</th>
<th>t</th>
<th>p</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behavioral coach rating of weekly parent motivation</td>
<td>-.404</td>
<td>.667</td>
<td>4.53</td>
<td>&lt; .001</td>
<td>-.579</td>
</tr>
<tr>
<td>Socioeconomic status</td>
<td>-.019</td>
<td>.981</td>
<td>2.47</td>
<td>.014</td>
<td>-.035</td>
</tr>
<tr>
<td>Child BMI%</td>
<td>.016</td>
<td>1.016</td>
<td>.47</td>
<td>.641</td>
<td>-.052</td>
</tr>
<tr>
<td>Parent BMI baseline</td>
<td>-.017</td>
<td>.983</td>
<td>1.17</td>
<td>.243</td>
<td>-.045</td>
</tr>
<tr>
<td>Child depressive symptoms</td>
<td>.042</td>
<td>1.042</td>
<td>2.73</td>
<td>.006</td>
<td>.012</td>
</tr>
<tr>
<td>Child age</td>
<td>-.074</td>
<td>.929</td>
<td>.86</td>
<td>.390</td>
<td>-.242</td>
</tr>
</tbody>
</table>

Akaike Corrected Information Criterion (AICC) = 4041.91
Bayesian Information Criterion (BIC) = 4051.44
Table 7: Summary of Generalized Linear Mixed Model Analysis Using Parent Self-Rating of Weekly Motivation and SES with Attendance (Covariates Included Parent BMI, Child BMI%, Child Age, Child Depressive symptoms)

<table>
<thead>
<tr>
<th>Model term</th>
<th>Unstandardized</th>
<th>OR</th>
<th>t</th>
<th>p</th>
<th>95% CI</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent self-rating of weekly motivation</td>
<td>-.384</td>
<td>.681</td>
<td>4.23</td>
<td>&lt;.001</td>
<td>-.562</td>
<td>-.206</td>
</tr>
<tr>
<td>Socioeconomic status</td>
<td>-.016</td>
<td>.984</td>
<td>2.16</td>
<td>.031</td>
<td>-.031</td>
<td>-.001</td>
</tr>
<tr>
<td>Child BMI%</td>
<td>-.024</td>
<td>.976</td>
<td>.79</td>
<td>.432</td>
<td>-.085</td>
<td>.037</td>
</tr>
<tr>
<td>Parent BMI baseline</td>
<td>-.024</td>
<td>.976</td>
<td>1.72</td>
<td>.085</td>
<td>-.051</td>
<td>.003</td>
</tr>
<tr>
<td>Child depressive symptoms</td>
<td>.032</td>
<td>1.032</td>
<td>2.27</td>
<td>.024</td>
<td>.004</td>
<td>.060</td>
</tr>
<tr>
<td>Child age</td>
<td>-.108</td>
<td>.898</td>
<td>1.39</td>
<td>.166</td>
<td>-.260</td>
<td>.045</td>
</tr>
</tbody>
</table>

Akaike Corrected Information Criterion (AICC) = 4506.83
Bayesian Information Criterion (BIC) = 4516.53
Table 8: Summary of Generalized Linear Mixed Model Analysis Using Behavioral Coach Motivation Ratings and Family Ethno-racial Minority Status with Child Self-Monitoring (Covariates Included Parent BMI, Child BMI%, Child Age, Child Depressive symptoms)

<table>
<thead>
<tr>
<th>Model term</th>
<th>Unstandardized</th>
<th>Standardized</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\beta$</td>
<td>$\beta$</td>
<td>$t$</td>
</tr>
<tr>
<td>Family ethno-racial minority status</td>
<td>-1.403</td>
<td>-.379</td>
<td>2.17</td>
</tr>
<tr>
<td>Behavioral coach rating of weekly parent motivation</td>
<td>.386</td>
<td>.094</td>
<td>2.41</td>
</tr>
<tr>
<td>Child BMI%</td>
<td>.004</td>
<td>.003</td>
<td>.05</td>
</tr>
<tr>
<td>Parent BMI baseline</td>
<td>-.032</td>
<td>-.054</td>
<td>.93</td>
</tr>
<tr>
<td>Child depressive symptoms</td>
<td>-.035</td>
<td>-.062</td>
<td>.94</td>
</tr>
<tr>
<td>Child age</td>
<td>.169</td>
<td>.058</td>
<td>.82</td>
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</table>

Akaike Corrected Information Criterion (AICC) = 2695.46
Bayesian Information Criterion (BIC) = 2703.98

<table>
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<th>p</th>
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</thead>
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<tr>
<td></td>
<td>β</td>
<td>SE</td>
<td>β</td>
<td>t</td>
<td>p</td>
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<tr>
<td>Family ethno-racial minority status</td>
<td>-1.410</td>
<td>.62</td>
<td>-.381</td>
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<td>.023</td>
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<tr>
<td>Parent self-rating of weekly motivation</td>
<td>.453</td>
<td>.18</td>
<td>.101</td>
<td>2.49</td>
<td>.013</td>
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<tr>
<td>Child BMI%</td>
<td>-.009</td>
<td>.09</td>
<td>-.007</td>
<td>.10</td>
<td>.922</td>
</tr>
<tr>
<td>Parent BMI baseline</td>
<td>-.023</td>
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<td>-.039</td>
<td>.64</td>
<td>.522</td>
</tr>
<tr>
<td>Child depressive symptoms</td>
<td>-.044</td>
<td>.04</td>
<td>-.080</td>
<td>1.21</td>
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<tr>
<td>Child age</td>
<td>.147</td>
<td>.20</td>
<td>.050</td>
<td>.74</td>
<td>.457</td>
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Akaike Corrected Information Criterion (AICC) = 3020.47
Bayesian Information Criterion (BIC) = 3029.22
Table 10: Summary of Generalized Linear Mixed Model Analysis Using Behavioral Coach Motivation Rating with Parental Self-Monitoring (Covariates Included Parent BMI, Child BMI%, Child Age, Child Depressive symptoms)

<table>
<thead>
<tr>
<th>Model term</th>
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<th>Standardized β</th>
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<th>p</th>
<th>95% CI</th>
<th>LL</th>
<th>UL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behavioral coach rating of weekly parent motivation</td>
<td>.450</td>
<td>.22</td>
<td>.109</td>
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<tr>
<td>Child BMI%</td>
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<td>.09</td>
<td>.017</td>
<td>.26</td>
<td>.798</td>
<td>-.154</td>
<td>.200</td>
<td></td>
</tr>
<tr>
<td>Parent BMI baseline</td>
<td>-.031</td>
<td>.03</td>
<td>-.053</td>
<td>1.07</td>
<td>.284</td>
<td>-.089</td>
<td>.026</td>
<td></td>
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<tr>
<td>Child depressive symptoms</td>
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<td>.04</td>
<td>-.113</td>
<td>1.66</td>
<td>.098</td>
<td>-.136</td>
<td>.012</td>
<td></td>
</tr>
<tr>
<td>Child age</td>
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<td>.22</td>
<td>.058</td>
<td>.77</td>
<td>.444</td>
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<td>.600</td>
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</table>

Akaike Corrected Information Criterion (AICC) = 2551.66
Bayesian Information Criterion (BIC) = 2560.07

<table>
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<th>Standardized β</th>
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<th>p</th>
<th>LL</th>
<th>UL</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent self-rating of weekly motiva</td>
<td>.069</td>
<td>.21</td>
<td>.015</td>
<td>.33</td>
<td>.739</td>
<td>-.335</td>
<td>.472</td>
<td></td>
</tr>
<tr>
<td>tion</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child BMI%</td>
<td>.009</td>
<td>.08</td>
<td>.007</td>
<td>.11</td>
<td>.914</td>
<td>-.154</td>
<td>.172</td>
<td></td>
</tr>
<tr>
<td>Parent BMI baseline</td>
<td>-.010</td>
<td>.03</td>
<td>-.017</td>
<td>.35</td>
<td>.724</td>
<td>-.068</td>
<td>.047</td>
<td></td>
</tr>
<tr>
<td>Child depressive symptoms</td>
<td>-.060</td>
<td>.04</td>
<td>-.108</td>
<td>1.68</td>
<td>.094</td>
<td>-.130</td>
<td>.010</td>
<td></td>
</tr>
<tr>
<td>Child age</td>
<td>.242</td>
<td>.20</td>
<td>.083</td>
<td>1.20</td>
<td>.231</td>
<td>-.155</td>
<td>.640</td>
<td></td>
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</tbody>
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Akaike Corrected Information Criterion (AICC) = 2809.10
Bayesian Information Criterion (BIC) = 2817.71

<table>
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<th>Model term</th>
<th>Unstandardized β</th>
<th>SE</th>
<th>Standardized β</th>
<th>t</th>
<th>p</th>
<th>95% CI</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Family ethno-racial minority status</td>
<td>-.321</td>
<td>.34</td>
<td>-.087</td>
<td>.95</td>
<td>.342</td>
<td>-.985</td>
<td>.342</td>
</tr>
<tr>
<td>Parent self-rating of weekly motivation</td>
<td>.440</td>
<td>.18</td>
<td>.098</td>
<td>2.43</td>
<td>.015</td>
<td>.085</td>
<td>.796</td>
</tr>
<tr>
<td>Parent self-monitoring</td>
<td>.652</td>
<td>.05</td>
<td>.653</td>
<td>11.93</td>
<td>&lt; .001</td>
<td>.544</td>
<td>.759</td>
</tr>
<tr>
<td>Child BMI%</td>
<td>-.016</td>
<td>.04</td>
<td>-.012</td>
<td>.39</td>
<td>.695</td>
<td>-.096</td>
<td>.064</td>
</tr>
<tr>
<td>Parent BMI baseline</td>
<td>-.011</td>
<td>.02</td>
<td>-.018</td>
<td>.52</td>
<td>.607</td>
<td>-.051</td>
<td>.030</td>
</tr>
<tr>
<td>Child depressive symptoms</td>
<td>-.011</td>
<td>.02</td>
<td>-.020</td>
<td>.51</td>
<td>.608</td>
<td>-.053</td>
<td>.031</td>
</tr>
<tr>
<td>Child age</td>
<td>-.022</td>
<td>.11</td>
<td>-.008</td>
<td>.20</td>
<td>.840</td>
<td>-.240</td>
<td>.196</td>
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</table>

Akaike Corrected Information Criterion (AICC) = 2348.77
Bayesian Information Criterion (BIC) = 2357.20
Appendix 2: Social Cognitive Theory of Behavior

Behaviors

Environmental Factors

Personal Factors
Appendix 3: Self-Regulatory Feedback Loop

Goal Setting

Self-Monitoring

Self-Evaluation

Self-Consequation
Appendix 4: Depression Subscale of the Brief Symptom Inventory (BSI), presented independently of other items

Here is a list of problems people sometimes have.

*Please read each one and tell us HOW MUCH THAT PROBLEM HAS DISTRESSED OR BOTHERED YOU DURING THE PAST 7 DAYS, INCLUDING TODAY.*

*Choose the answer from the list of options below that best represents how much each problem has distressed or bothered you. Please answer all of the questions.*

1. DURING THE PAST 7 DAYS, how much were you distressed by . . .

<table>
<thead>
<tr>
<th>Problem</th>
<th>Not at all</th>
<th>A little bit</th>
<th>Moderately</th>
<th>Quite a bit</th>
<th>Extremely</th>
<th>I prefer not to answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>9. Thoughts of ending your life</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Feeling lonely</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Feeling blue</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Feeling no interest in things</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35. Feeling hopeless about the future</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50. Feelings of worthlessness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix 5: Center for Epidemiological Studies Depression Scale for Children

Please answer the following questions about yourself

During the PAST WEEK:

<table>
<thead>
<tr>
<th></th>
<th>Not At All</th>
<th>A Little</th>
<th>Some</th>
<th>A Lot</th>
</tr>
</thead>
<tbody>
<tr>
<td>I felt down and unhappy.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I felt like I was too tired to do things.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I felt like something good was going to happen.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I felt like things I did before didn’t work out right.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I felt scared.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I didn’t sleep as well as I usually sleep.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I was happy.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I was more quiet than usual.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I felt lonely, like I didn’t have many friends.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I felt like kids I know were not friendly or that they didn’t want to be with me.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I had a good time.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I felt like crying.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I felt sad.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I felt people didn’t like me.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>It was hard to get started doing things.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix 6: Considerations of Future Consequences Scale

For each of the statements below, please indicate whether or not the statement is characteristic of you.

*If the statement is extremely uncharacteristic of you (not at all like you) please fill-in a “1”.

*If the statement is extremely characteristic of you (very much like you) please fill-in a “5”.

*Use the numbers in the middle (2, 3 or 4) if you fall between the extremes.

Please keep the following scale in mind as you rate each of the statements below.

1=extremely uncharacteristic
2=somewhat uncharacteristic
3=uncertain
4=somewhat characteristic
5=extremely characteristic

Please answer the following:

<table>
<thead>
<tr>
<th>I consider how things might be in the future, and try to influence those things with my day to day behavior.</th>
<th>1 Extremely uncharacteristic</th>
<th>2 Somewhat uncharacteristic</th>
<th>3 Uncertain</th>
<th>4 Somewhat characteristic</th>
<th>5 Extremely characteristic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Often I engage in a particular behavior in order to achieve outcomes that may not result for many years.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I only act to satisfy immediate concerns, figuring the future will take care of itself.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My behavior is only influenced by the immediate (i.e., a matter of days or weeks) outcomes of my actions.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My convenience is a big factor in the decisions I make or the actions I take.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I am willing to sacrifice my immediate happiness or well-being in order to achieve future outcomes.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>I think it is important to take warnings about negative outcomes seriously even if the negative outcome will not occur for many years.</td>
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<tr>
<td>I think it is more important to perform a behavior with important distant consequences than a behavior with less important immediate consequences.</td>
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<tr>
<td>I generally ignore warnings about possible future problems because I think the problems will be resolved before they reach crisis level.</td>
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<tr>
<td>I think that sacrificing now is usually unnecessary since future outcomes can be dealt with at a later time.</td>
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<tr>
<td>I only act to satisfy immediate concerns, figuring that I will take care of future problems that may occur at a later date.</td>
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<tr>
<td>Since my day to day work has specific outcomes, it is more important to me than behavior that has distant outcomes.</td>
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</table>
Appendix 7: Parent Motivation Baseline Assessment

All parents who participate in the treatment study with their children are different. How much do you agree with each of the following statements related to your participation in your child’s treatment?

*Your responses will not affect the treatment you receive in any way.

Please answer the following questions:

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Agree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>My child has to lose weight soon.</td>
<td></td>
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<tr>
<td>I am willing to work on changing my own behavior as it relates to managing my child.</td>
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<tr>
<td>It is very important for the well-being of my family that my child loses weight.</td>
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<tr>
<td>I am prepared to come to the treatment every week for several months to help my child lose weight.</td>
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<tr>
<td>Although the main problem is with my child’s weight, I believe I should come to treatment every week.</td>
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<tr>
<td>It is very important for the well-being of my child that he/she loses weight.</td>
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<tr>
<td>I am willing to change my parenting techniques and try new ones.</td>
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<tr>
<td>I think the benefits of this treatment will be greater than the costs.</td>
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<tr>
<td>I would like my child’s weight to improve.</td>
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<tr>
<td>I am willing to try new parenting techniques even if I think they might not work.</td>
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<tr>
<td>I want to be involved in my child’s treatment at this time point.</td>
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<tr>
<td>My child will experience many negative outcomes in life if he/she does not lose weight.</td>
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<tr>
<td>I am motivated to practice the techniques I will learn in session at home with my child.</td>
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<tr>
<td>I believe that my child cannot lose weight without my involvement in treatment.</td>
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<tr>
<td>My family will experience many negative outcomes in life if my child’s weight does not change.</td>
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<tr>
<td>I am eager to participate in treatment.</td>
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<tr>
<td>I believe that improving my own eating and physical activity can assist my child in losing weight.</td>
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<tr>
<td>I want my child to lose weight.</td>
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<tr>
<td>I am motivated to change the way I reward and punish my child if it will lead to improvement.</td>
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<tr>
<td>I believe that I can learn to help my child lose weight.</td>
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<tr>
<td>I am motivated to participate in my child’s treatment each week.</td>
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<tr>
<td>Participation in this treatment is a top priority in my schedule and that of my child.</td>
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<tr>
<td>I believe that I am capable of learning the skills needed to help my child lose weight.</td>
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<tr>
<td>I look forward to learning new techniques for managing my child’s weight.</td>
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<tr>
<td>I am motivated to come to treatment groups for 2 hours a week in order to improve my eating and physical activity.</td>
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</table>
Appendix 8: Weekly Motivation rating of Parent by Behavioral Coach

Rate parent’s motivation.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>not at all motivated</td>
<td>somewhat motivated</td>
<td>very motivated</td>
<td></td>
<td></td>
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</tbody>
</table>
Appendix 9: Weekly Parent Self-Report of Motivation

How motivated are you to continue FRESH?

<table>
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<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>not at all motivated</td>
<td>somewhat motivated</td>
<td>very motivated</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
References


Ellis, D. A., Berio, H., Carcone, A. I., & Naar-King, S. (2012). Adolescent and parent motivation for change affects psychotherapy outcomes among youth with


low-income minority children. *Journal of Pediatric Psychology, 32*(1); 111-121. doi: 10.1093/ypepsy/jsl007.


Larson, J., Stewart, M., Kushner, R., Frosch, E., & Solomon, B. (2013). Barriers to mental health care for urban, lower income families referred from pediatric primary care. *Administration and Policy in Mental Health and Mental Health Services Research, 40*(3), 159-167.


http://factfinder.census.gov/tableservices/jsf/pages/productview.xhtml?src=CF.


