

Hope as a Predictor of Initial Treatment Response in a Pediatric
Weight Management Program

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ABSTRACT

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The dramatic increase in pediatric overweight and obesity in the last two decades has lead researchers and clinicians to develop a number of treatment interventions. In addition, researchers have also examined individual factors that have been associated with positive outcomes in these weight-loss interventions. The present study was designed to examine an individual factor, hope, and its relationship with outcomes in “Positively Fit”, a weight-management program for children ages seven to seventeen. This study consisted of 73 participants measured for height and weight (to determine BMI percentiles), and who completed a measure of hope. Statistical analyses indicated that hope was not significantly predictive of change in BMI at the conclusion of treatment. Future research would benefit from an evaluation of parent – along with child – hope scores, and from utilizing a state hope scale that is specific to the weight-management context.

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Pediatric obesity is an increasingly widespread problem in both the United States and abroad. According to the International Obesity TaskForce, 10 percent of the world's school-aged population is overweight, and 25 percent of those are obese (Lobstein et al., 2004; Wang & Lobstein, 2006). In the U.S., the prevalence of pediatric obesity is more dramatic, with recent data indicating that over 16 percent of children and adolescents between the ages of 2 and 19 years are obese ($\geq 95^{\text{th}}$ percentile for Body Mass Index [BMI]; American Medical Association [AMA] 2007), and nearly 32 percent are either obese or overweight ($\geq 85^{\text{th}}$ percentile for BMI [AMA 2007]; Ogden et al., 2008). Unfortunately, the obesity rates in the U.S. continue to rise in all age groups. In children 2-5 years-old, the prevalence of overweight or obesity is over 24 percent. For children ages 6-11, the rates of overweight and obesity have increased considerably to 33 percent. In adolescents 12 to 19 years-old, over 34 percent are overweight or obese. Moreover, when considering adolescents specifically, the rate of obesity in the United States has tripled over the last 25 years.

The critical nature of the obesity epidemic has been highlighted by the U.S. Surgeon General, who noted that “overweight may soon cause as much preventable disease and death as smoking” (U.S. Dept of Health and Human Services [DHHS], 2001, p. 12). Furthermore, obesity-related hospital costs specific to children ages 6 to

17 have increased threefold over the last 20 years (Wang & Dietz, 2002), making the reduction in the proportion of the U.S. population that is overweight or obese a primary goal of Healthy People 2010 (U.S. DHHS, 2000). These concerns are further escalated by the greater likelihood that overweight children will become obese adults, thereby causing further health problems later in life (Field et al., 2005).

A number of investigations has demonstrated the association between pediatric obesity and a variety of negative health and mental health outcomes in young people. Health risks for overweight children and adolescents include type 2 diabetes mellitus (58% of diagnosed cases can be attributable to being overweight), cardiovascular disease (hypertension, total cholesterol, etc.), neurological disorders, sleep disorders, fatty liver disease, asthma, and others (Kinugasa et al., 1984; Must & Strauss, 1999; Rashid & Roberts, 2000; Rodriguez et al., 2002; Silverman et al., 1989; Silvestri et al., 1993). Obesity also has been linked to many psychosocial problems and disorders, such as body image concerns, inappropriate compensatory eating behaviors (e.g., purging), lower self-esteem and self-worth, somatoform disorders, anxiety disorders, mood disorders, binge-eating disorder, as well as bullying and victimization problems (Britz et al., 2000; Carpenter et al., 2000).

In response to the negative physical and mental health conditions associated with overweight and obesity, there has been increased development of interventions targeted at promoting healthier lifestyles for children and adolescents in both clinical and community settings. A majority of these interventions include one or more of the following components: medication, nutrition education, exercise education,

behavioral treatment, and surgery (Fowler-Brown & Kahwati, 2004; Jelalian & Saelens, 1999; Reinehr et al., 2003; Young et al., 2007). While pharmacological and surgical options have demonstrated some success in obesity treatment, they also present a variety of inherent dangers (e.g., medication side-effects and complications from surgery; Mitka, 2003; Moran, 1999). In contrast, nutrition programs, exercise programs, and nutrition-exercise combination programs pose less risk for participants and have demonstrated efficacy in treating pediatric overweight and obesity (Epstein, McKenzie, Valoski, Klein, & Wing, 1994; Epstein, Paluch, Gordy, & Dorn, 2000; Moreno, Ochoa, Warnberg, Marti, Martinez, & Marcos, 2008).

Overall, the most efficacious treatments for pediatric obesity utilize a multi-component program (i.e., nutrition and exercise education programs combined with behavioral treatments) (Jelalian & Saelens, 1999). One such multi-component program that has been shown to be especially effective – in both the short and long-term – is Epstein’s “Traffic Light Diet” (TLD; Epstein, 1985; Epstein et al., 2001). The TLD combines nutrition education, physical activity education, and behavioral change techniques (Epstein et al., 2000). Other aspects of successful interventions include the following focus points for families: a family caregiver component to model and control specific eating behaviors, exercise, and physical activity; increased consumption of fruits and vegetables; limited sweetened beverages; and structured daily eating (including meal times and family involvement; Spear et al., 2007).

A number of individual factors has been associated with positive outcomes (i.e. significant or sustained weight-loss) in obesity interventions. Among adults, for

example, Nothwehr and Yang (2007) found goal-setting to be a significant predictor of weight-management. More specifically, they found that participants who set frequent weight-related goals were more likely to follow through with behavioral intervention strategies. Numerous investigations in the adult literature have found similar support for goal-setting strategies as an enhancing component for interventions in the weight management context (Berry et al., 1989; Cullen et al., 2001). Individual motivation levels have also demonstrated significant associations with weight-loss in adult populations. For instance, Herriot and colleagues (2008) found that adult participants who cited more internal motivators were more successful in weight-loss plans than individuals who endorsed more extrinsic motivators. An individual's motivation is important when participating in an intervention because it has the power to affect his/her response in a variety of areas. For example, an individual with a high level of motivation for positive outcomes in an intervention is expected to be more adherent overall – particularly with his/her attendance, self-monitoring, and application of behavioral modifications.

Some individual factors that have predicted positive outcomes for children in obesity interventions include adherence, previous participation in exercise groups, age (older children showing more weight loss), and initial weight loss (Braet, 2006; Germann et al., 2006; Reinehr et al., 2003). More specifically, Germann and colleagues (2006) found better weight-loss outcomes among children who were more adherent to treatment (based on intervention sessions attended) and who had better self-monitoring skills (i.e., observation and recording of target behaviors). In a recent

follow-up investigation, Germann and colleagues (2007) found further support for child and parent self-monitoring skills as predictors of successful weight control in minority children from low-income families. Like Germann and colleagues (2006), Wrotniak and colleagues (2005) found support for adherence (self-reported over a two month span) as a predictor of weight-loss in a family-based behavioral intervention for parents and children.

In contrast to the adult investigations described above, fewer studies have directly examined the concept of goal-setting with interventions targeted for children and adolescents. In one of the few investigations in the literature, Gillison and colleagues (2006) found that British school-children were more likely to engage in exercise behavior if they endorsed intrinsic, as opposed to extrinsic, weight-related exercise goals before exercising. Also, children who endorsed intrinsic goals were more likely to demonstrate self-determined motivation and reported higher quality of life. In a U.S. sample of adolescents seeking treatment for heart conditions, Killen and colleagues (1989) demonstrated a significant decrease in risk-related behaviors (e.g., poor diet and sedentary behavior) for cardiovascular disease using goal-setting strategies that promoted setting specific and proximal change goals. While these investigations provide initial support for the importance of goal-setting among children in the weight-management context, many other aspects of goal-setting (e.g., frequency of goals or the motivation to reach goals) remain to be studied.

Hope

Conceptually, the above mentioned association between goal-setting and treatment outcomes fits within the overall framework of the concept of hope. Hope has been defined by Snyder (2002) as “a positive motivational state that is based on an interactively derived sense of successful (a) agency (goal-directed energy), and (b) pathways (planning to meet goals)” (p. 250). Goals are the foundation of the Hope Theory because they describe a desired future end state. In this regard, nearly all human activity may be considered goal directed (Snyder, 1994). Goal-directedness does not mean that all people pursue goals adaptively. Goals that are too easy to achieve yield little in the way of psychological rewards. Goals that are too difficult may set people up for failure experiences. Even if goals are set in the optimum difficulty level (challenging yet achievable), they may be too complex (compound goals), too vague, or lack specific time lines for completion. Thus, when high-hope individuals are compared to their low-hope counterparts, differences in their goal-setting characteristics are evident. For instance, high-hope people have been found to have (a) more goals, (b) goals that are clearly defined, (c) goals that are challenging yet achievable, (d) goals that are personally meaningful, and (e) goals that have specific time frames (Snyder, 1994).

Similar to goals, pathways are an important component of Hope Theory. According to Snyder (2002), “goals remain but unanswered calls without the requisite means to reach them” (p. 251). Pathways represent a means to an end. In general, people often think about getting from one point to another (especially in general life

goals), and pathways represent the route between the two (Snyder, 1994). High-hope people tend to select more specific and precise pathways in order to give themselves the best opportunities to succeed, whereas low-hope people often have difficulty selecting pathways, and tend to select pathways that are inadequate for their stated goals (Snyder, 1994, 2002). High-hope people also are more successful at developing alternate pathways to implement when routes to goals are blocked. Conversely, low-hope people have difficulty constructing alternate routes and often will become frustrated and distraught when goal-blockages are present.

The third aspect of Hope Theory, agency, can be described as the motivational force that drives a person to continue along a pathway to goal attainment (Snyder, 2002). This motivation can be very basic, triggered by some biological need (e.g., the need for nourishment), or it can also be the driving force behind a more complex goal (e.g., the motivation to get a PhD; Little et al., 2006). In high- as opposed to low-hope people, Snyder (2002) hypothesized that agency is more fluid and consistent throughout goal pursuits. In response to setbacks or frustrations, high-hope people will experience changes in their motivation, but these changes rarely result in giving up on goals. Low-hope people, in contrast, frequently struggle with maintaining motivation under difficult circumstances and may give up on their goals (Snyder, 1994).

The concept of hope has been posited to play an important role in many of life's arenas (Snyder, 1994). Generally, adult research has shown high hope to be associated with a number of benefits in life areas such as academics, physical fitness

and health, and overall psychological adjustment (for a thorough review see Snyder, 2002). In addition, hope has been related to a number of psychological constructs in adults. For instance, higher levels of hope have been related to higher levels of secure and lower levels of insecure attachment (avoidant and preoccupied styles) (Shorey et al., 2005). Moreover, Shorey and colleagues found that hope mediated the relationship between adult attachment and indices of mental health such as depressive symptoms, anxiety, and general positive affect. High-hope adults have reported lower levels of depressive symptoms on the Beck Depression Inventory, and Hope scores have correlated positively with positive affect and negatively with negative affect (Snyder et al., 1991). High-hope adults also have reported greater feelings of confidence, overall life-satisfaction, and self-worth (Chang, 1998; Snyder et al., 1996). Motivational and goal theorists have held that such positive outcomes are a direct result of meeting basic needs and achieving higher-level life goals (Dreikurs Ferguson, 2003). Hope interventions also have been shown to be effective in terms of adult psychotherapy outcomes, including therapy for depression, anxiety, posttraumatic stress, alcohol and drug abuse, and Axis II disorders (Irving et al., 2004).

In children, the components and conceptualization of hope are much the same. Children's hope has been defined as "a cognitive set involving the beliefs in one's capabilities to produce workable routes to goals (the pathways component), as well as the self-related beliefs about initiating and sustaining movement toward those goals (the agency component)" (Snyder et al., 1997, p. 401). Snyder and colleagues (1997)

theorized that children, like adults, rate their own competencies based on their abilities to create and achieve specific goals. Children also experience negative emotions when impediments to goals are encountered, and feel positive emotions when goals are accomplished, especially when an obstacle is overcome in the process (Snyder et al., 1997). Children's attitudes towards goals also guide their self-esteem and sense of self-worth (Snyder et al., 1997). Thus, it is hypothesized that hopeful children believe a goal pursuit is attainable and those positive thoughts raise their self-esteem.

Hope and Health Outcomes

Outside of its influences on emotional well-being, hope has also shown significant effects within the medical context. In fact, hope has demonstrated predictive associations with individuals' responses and coping to a variety of chronic health problems (Cheavens et al., 2005). Explaining these associations, Snyder and colleagues (1997) hypothesized that high-hope people with medical illness would devote their goal-directed thoughts to the various aspects involved in the treatment of their illness. These proactive thoughts may then lead to the implementation of helpful strategies and the prevention of other goal-impediments that could interfere with illness recovery. Among adults, hope has been shown to predict psychological and psychosocial adjustment among breast cancer patients, individuals with visual impairment, familial cancer experiences, and heart failure (Irving et al., 1998; Jackson et al., 1998; Rustoen et al., 2005; Stanton et al., 2000). In college women with familial cancer experiences, higher-hope scores predicted more active, hope-

related coping (Irving et al., 1998). Similarly, among individuals with visual impairment, high-hope scores were associated with more sociable, proactive coping styles and higher levels of self-reported ability (Rustoen et al., 2005).

While less often studied, hope has also been shown to be correlated with medical outcomes among children and adolescents. For example, among adolescent burn victims (aged 13-19 years), hope predicted externalizing behaviors and global self-worth; adolescents reporting high levels of hope demonstrated less disruptive behavior disorders and greater self-worth when compared to a healthy matched peer sample (Barnum et al., 1998). In addition, Maikranz and colleagues (2007) found that hope was related to depressive symptoms and anxiety in a sample of renal and liver transplant recipients between the ages of 7-18 years. Specifically, children with high-hope (and low levels of illness-related uncertainty) were more likely than their counterparts to be adherent to medical regimens after transplantation, provided that they were not reporting depressive symptoms at the time. Similarly, Berg and colleagues (2007) found hope to be a significant predictor of treatment adherence among children 8 to 12 years old diagnosed with moderate to severe asthma. Like Snyder and colleagues (1997), authors from the previous two studies hypothesized that high-hope individuals would adaptively focus goal-directed thoughts on health improvement behaviors (i.e., adherence to medical regimens). Results from their investigations suggest that high-hope individuals may be more likely to set adherence goals, make realistic plans to reach those goals, and be more motivated to create another plan when barriers to adherence arise.

Current Study

Throughout the world, childhood obesity rates are at epidemic levels, and one of the most dramatic rates is presently among children in the United States. Reacting to obesity's association with poor health and mental health outcomes, researchers have designed numerous interventions to address these concerns. Among the variety of interventions, multi-component interventions have demonstrated the most efficacy, and many individual characteristics have been shown to be associated with intervention outcomes. Potentially contributing to the existing literature on individual factors that influence response to obesity interventions, the present study aims to examine the relationship between weight-loss and a self-reported positive psychology construct, hope. Rather than focus solely on children's adjustment to obese or overweight status, or their adherence to treatment regimens, the present study investigates a possible individual factor predictive of health-related change.

As previously reviewed, research has shown goals and motivation levels to be significant contributors in weight-loss interventions. More specifically, studies have demonstrated goal-setting frequency, goal specificity, and effective goal-setting strategies as positive predictors of weight-management in adult populations (Gillison et al., 2006; Killen et al., 1989; Knauper et al., 2005; Nothwehr & Yang, 2007). Among adults, motivation levels have also been associated with positive outcomes in the weight-management context (Herriot et al., 2008). In accordance with the literature discussed above, the construct of hope includes goals, pathways (i.e., routes to goals), and agency (i.e., motivation) within its framework. While previous studies

have examined the weight-related influence of these components separately in adult populations, and suggest a significant relationship between hope and weight-change conceptually (Gillison et al., 2006; Herriot et al., 2008; Killen et al., 1989; Knauper et al., 2005; Nothwehr & Yang, 2007), no study to date has included each of these components together in an examination of a weight-loss intervention for children. An examination of this association is important because it allows researchers to better understand hope in the health and weight-management context. Thus, if hope is found to be a significant predictor of positive outcomes in overweight and obesity treatment, future interventions can be designed to foster hope (and then perhaps more weight-loss) within a multi-component framework.

Specific Hypotheses

Because the present study aims to inform future obesity intervention programs, the outcome variable for this analysis will be body composition (i.e., BMI). Overall, it was hypothesized that total hope scores would significantly predict changes in participants' BMI percentiles through the use of hierarchical regression analyses. More specifically, it was hypothesized that children with high-hope scores would show greater change in their BMI percentile at the end of treatment than their low-hope counterparts, and that this relationship would remain significant when controlling for age, gender, ethnicity, and treatment condition (Enhanced Standard of Care vs. Treatment Group). As stated previously, this hypothesized association is based conceptually on previous work demonstrating associations between goal-setting and agency (i.e., factors similar to hope components), and weight-change.

In addition, it was hypothesized that *change* in total hope scores over approximately 10 weeks would significantly predict change in BMI percentiles. An analysis of this type allowed an evaluation of whether fluctuations in an individual's level of hope is a better (or worse) predictor of BMI percentile change than the dispositional (i.e., trait) construct of hope as measured by total hope scale scores.

Method

The proposed project was approved by the university's internal review board (Human Subjects Committee of Lawrence [HSCL]), and is funded by grant R40 MC 06631 from the Maternal and Child Health Bureau (Title V, Social Security Act), Health Resources and Services Administration, and the Department of Health and Human Services.

Participants

Participants included 94 children ages 7 to 17 from a large Midwestern metropolitan area. Mean age (11.57-years-old) of the sample, along with reported ethnicities, are presented in Table 1. A number of participants were excluded from primary and secondary study analyses because of missing information for study variables at Time 2. Thus, the final sample included 73 participants (33 male, 40 female), with a mean age of 12.7 years. Demographic information indicated that 58 participants reported an ethnicity of European-American/Caucasian, 10 African-American, 4 Latin-American, and 1 other.

Participants for this investigation were recruited through referrals from local pediatricians and school nurses; from an advertisement in a local newspaper; and

from flyers given to various agencies. Individuals were recruited to participate in a randomized clinical trial of a weight-management program, “Positively Fit”, and were included if their body mass index (BMI) was at the 85th percentile or above, as measured by their respective height, weight, age, and gender; if they were between 7 and 17 years of age; and if at least one of their parents agreed to accompany their child to intervention sessions. Participants were excluded if their parents reported that their child had been diagnosed with a serious mental illness or developmental delay. These exclusion criteria were based on the relative cognitive demands of the program. Consent forms were obtained from the parents of all participants.

Procedure

Participants for this study were randomly assigned by a consulting statistician into either a 10 week group treatment condition or an individual enhanced standard care (ESC) condition (3 sessions over 10 weeks). The group treatment condition was based on the Traffic Light Diet (TLD; Epstein, 1985; Epstein et al., 2001), while the ESC condition was based on the Trim Kids weight loss plan (Sothorn et al., 2001). Sessions in the group treatment condition included approximately 40 minutes of behavioral therapy from Master’s level therapists supervised by a Ph.D.-level licensed psychologist; 40 minutes of nutritional education provided by a licensed nutritionist; and 10 minutes of time in which families were given the opportunity to discuss their progress, concerns, and challenges. Families in the ESC condition participated in three 60 minute sessions of nutritional education and were given additional education materials to promote further treatment progress. All sessions were held at the

University of Kansas Child and Family Services Clinic or the University of Kansas Medical Center; participants generally attended sessions that were closest in proximity to their residence. Before either the treatment or ESC conditions began, research assistants conducted in-home assessments with each participating family in order to obtain participants' height and weight, to take an inventory of the food in the home's kitchen, and to allow participants to complete study measures in the comfort of their homes.

Measures

Demographics Form. Demographics for this study included information on participants' and parents' ethnicity, parents' past weight problems, parents' current weight problems, current medications, household monthly income, family mental and physical health conditions, parents' marital status, highest level of education obtained by parents, and previous treatment attempts for weight problems. Parents provided this information during the initial home-visit before treatment.

Children's Hope Scale (CHS; Snyder et al., 1997). The Children's Hope Scale is based on the Trait and State Hope Scales, which were originally aimed to assess two main components of goal-directed thinking: agency and pathways. The CHS is a 6-item self-report instrument designed for children, and is administered with a Likert response continuum ranging from "None of the time" to "All of the time" and is divided into 3 items that measure agency and 3 items that measure pathways. A higher total score on the CHS reflects greater overall hope. The CHS has demonstrated good internal consistency, with Cronbach alphas ranging between .72

and .86 (Snyder et al., 1997); Cronbach alpha for the present study is 0.82. The CHS has also shown consistent test-retest correlations ranging between .71 and .73, while also demonstrating predictive ability with future standardized achievement scores (Snyder et al., 1997). The scale has been shown to correlate positively with parents' reports of their children's hope, children's assessment of their own competencies, and physical self-efficacy, while correlating negatively with feelings of helplessness and depression (Snyder et al., 1997). The established predictive abilities of the Children's Hope Scale (Snyder et al., 1997) points to further utility in predicting psychological functioning, as well as adherence to medical regimes and other interventions (e.g. obesity/nutritional interventions). To date, no gender, age, or ethnic differences have been demonstrated; similarly, no significant differences were found for the current study among demographic measures of gender, age, and ethnicity. Children completed this measure during initial home-visits before treatment, and during the follow-up home-visit after treatment was completed.

Body Mass Index (BMI) Percentiles. BMI is a measure of body composition in which body weight is divided by squared height (Formula: weight (kg) / [height (m)]² or weight (lb) / [height (in)]² x 703). BMI is widely used in obesity research as a reliable measurement of mass (Ogden, Carroll, Curtin, McDowell, Tabak, & Flegal, 2006). Researchers in this investigation used an electronic scale and a stadiometer to measure weight and height, respectively. The outcome measure of interest for this investigation was BMI percentiles, which are calculated based on a child's BMI, age, and gender using Center for Disease Control and Prevention (CDC) norms (Ogden et

al., 2000). Children are considered overweight if they are measured between the 85th and 95th percentile for BMI, and considered obese if they fall at or above the 95th percentile. BMI percentiles are preferred over base BMI levels or standardized BMI (z-BMI) because they allow for more accurate interpretations of a child's weight at specific developmental levels. Children provided these measurements during initial home-visits before treatment, before each session of treatment, and during follow-up home-visits after treatment was completed.

Adherence. Adherence for this sample is based on child participants' completion of treatment homework. Weekly homework consisted of recording the number of fruits and vegetables consumed daily, the daily number of physical activity (PA) calories expended during exercise, and the amount of water (in ounces) consumed each day of the week. Participants were also asked to record whether treatment goals were met for that week, and to record any barriers they had for completing these goals. Adherence rates for this sample represent the total number of treatment goals recorded on goal sheets (range from 0 to 27) during the course of the intervention.

All study measures are included in Appendix A.

Statistical Analyses

Preliminary Analyses. An analysis of categorical demographic comparisons was conducted using one-way ANOVAs, with hope scores and BMI percentiles used as outcome variables. Researchers planned to include any demographic variables that demonstrated significant differences within the sample in further analyses.

Primary Analyses. Multiple hierarchical regression analyses were carried out in order to determine the degree to which various demographic variables and scores on the hope scale predict change in participants' BMI percentile. In Step 1, age, gender, and ethnicity were entered into the regression analysis if preliminary ANOVAs suggested any significant differences within the sample for these demographic variables. Treatment condition (Group Treatment vs. ESC) was entered in Step 1, in order to determine whether change in BMI percentiles varies according to which group participants were randomized to. In order to demonstrate change in BMI percentiles, Time 1 BMI percentiles were entered into Step 2 of the regression, with Time 2 BMI percentiles set as the dependent variable. Hope scores were entered into Step 3 of the equation in order to determine whether Hope significantly predicts observed changes in BMI percentile.

For these analyses, BMI percentiles at Time 2 were based on the last measured BMI percentile the researchers obtained, regardless of whether the participant completed either the ESC condition or the treatment condition in its entirety. In this way, our analyses mirror Intent to Treat analyses recommended by the Food and Drug Administration (FDA) and the National Institute of Health (NIH; Lachin, 2000; Temple & Pledger, 1980). This type of analysis is recommended because it reduces the likelihood of introducing biases that result from post-hoc selections of data subsets, while also limiting an increase in the probability of Type I error inherent in efficacy subset analyses (i.e., designs which exclude incomplete subject data from analyses).

In order to evaluate the study hypothesis that changes in hope will significantly predict changes in BMI percentiles, multiple hierarchical regressions were carried out using the same variables in the first regression analyses; however, initial hope scores used in Step 3 of the first regression analyses were replaced with a variable representing changes in hope scores. This variable for Step 3 was calculated by regressing hope scores at Time 2 onto hope scores at Time 1, and saving the residuals from this regression to be used in the hierarchical regression analyses.

Exploratory Analyses. Based on previous investigations demonstrating the importance of adherence in the examination of hope in health research (Berg et al., 2007; Maikranz et al., 2007), this investigation allowed for an exploratory analysis to test for adherence as a mediator of the relationship between hope and change in BMI percentile. In order to conduct this analysis, multiple regression was used in an attempt to determine whether (1) hope significantly predicts BMI percentile change; (2) hope significantly predicts adherence, such that individuals with higher hope will show higher rates of adherence; (3) adherence significantly predicts change in BMI percentile while accounting for hope's relationship with change in BMI; and (4) the predictive relationship between hope and change in BMI percentile is no longer significant while controlling for adherence.

Effect Size and Participants. In order to determine the minimum number of participants needed in this study to achieve a specific effect size, a literature search was conducted to identify the average effect size in studies of similar design to the proposed investigation. Because the present study is the first of its kind, other studies

demonstrating associations between goals or motivation levels, and successful weight management were analyzed for their effect sizes. Results indicated a wide range of effect sizes for regression ($f=.08$) and correlational ($d=1.7$) analyses (Killen et al., 1989; Nothwehr & Yang, 2007). Associations (i.e., correlations) between hope and other health outcomes were also examined, which demonstrated a wide array of effect sizes (.56 to .899; Barnum et al., 1998; Berg et al., 2007; Stanton et al., 2000).

Based on the wide disagreement in effect sizes from each study evaluated – as well as the differences in study design when compared to similar investigations –the number of participants needed to observe a *medium* effect size (.15 for multiple regression analyses) was calculated. Results indicated that the present study would need between 55 (power of .80) and 89 (power of .95) participants to observe a medium effect size with the proposed number of predictor variables in the primary analyses.

Results

Preliminary Analyses

Multiple ANOVAs were conducted in order to evaluate whether any significant differences were present among demographic variables with respect to total hope scores and BMI percentiles at Time 1. First, results indicated no significant differences in total hope scores or BMI percentiles based on age. Similarly, no significant differences were found in total hope scores, change in hope scores, or BMI percentiles for ethnicity or gender.

Table 1

Means (SD) and Frequencies of Demographic and Primary Study Variables.

Variable	Mean (SD)	Frequency (%)
Age of child	11.59 (2.63)	
Total Hope Time 1	24.30 (6.08)	
Total Hope Time 2	25.85 (5.84)	
BMI Percentile Time 1	98.29 (1.68)	
BMI Percentile Time 2	97.84 (2.27)	
Adherence	16.12 (7.72)	
Ethnicity		
Caucasian		67 (71.3)
African-American		12 (12.8)
Hispanic		5 (5.3)
Asian		0 (0)
Native American		1 (1.1)
Biracial		4 (4.3)
Other		5 (5.3)

Primary Analyses

Hierarchical multiple regressions were conducted in order to test whether total hope scores would be significantly predictive of change in BMI percentile, in addition to the effect of group condition (i.e., treatment vs. ESC) on this same analysis.

Results indicated that child-reported hope was not significantly predictive of BMI percentile at Time 2 beyond the contributions of group condition and BMI percentile at Time 1 (Change statistics: $\Delta R^2=.000$, $\Delta F=.17$. Overall Model: $F(3,77)=207.29$, $p<.001$).

A hierarchical regression also was conducted to determine whether change in total hope scores from Time 1 to Time 2 would significantly predict change in BMI percentiles. Similar to analyses above, results did not suggest a significant

relationship beyond the contributions of group condition or BMI percentile at Time 1 (Change statistics: $\Delta R^2=.000$, $\Delta F=.003$. Overall Model: $F(2,66)=333.94$, $p<.001$).

Exploratory Analyses

Exploratory analyses were proposed to determine whether adherence mediated the relationship between initial hope scores and change in BMI percentile. Based on the absence of a significant relationship between total hope scores and change in BMI percentiles, and between total hope scores and adherence, it was not possible to find significant results using the proposed mediational analyses. Nonetheless, the relationship between hope and adherence was examined outside of the proposed mediational context; results indicated that hope did not significantly predict adherence.

Additional exploratory analyses were conducted to determine whether total hope scores significantly predicted other outcome measures of body composition (e.g., percent change in BMI, percent weight change, etc.). It was hypothesized that other measures of body composition may be beneficial based on the limited variance allowed by BMI percentiles. Nevertheless, total hope was not a significant predictor of change in BMI, change in standardized BMI (i.e., zBMI), change in weight, percent change in BMI, or percent change in weight.

Discussion

The present study aimed to examine the relationship between a positive psychology construct, hope, and participant outcomes (i.e., reduction in body composition) in a pediatric weight management program. Previous research has

demonstrated that the individual components hypothesized to define the construct of hope, are themselves significant predictors of positive outcomes in weight-related interventions. Namely, goal-setting frequency, goal-specificity, effective goal-setting strategies, and motivation levels have all been associated with positive outcomes in the weight-management context (Gillison et al., 2006; Herriot et al., 2008; Killen et al., 1989; Knauper et al., 2005; Nothwehr & Yang, 2007). Building upon these previous findings in adult populations as well as studies in the child literature (Germann et al., 2006; Gillison et al., 2006), it was hypothesized that hope would be a significant predictor of change in body composition (i.e., reduction in BMI percentile) for participants in the current weight-loss intervention. In addition, it was hypothesized that changes in hope would predict significant changes in BMI percentile. Finally, based on previous research demonstrating hope as a significant predictor of adherence within various medical contexts (Berg et al., 2007; Maikranz et al., 2006), an exploratory analysis examining adherence as a mediator of the relationship between hope and change in BMI percentiles was proposed.

Results from study analyses did not support the study hypotheses: hope was not a significant predictor of change in BMI percentile and change in hope did not significantly predict change in BMI percentile. Because hope did not significantly predict change in BMI percentile, the proposed mediational analysis could not be conducted. Exploratory analyses were included to investigate the absence of the proposed relationships in more detail. It was hypothesized that the limited variability in outcome data may have limited the ability of hope to predict change in BMI

percentile to a significant degree. In fact, while hope demonstrated a normal distribution for the study data – with means and standard deviations similar to normative samples (i.e., Snyder et al., 1997) – the distribution of BMI percentiles was considerably leptokurtic. This extreme kurtosis indicates that a majority of participants maintained a BMI percentile at the end of treatment that was very similar to their BMI percentile at initial assessment. Further, the limited variability between hope scores at Time 1 and Time 2 reduced the likelihood in demonstrating *change* in hope as a significant predictor of outcome measures.

In response to the limited variability of BMI percentile at treatment-end, the predictive power of hope with regard to other measures of change in body composition was investigated. Exploratory analyses examined BMI z-scores, percent change in BMI, percent change in weight, and simple changes in BMI and weight (i.e., subtraction of Time 1 BMI or weight from Time 2 BMI or weight). BMI z-scores are advantageous because they are constructed from the same norms that BMI percentiles are constructed from, but they do not have the same limitations at scale extremes that BMI percentiles have. For instance, a 9-year-old boy with a height of 4 feet 6 inches, and a weight of 165 pounds, would have a BMI percentile of 99.9; however, a 9-year-old boy of the same height, who weighs 210 pounds, would have the same BMI percentile. This lack of variability can be attributed to the limitations of BMI percentile at extreme ends of the measurement scale. In contrast, the two individuals mentioned above would have different BMI z-scores (2.81 and 2.91 respectively), because the ceiling for BMI z-scores is more varied. In addition, zBMI

scores did not demonstrate the leptokurtic distribution for the present sample that BMI percentiles did.

Analyses utilizing outcome measures of percent change in BMI and weight, and simple change in BMI and weight, were also conducted. These analyses are limited, because measures of simple change and percent change are not normed for age and gender. Thus, it was necessary to include age and gender in regression analyses, further limiting the amount of variance left to associate with hope scores. Simple change scores (i.e., subtracting Time 1 weight or BMI from Time 2 weight or BMI) are especially limited because they do not necessarily measure the changes in body composition measured by BMI percentiles. For example, a child who does not lose a pound of weight during treatment could still demonstrate a change in BMI percentile based on changes in age and height. While BMI changes with respect to height, it does not change with respect to gender or age. Regardless of the outcome measure used in exploratory analyses, no significant results were found utilizing hope as a predictor of outcome change. In addition, hope was not a significant predictor of adherence (as measured by goal sheets or attendance) outside of the meditational context proposed. As such, a number of additional explanations are given below for nonsignificant findings in primary and secondary analyses.

First, given the nature of the intervention, children's hope in this study may not be related with outcomes as much as parental hope. Parents have a great deal of control over their child's food related behavior, and in many cases they are responsible for every meal that their child has. For example, even if children are

offered lunch at school, parents have the power to send a lunch with their child that represents a healthier choice than normal school offerings, if they have the financial resources to afford this option. This type of stimulus control takes careful planning, motivation, and goal-setting on the part of the child's parents. In turn, if a parent has high levels of hope (which involves planning, motivation, and goal-setting in its framework), they are more likely to carefully plan and set specific goals for their child that will increase the likelihood of their child's success within a weight-loss intervention. While a child's level of hope may be predictive of independent food choices that they make, parental hope may be more predictive of success if a particular parent controls a majority of the food choices in a child's life. In this way, parental goal-setting and motivation (i.e., hope) may be a more powerful predictor among children with less food-related autonomy, as their parents may be more likely to follow treatment protocol (i.e., adherence to recommendations) if they are high in hope. A relationship between high levels of parental hope and high levels of adherence in weight-loss interventions would not be surprising considering the significant relationship previously mentioned between hope and adherence among children in other medical contexts (Berg et al., 2007; Maikranz et al., 2007), and should be investigated in the context of family weight-management programs.

Second, while previous studies had demonstrated a number of components within hope to be significantly related to positive outcomes in weight-related interventions, the present study differed from those investigations in a number of ways. For example, many of the investigations used to support the hypothesized

importance of various goal-setting and motivational components in weight-loss interventions included adults, and not children, within their study samples (Berry et al., 1989; Cullen et al., 2001; Herriot et al., 2008; Nothwehr & Yang, 2007). More specifically, among the adults studies mentioned, Nothwehr and Yang (2007) found that participants who set frequent weight-specific goals were more likely to use behavioral intervention strategies. Similarly, Herriot and colleagues (2008) demonstrated that adults were more successful in weight-loss plans if they cited more internal motivators, rather than external motivators, for weight-loss. In contrast to these adult investigations, the present study assumed that children had motivation and goal-setting aimed specifically at weight-loss, but this was not directly measured. Instead, it is possible that some children may not have demonstrated strong associations with initial hope scores and future outcomes in weight-related interventions as their parents may have served as the primary goal-setters and motivators (i.e., an external motivator) for their success. Therefore, previous studies within adult populations may not provide significant theoretical support for the mechanisms of change proposed in the present investigation.

While researchers have not directly assessed hope theory components among children in weight-loss interventions, they have found a number of significant predictors of positive intervention outcomes that are related to hope including intrinsic weight-related goals and appropriate goal-setting strategies (Gillison et al., 2006; Killen et al., 1989). These components are strongly related to hope as measured in the present study, but some important differences are present. First, weight-specific

goal-setting was not assessed in the present study, nor is it assessed by the Children's Hope Scale; instead, the CHS measures goal-setting behavior in *general*. Second, a global (or trait) measure of hope may not assess a child's intrinsic motivation (i.e., agency) to lose weight. A child may have high levels of motivation to achieve general life goals, but may not have high levels of motivation with regard to their weight specifically. Overall, inaccurate measurement of these hope subcomponents within the weight-loss context may allow for the possibility that a child could report a high level of trait hope while also demonstrating relatively poor outcomes within a weight-loss intervention. In other words, some children may have different levels of self-reported hope in more specific domains (e.g., hope aimed at achieving a healthy weight status), and yet still report generally high levels of hope overall.

In response to the limited utility of hope in certain contexts, some researchers have made a case for the importance of more temporal, or domain-specific, hope scales (Chang, 1998; Feldman & Snyder, 2005; Snyder et al., 1996). For instance, a weight-specific measure of hope may allow the subconstructs within hope to be more descriptive of the goal-setting and motivational processes that children experience in a weight-management program. Participation in such a program is likely to be a very unique experience for children, which may lead to a decrease in predictive power for a child's general, dispositional hope. For instance, it may be the case that children do not fully understand – or become motivationally affected by – the long-term consequences associated with obesity. In turn, some children may not have the weight-specific agency required to have high hope within the context of an obesity

intervention. Nonetheless, these children may have high levels of dispositional hope (or hope for most things in their life), further limiting a possible relation between trait hope scores and outcomes in weight-related interventions. Thus, a measure of a child's weight-related hope may be more predictive of weight-related outcomes.

Nonsignificant changes in hope scores between Time 1 and Time 2 also were demonstrated within the present study. However, the intervention in this investigation did not explicitly attempt to increase levels of hope. It was hypothesized that increases in hope would be a secondary benefit as children were taught goal-setting and problem-solving skills, but it may be the case that a child's *general* hope would not increase over the short 10-week intervention period. It may also be the case that a child's general hope would not increase in response to perceived success in a specific domain. Instead, a more domain-specific measure of hope may show more variability over time within the context of a weight-specific intervention.

Conclusions

Results suggest that children's hope, as currently measured by the CHS, may not be significantly related to outcomes in a pediatric weight-management intervention. In addition, results suggest that children's hope may not significantly predict children's adherence in a weight-loss treatment program.

However, future research would benefit from addressing a number of study limitations. First, given the importance of parental behavior on child weight loss (Janicke et al., 2007) parental hope should be assessed in order to determine if it is predictive of outcomes in weight-loss interventions, or if it has meditational or

moderational effects on other relationships in this study. An analysis of this type may help researchers and professionals determine appropriate areas of focus if parents have difficulties following treatment protocol, and it may also point to particular areas within hope that are more powerful predictors of change. Second, future studies would benefit from including separate measures of goal-setting and motivation, as these concepts have yet to be directly measured within pediatric obesity intervention research, and may provide beneficial comparisons to hope.

Third, state hope levels and domain-specific hope levels should be measured at initial assessment, and throughout the intervention process, to elucidate the effects of hope-change within the weight intervention context. To date, however, measures of children's state hope and domain-specific hope have not been published in peer-reviewed journals, but are being developed in a number of research labs in the United States. For example, Rose and colleagues have demonstrated initial support for a measure of academic hope, or hope specific to the school context (see Rose, 2007 for initial dissertation research on the measure). In addition, Woodruff and colleagues have developed a domain-specific hope scale for children that is intended to measure hope in six different domains (friendships, academics, leisure, health, safety, and family; see Woodruff, 2002 for dissertation research). Finally, it may also be the case that hope would demonstrate a more robust relationship with treatment outcomes if provided with greater variability and a longer time-frame than was available with the current study. While the present intervention was aimed at increasing appropriate health behavior in children to promote weight loss, significant changes in outcome

data (i.e. BMI percentile) may take longer than the ten weeks included in the “Positively Fit” program. Therefore, longitudinal analyses of the study variables of interest may be more appropriate.

Results from the present study contribute to a growing research base on the relationships of a positive psychology construct, hope, within the pediatric context. This study also adds to previous research within pediatric psychology and obesity interventions in general. Future research would benefit from including hope in intervention studies that have shown more variability in participant response, as well as addressing the study limitations mentioned above.

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Appendix

Facts about You

This information will be used to describe the participants of the study.

Date: _____ Form Completed by _____

Name: _____ Phone (home) _____ (work) _____

Address: _____
Street

_____ City State Zip Code

Child's Name: _____ Date of Birth ____ / ____ / ____ Grade _____

School _____ Gender _____

What is your relationship to the child in the pediatric weight management intervention?

_____ Mother _____ Father
_____ Other (please specify) _____

What is your current marital status?

_____ married, living together _____ not married, living with partner
_____ married but separated _____ single, never married
_____ divorced _____ widowed

Estimated gross monthly income: \$ _____

What is your current age? _____ Spouse's current age (if applicable) _____

Your height: _____ Your spouse's height: _____

What level of school have you completed?

_____ some high school
_____ high school graduate
_____ attended college
_____ junior college or vocational school graduate (for example, associate's degree)
_____ college graduate (for example, bachelor's degree)
_____ post-graduate work
_____ graduate degree

What level of school has your spouse completed? (if applicable)

_____ some high school
_____ high school graduate

- _____ attended college
- _____ junior college or vocational school graduate (for example, associate's degree)
- _____ college graduate (for example, bachelor's degree)
- _____ post-graduate work
- _____ graduate degree

Do you feel that **you** currently have a weight problem? Y or N

Do you feel that **your spouse** currently has a weight problem? Y or N

Have **you** ever had a weight problem? Y or N

Has **your spouse** ever had a weight problem? Y or N

How would you describe **yourself**, choosing one from these categories:

- _____ white, not Hispanic _____ Native American
- _____ black, not Hispanic _____ Asian or Asian-American
- _____ Hispanic _____ Other

How would you describe **your spouse** (if applicable), choosing one from these categories:

- _____ white, not Hispanic _____ Native American
- _____ black, not Hispanic _____ Asian or Asian-American
- _____ Hispanic _____ Other

How would you describe **your child**, choosing one from these categories:

- _____ white, not Hispanic _____ Native American
- _____ black, not Hispanic _____ Asian or Asian-American
- _____ Hispanic _____ Other

With whom does the child live?

- _____ birth parents
- _____ adoptive parents
- _____ foster parents
- _____ Other (specify) _____

List all other persons living in the home:

<u>Age</u>	<u>Gender</u>	<u>Relationship to child</u>	<u>History of Weight Problem</u>
_____	_____	_____	y / n
_____	_____	_____	y / n
_____	_____	_____	y / n
_____	_____	_____	y / n

List any other people who care for the child a significant amount of time

Mental Retardation										
Learning/Attention Problems										
Suicide/Suicide Attempt										
Other (Specify)										

Is your child currently on any medications ? Y or N

If Yes, Please list:

Name of Medication

Reason for Medication

_____	_____
_____	_____
_____	_____
_____	_____

How did you hear about this intervention for weight management?

- _____ KUMed
- _____ Flyer
- _____ Newspaper Ad
- _____ Other(specify)_____

Previous Treatment/Interventions: _____

Children's Hope Scale (CHS)

Directions: The six sentences below describe how children think about themselves and how they do things in general. Read each sentence carefully. For each sentence, please think about how you are in most situations. Place a check inside the circle that describes YOU the best. For example, place a check (✓) in the circle (O) above "None of the time," if this describes you. Or, if you are this way "All the time," check this circle. Please answer every question by putting a check in one of the circles. There are no right or wrong answers.

1. I think I am doing pretty well.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
None of the time	A little of the time	Some of the time	A lot of the time	Most of the time	All of the time

2. I can think of many ways to get the things in life that are most important to me.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
None of the time	A little of the time	Some of the time	A lot of the time	Most of the time	All of the time

3. I am doing just as well as other kids my age.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
None of the time	A little of the time	Some of the time	A lot of the time	Most of the time	All of the time

4. When I have a problem, I can come up with lots of ways to solve it.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
None of the time	A little of the time	Some of the time	A lot of the time	Most of the time	All of the time

5. I think the things I have done in the past will help me in the future.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
None of the time	A little of the time	Some of the time	A lot of the time	Most of the time	All of the time

6. Even when others want to quit, I know that I can find ways to solve the problem.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
None of the time	A little of the time	Some of the time	A lot of the time	Most of the time	All of the time