The Pennsylvania State University

The Graduate School

College of Health and Human Development

ADAPTED GROUP LIFESTYLE TRIPLE P:

RESULTS FROM A RANDOMIZED PILOT INTERVENTION TRIAL

A Thesis in

Human Development and Family Studies

by

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Submitted in Partial Fulfillment
of the Requirements
for the Degree of

Master of Science

December 2014

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ABSTRACT

This study evaluated the effectiveness of a lifestyle-specific parenting program for the treatment and prevention of childhood obesity. The program aims to change parents' confidence in their parenting practices and ability to manage their child's lifestyle behaviors, and by extension, the child's lifestyle behaviors, psychosocial adjustment, and body size. A pilot randomized trial was conducted in two central Pennsylvania communities with 36 families of mostly overweight and obese 5- to 13- year-old children. The trial aimed to test against a delayed-intervention control group the Australian *Group Lifestyle Triple P* (GLTP) intervention, which was adapted for the implementation with an American audience and through community settings. Results of pre-post and effect size analyses of the parent and child outcomes showed that the adapted GLTP (a-GLTP) generally demonstrated improvements in parent confidence, parenting practices, child psychosocial adjustment, and child BMI z-scores. Mediation analyses indicated that GLTP operated indirectly on parents' concern about child weight and child's hyperactivity through changes in parent confidence. Overall, the results of this pilot study support the effectiveness of the a-GLTP for American families in central Pennsylvania and suggest that parent influences treatment outcomes. The findings will inform future larger-scale effectiveness trial to establish long-term effectiveness of the intervention.

Keywords: childhood obesity, healthy lifestyle, cultural adaptation, parenting, Triple P

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Introduction

The Childhood Obesity Epidemic

Childhood obesity is a serious public health problem worldwide that places a heavy burden on society (McGuire, 2014). In the United States, the prevalence of obesity among school-age children and adolescents has tripled since the 1980s (Ogden, Carroll, Curtin, Lamb, & Flegal, 2010) and remains high at 17% (Ogden, Carroll, Kit, & Flegal, 2014). A recent national estimate of trends in childhood obesity showed that 34% of children ages 6-11 years were classified as overweight or obese, of whom 18% were obese (Ogden et al., 2014).

Overweight and obese children face increased risk for medical comorbidities such as hypertension, hypercholesterolimia, type II diabetes, and asthma, as well as psychosocial sequelae such as low self-esteem, social isolation and discrimination, and depression (Pulgaron, 2013). Moreover, childhood obesity tracks into adulthood (Deckelbaum & Williams, 2001) and can severely compromise the duration and quality of life of children who are overweight or obese (Ebbeling, Pawlak, & Ludwig, 2002). Given the gravity of the childhood obesity epidemic, the development and dissemination of effective prevention and intervention programs for childhood obesity are of high priority (McGuire, 2014).

Environmental and lifestyle factors have been strongly implicated in the development and maintenance of childhood weight problems. Excess weight in children has been associated with low consumption of fruits and vegetables (Margarey, Daniels, Boulton, & Cockinton, 2003), high consumption of low-nutrient, calorie-dense food prepared away from home (Guthrie, Lin, & Frazao, 2002), high consumption of sugar-sweetened beverages (Nielsen & Popkin, 2004), low

levels of physical activities (Trost, Kerr, Ward, & Pate, 2001), and high levels of sedentary activities such as television-viewing (Andersen, Crespo, Bartlett, Cheskin, & Pratt, 1998). Young children develop these obesity-related dietary and activity patterns (lifestyle behaviors) within the context of the family environment (Davison & Birch, 2001).

Because parents and adult caregivers primarily control the nutrition and physical activity pattern of the family in which children's dietary and activity patterns evolve, parents' willingness and ability to monitor and manage their children's eating and activity choices have been linked with children's weight (Davison & Birch, 2001). Parents affect children's dietary and activity patterns through both modeling healthy behaviors and arranging the family environment in a manner that promotes healthy eating and activity (Davison & Birch, 2001). In addition, parenting styles and practices in both the general and lifestyle-specific domains have been linked to child lifestyle behaviors and weight status. A recent review of the literature found that an authoritative parenting style is associated with healthy lifestyle behaviors, and thus is protective against overweight and obesity; in contrast, indulgent or permissive styles were associated with unhealthy lifestyle behaviors and increased risk for overweight and obesity (Vollmer & Mobley, 2013). Furthermore, parents' anxiety about their children's weight and the use of restrictive feeding practices have been linked to the impairment of children's self-regulation, thereby increasing risks for disordered eating behavior, such as binge-eating (Costanzo & Woody, 1985).

Parents of overweight and obese children may face heightened challenges in raising healthy children. In research studies, parents of overweight and obese children reported lacking confidence in their abilities to address or manage their child's lifestyle problem behaviors compared to parents of healthy weight children (Borra, Kelly, Shirreffs, Neville, & Geiger, 2003; Walsh Pierce & Wardle, 1997; West & Sanders, 2009). They also reported less knowledge about

how to introduce lifestyle changes to their family, and less access to helpful and practical information from health care providers (Barlow, Trowbridge, Klish, & Dietz, 2002; Jelalian, Boergers, Alday, & Frank, 2003; Story et al., 2002).

Since parents, parenting competence and practices, and family environment all play a prominent role in the development and maintenance of the child's behaviors and health outcomes, intervention efforts for childhood overweight and obesity need to address both the issues of lifestyle behaviors and parenting quality. The intervention described in the present thesis represents the confluence of these two separate traditions of interventions involving child well-being: childhood obesity and parenting.

Family-Based Childhood Obesity Interventions

The first intervention tradition to be examined is childhood obesity intervention. Over the past four decades, family-based approaches have become well-established in the literature for addressing child weight problems (Sung-Chan, Sung, Zhao, & Brownson, 2012). These approaches, a majority of which are based on theories rooted in behavioralism (Bandura, 1977, 1989, 1995, 1997), aim to reduce the risk of childhood obesity through the adoption of healthy lifestyle behaviors (i.e. prescribed plan for diet and exercise, behavior modification techniques). By aiming to change the social environment that shapes behaviors and risk factors, family-based interventions represent an opportunity for long-term changes in child lifestyle and weight outcomes. Meta-analyses show that multicomponent family-based interventions were associated with medium effects (Cohen's d = 0.60 to 0.75) on short-term improvements in child body size, compared to standard care or no treatment control conditions (Wilfley et al., 2007; Young, Northern, Lister, Drummond, & O'Brien, 2007).

Historically, these family-based interventions have conceptualized "family" as the target child and at least one parent. Over the past few decades, however, the particular nature of the child's and parent's roles has evolved into two perspectives. The earlier "child-focused" approach considered the overweight or obese child to be the agent-of-change and the parent as the child's partner or supporter who functions to increase the effectiveness of the child's behavioral modification efforts (Epstein, 1996; Epstein, McKenzie, Valoski, Klein, & Wing, 1994; Epstein, Paluch, Kilanowski, & Raynor, 2004; Epstein, Roemmich, & Raynor, 2001; Nemet et al., 2005; Oude Luttikhuis et al., 2009; Summerbell et al., 2003). By contrast, the newer "parent-focused" approach targets the parent as the sole agent-of-change and incorporates new intervention components on parenting skills and child management styles.

The efficacy of the child-focused family-based intervention is well-established in the literature. Supporting studies typically involved parents and children—thought children were still treated as the main agent-of-change – and demonstrated superior outcomes in child eating and physical activity behavior change and weight loss as compared to child-only treatments that did not involve the parents. In an early study of a 16-month controlled trial with 42 obese 12- to 16-year-old adolescents, Brownell, Kelman, and Stunkard (1983) found that treating mothers and child separately in parallel programs produced greater weight loss compared to treating mothers and child together and compared to treating the child only. The authors suggested that parental support that also allows for a certaind degree of child autonomy and personal responsibilty can be an important asset for family-based interventions targeting child weight problems. Another study pooled data from 158 children across four randomized studies (Epstein, Valoski, Wing, & McCurley, 1994), and also demonstrated superior long-term (10-year) effectiveness when

children and parents were targeted and reinforced for weight loss compared to child-only treatment and general-information controls.

Despite promising early results, the child-focused approaches were unable to help many of the treated children to achieve normal weight status after the intervention (Epstein et al., 1994) and suffered from substantial attrition (Golan, 2006) and relapse rates (Haddock, Shadish, Klesges, & Stein, 1994). The child-focused treatments also had several drawbacks related to the risks of practicing dietary restriction including nutrient deficiency (Gehling, Magarey, & Daniels, 2005; Ikeda & Mitchell, 2001), preoccupation with food and appearance that may leads to disordered eating, and low self-esteem due to weight-based stigmatization (Hill, 1993; Hill, Draper, & Stack, 1994, Braet, 1999). Furthermore, the excessive restriction of a child's food intake may also limit the child's ability to learn self-regulation skills (Costanzo & Woody, 1985) that would facilitate long-term dietary change.

In response to these challenges, the parent-focused approach emerged as an alternative to the earlier child-focused approaches to family-based intervention for childhood overweight and obesity. This shift to a focus on the role of parents as the agents of change (Faith et al., 2012) reflects the recognition that parents play the primary role in creating the home and family environments that shape children's knowledge, attitudes, and practices around eating and physical activity (Davison & Birch, 2001). Golan and Weizman's (2001) conceptual model of the parent-focused family lifestyle intervention (which excludes treatment of the child) consists of three components. The first component is the parental cognitive and behavioral change, achieved through increasing parents' skills and self-efficacy specific to healthy eating and to general parenting practices (i.e. reframing problems to avoid blaming the child for weight problems; recognizing parental role in providing environment conducive to healthy behaviors;

using general positive parenting skills such as praise, effective parent-child communication, and problem solving). The second component is changing the home environment to foster healthy lifestyle behaviors (e.g., making available healthy foods and opportunities for physical activity, having regular family meals, and reducing environmental stimulus for overeating and sedentary activity). The third component is parental modeling of healthy lifestyle behaviors (Bandura, 1977). Because parents serve as children's models for lifestyle behaviors, parents are taught to present healthy eating and physical activity styles in the home and external social environment.

Early research on the parent-focused treatment model supports the importance of bolstering parents' parenting skills and self-efficacy for helping their child to achieve and maintain a healthy lifestyle behaviors and body size. In an evaluation of an eight-week multicomponent behavioral weight reduction program with 33 overweight 8- to 12-years-old children and their parents, Israel, Stolmaker, and Andrian (1985) showed that incorporating two parenting-skills training sessions focused on parenting style and general child management skills resulted in the child's improved long-term (1-year follow-up) maintenance of weight loss compared to the group that underwent a traditional, child-focused treatment, and compared to the waitlist control group. Similarly, Graves and Meyers (1988) found, in a slightly larger study using an eight-week family-based program with 40 families with obese 6- to 12-years-old children, that the group that underwent a structured parental problem-solving training experienced improved child weight loss at post-intervention and 6-month follow up compared to the group that underwent a behavioral weight-reduction methods or a diet and exercise instruction-only method.

More recent advancements in parent-focused approach, led primarily by Golan and colleagues, have advocated for parent-only treatments that completely excluded the child from

the treatment (Golan & Crow, 2004; Golan, Kaufman, & Shahar, 2006). Studies in this perspective purport that the parent-only treatment is more desirable than both the child-only treatment and the parent-and-child treatment model. In their one-year longitudinal prospective study of sixty 6- to 11-years-old obese children, Golan, Fainaru, and Weizman (1998) found that the 14-session parent-only treatment was more effective for producing both weight reduction and healthier food consumption patterns compared to the conventional 30-sesssion child-only treatment (Golan, Fainaru, et al., 1998; Golan, Weizman, et al., 1998). The researchers subsequently found that the parent-only treatment also induced greater decrease in the parents' own cardiovascular risk factors of dyslipidemia and elevated insulin levels (Golan, Weizman, & Fainaru, 1999), and produced superior effect on mean child weight reduction at 7-year follow-up (Golan & Crow, 2004). Furthermore, Golan and colleagues (2006) found in their randomized evaluation trial of a parent-only and a parent-and-child six-month comprehensive healthy lifestyle education program with 32 families of obese 6- to 11-year-old children that the parent-only condition resulted in significant reduction in percent overweight at post-intervention and 1-year follow-up while the parent-and-child condition did not. The parent-only group also showed a significant reduction in unhealthy food stimuli at home. The results of these studies suggest that omitting the child from active participation in intervention may be beneficial for the promotion of healthy lifestyle and weight loss in these children (Golan et al., 2006).

Aside from treatment efficacy, additional benefits have been cited for the parent-focused interventions that involve only the parent. Since no child session is required, the parent-only treatment approach benefits from cost-efficiency due to reduced therapeutic demands on clinicians (Janicke et al., 2009). Additionally, this approach may show improved maintenance of results compared to the child-focused approach since children are more likely to adopt

sustainable eating and activity patterns when the parents make a whole-of-family change (Golan, Weizman, Apter, & Fainaru, 1998). Furthermore, the focus on improving the parenting and family environment may have additional long-term and wide-reaching benefits (child psychosocial adjustment, family interactions, etc.) given the extensive influence that parents exert on multiple domains of the child's development (Collins, Mccoby, Steinberg, Hetherington, & Bornstein, 2000).

Behavioral Family and Parenting Interventions

The second intervention tradition—parenting interventions—has been evolving separately from the childhood obesity intervention tradition. The development of behavioral family and parenting interventions stems from a theoretical analysis of the contingencies in the parent-child interactions (Skinner, 1953). According to this theory, parents influence children's behavior through positively reinforcing consequences (e.g. attention, praise, rewards) or through punishing consequences (e.g. removal of privileges, "time out"; Taylor & Biglan, 1998).

The core of the behavioral family intervention has been training parents in child management strategies derived the social learning principle (Patterson, 1982). Parents are guided and encouraged to increase positive interactions with children, use praise and reward for appropriate behaviors, and apply consistent, mild punishment for discipline situations (Taylor & Biglan, 1998). As the field of behavioral family and parenting intervention progressed, additional components aimed at enhancing family protective factors and reducing risk factors associated with severe behavioral and emotional problems in children were added. Thus, the model of parent training in child management evolved into the model of parenting skills intervention, the latter of which focused on increasing parents' competence in managing their children's problem behaviors (Taylor & Biglan, 1998). This approach to the treatment and prevention of childhood

disorders, particularly conduct problems, has had the strongest empirical support among interventions for children (Kazdin, 1987; Taylor & Biglan, 1998; Webster-Stratton & Hammond, 1997).

A particular form of behavioral family intervention that evolved from this tradition is the Triple P-Positive Parenting Program (Triple P), a multilevel system of parenting and family support developed and evaluated primarily in Australia as public health approaches to preventing and managing social, emotional, and behavioral problems in children (Sanders, 1999, 2008). All forms of Triple P are based on the social learning theory (Bandura, 1977), with a particular focus on parental self-efficacy. Self-efficacy refers to "a person's belief in his or her capabilities to organize and execute the course of action required to manage prospective situations" (Bandura, 1995). It is recognized as an important determinant of motivation as reflected by the amount of effort exerted in the extent of perseverance in face of obstacle (Bandura, 1989). Self-efficacy can be assessed on three levels: a global or general level without reference to specific tasks or condition; an intermediate level with reference to a range of performance in a particular domain, such as parenting; and a specific level with regards to self-efficacy for particular tasks under specified conditions. According to Bandura (1997), task-level self-efficacy may be more predictive of actual performance because specific self-efficacy beliefs guide behaviors and dictate how well activities are performed (Bandura, 1997, in Sanders & Woolley, 2005, p. 66).

When applied to the domain of parenting, self-efficacy refers to the parent's confidence and belief that he or she can overcome or solve a parenting or child management problem. Research shows that parental self-efficacy is associated with parenting behaviors and child adjustment (Coleman & Katherine Hildebrandt, 2000; Jones & Prinz, 2005). Therefore, Triple P

aims to increase parenting self-efficacy through teaching parents skills for managing their children's specific problems behaviors (i.e. noncompliance, tantrums) and use preemptive strategies that enable parents to plan, anticipate, select appropriate activities, and encourage desirable behaviors at high-risk times (Sanders & Woolley, 2005).

Group Lifestyle Triple P

Uniquely positioned at the junction of the two evolving traditions of the childhood obesity intervention and the parenting interventions, *Group Lifestyle Triple P (GLTP)* is a relatively new parent-focused family-based lifestyle intervention for childhood overweight and obesity. GLTP is a selective, time-limited group therapy for parents of overweight and obese children between 4 and 11 years of age (West & Sanders, 2010). In the treatment literature, GLTP is one of the few existing evidence-based programs designed to reduce childhood obesity specifically through changes in parenting (Sung-Chan et al., 2012).

The theoretical core of GLTP lies in parenting self-efficacy--or confidence-- specific to managing the child's lifestyle behavior problems (i.e. eating too much junk food, refusing to participate in physical activity). Higher levels of maternal lifestyle-specific self-efficacy has been associated with healthier dietary and activity behaviors in the children and the family, and thus may be protective against excess weight (Campbell, Hesketh, Silverii, & Abbott, 2010; Chang, Brown, Baumann, & Nitzke, 2008). Therefore, GLTP aims to improve parents' lifestyle-specific parenting self-efficacy by teaching parents positive parenting skills (i.e. spending quality time with children; frequent praising and rewarding of positive behavior; effective, consistent limit-setting) and the application of these skills to more effectively managing children's eating, physical activity, and social, emotional, and behavioral problems. The program also teaches parents to prevent problems and encourage healthy behaviors through rearranging the family

environment, modeling healthy behaviors, and rewarding healthy choices. As depicted in the GLTP logic model in Figure 1, providing positive parenting strategies for managing child lifestyle behaviors is predicted to improve lifestyle-specific parenting self-efficacy (operationalized in this program as parents' self-reported confidence in managing children's lifestyle behavior problems), which will lead to reduced reliance on ineffective parenting practices (i.e. harshness, permissiveness, restricting) in both lifestyle-specific and general parenting domains. As a result, children's problem behaviors will diminish, leading to a reduction in excess weight.

GLTP is delivered as nine 90-minute weekly group sessions over the course of 12 weeks. During these facilitator-led group sessions, brief didactic presentations are alternated with group discussion, DVD and live demonstrations of parenting skills, rehearsal of skills using role-plays and peer modeling, and small group problem solving exercises. Participating parents also receive the take-home materials *Lifestyle Triple P Group Workbook*, *Lifestyle Triple P Active Games Booklet,* and *Lifestyle Triple P Recipe Booklet,* which provide descriptions of the information and strategies presented during the sessions and suggested homework tasks for parents to practice new skills on their own between the group sessions. In addition, parents participate in three weekly 20-minute phone sessions in which facilitators helped parents review their progress individually and problem-solve any barriers encountered in trying to implement new skills. Table 1 presents an overview of the GLTP curriculum and sessions.

Currently, the evidence base for GLTP is promising but small. In a randomized controlled efficacy trial with 101 families of 4- to 11-year-old overweight and obese children in Brisbane, Australia (West, Sanders, Cleghorn, & Davies, 2010), GLTP was shown to significantly increase parents' confidence in their abilities to managing child weight-related

issues, reduced dysfunctional parenting practices, and reduced children's lifestyle behavior problems and BMI z-score compared to baseline and to waitlist control. The intervention effects were maintained with additional improvements in child BMI z-score at the 1-year follow-up. In a review on family-based approaches to childhood obesity, GLTP was ranked as the top program in terms of efficacy and evaluation rigor among the randomized controlled trial studies of behavioral-approaches to family-based lifestyle interventions with parent education (Sung-Chan et al., 2012). The efficacy trial was also the only study to document changes in parenting style in conjunction with changes in child lifestyle behaviors and body size (West et al., 2010).

No other published studies have yet replicated the results of GLTP results in additional samples of families. Gerards and colleagues (2012) published a study plan of a randomized controlled trial that attempts to replicate the results of the efficacy trial in Dutch population. This study compares an extended 14-week GLTP program with an active control group that receives self-study materials such as brochures, web-based tailored advice, and suggestions for exercises to increase active playing at home (Gerards et al., 2012). Thus far, these Dutch researchers have made progress in producing the translation and validation of the instrument Lifestyle Behaviour Checklist in the Dutch population (Gerards, Hummel, Dagnelie, de Vries, & Kremers, 2013). More efforts to replicate the results and establish the efficacy of GLTP are needed, given the dearth of efficacious, evidence-based approaches to childhood obesity prevention, especially for middle childhood (Oude Luttikhuis et al., 2009; Stice, Shaw, & Marti, 2006).

Moreover, the effectiveness of GLTP in real-life community settings has not yet been established. In the original efficacy trial in Brisbane, Australia (West et al., 2010), all sessions were delivered by a trained psychotherapist and a program co-author to a relatively homogenous population of mostly middle- to high-income, highly educated Caucasian mothers. Whether

GLTP will be effective in a community setting under less-controlled conditions needs to be tested in community-level dissemination trials. A coordinated infrastructure in the community is needed to support high-quality delivery of evidence-based interventions and to produce changes on sufficiently broad scale in order to yield meaningful public health impacts (Bumbarger, Perkins, & Greenberg, 2010). The university-community partnership model Promoting School-Community-University Partnerships to Enhance Resilience (PROSPER) network is one such infrastructure. Originally established through a large trial funded by the National Institute of Drug Abuse, PROSPER is now an on-going, self-sustaining, type II translational initiative that serves to deliver evidence-based interventions within communities throughout Pennsylvania and Iowa (Spoth & Greenberg, 2005). The Pennsylvania PROSPER is led by the Penn State Cooperative Extension Services (CES) and serves as a prevention delivery infrastructure in several Pennsylvania communities. The PROSPER communities form teams comprised of local stakeholders, are led by CES educators, and have expertise in community mobilization, family recruitment, implementation fidelity, and program evaluation (Spoth, Guyll, Lillehoj, Redmond, & Greenberg, 2007). The university-community partnership structure, such as the CES, has demonstrated significant potential for disseminating childhood obesity interventions in rural, medically-underserved communities (Janicke et al., 2008). Therefore, PROSPER may provide a promising infrastructure support for infusing GLTP into communities and promoting engagement and sustainability.

The present study aimed to address the challenges of family-based childhood obesity interventions through replicating the efficacy of GLTP in the United States. Specifically, the evidence-based GLTP intervention was adapted for an American audience and partnership was formed with the PROSPER network to implement the adapted GLTP (a-GLTP) in two central

Pennsylvania locations. This study had three aims. The first aim was to determine the feasibility and acceptability of the a-GLTP for implementation in community settings with American families. The second aim was to evaluate using a randomized waitlist control design the effectiveness of a-GLTP for improving parents' lifestyle-specific parenting self-efficacy, parenting practices in the general and lifestyle-specific domains, children's lifestyle behavior problems and psychosocial adjustment, and children's body size. The third aim was to test whether changes in lifestyle-specific parenting self-efficacy mediated changes in parenting practices and child outcomes. To date, no other studies on the Triple P intervention have examined the underlying theory of change in which the intervention influences parental behaviors and child outcomes mediated through parenting self-efficacy. Yet, studies suggest that mothers' task-specific self-efficacy may mediate weight-management attitudes and behaviors (Chang et al. 2008). Therefore, GLTP's mechanisms of action needs to test the key underlying theory that parenting self-efficacy enables parents to practice positive parenting around their children's eating, physical activity, and social and emotional behaviors, and can lead to improved child behaviors, adjustment, and health outcomes.

In order to address the three aims, the present study tested five hypotheses. (1) First, it was hypothesized that the version of GLTP adapted for an American audience would be useful and acceptable to American families. (2) Second, a-GLTP would be successfully embedded into the community setting of PROSPER, representing a more ecologically-valid intervention model. (3) Third, compared to parents in the waitlist control group, the parents in the a-GLTP group would show improvements in self-reported confidence in their abilities to manage child lifestyle behavior problems, attitudes toward child weight, and in dysfunctional feeding and general parenting practices. (4) Fourth, children whose parents participated in a-GLTP would have

improvements in their lifestyle behaviors, psychosocial problems, and BMI z-scores compared to children whose parents were in the waitlist control. (5) Finally, improvements in parental confidence would mediate the effect of the intervention on parents' child feeding attitudes and behaviors and general parenting behaviors as well as on children's lifestyle behaviors and psychosocial problems.

Methods

Participants

This study enrolled forty-nine families of overweight and obese children who were attending kindergarten through 5th grade in two central Pennsylvania communities. Figure 2 presents the flow of participants through the study. Thirteen of the 49 families did not complete assessments prior to the beginning of the intervention, and 13 did not complete assessment after the end of the intervention, leaving 23 (13 in GLTP and 10 in control groups) families with complete pre- and post-intervention assessments. The attrition rate between the time of study enrollment and baseline assessment was 25%, which was driven by the large drop-out (n=10) from one of the communities. The baseline-to-post-intervention assessment attrition rate was 36%, accounted for by a family moving out of the school district (n=1), a withdrawal from the study (n=1), one of the school sites failing to return post-intervention surveys to the researchers (n=5), and loss to follow-up (n=6) for reasons including multiple disruptions of sessions due to weather-related school closings, time conflicts, and lack of spouse or partner support. Otherwise, no baseline characteristics were significantly associated with attrition rate.

Based on information provided by the 36 participants who completed the baseline assessment, all of the participating parents were mothers. Therefore, this study focused only on maternal reports of parenting and child behaviors. Table 2 presents the demographic

characteristics of the participating families. Mean age of the mothers was 38 years (SD = 9.2)
with range of 27 to 66 years (n = 3 missing). Almost all (97%) of the mothers had completed
high school, 67% completed at least some tertiary education, 56% were currently married, and
50% held full- or part-time employment. Of the mothers who were employed, the average hours
worked outside of the home each week was 35 hours (SD = 9) with a range of 16 to 48 hours.
Median annual household income for the sample was $20,000-$50,000 with a range of less than
$20,000 to more than $75,000. Families had an average of five household members (SD = 2)
with a range of 2 to 12 people, and 22% (n = 8) of the families were single-parent households.
The mean age of the target children was 8.67 years (SD = 1.85) with range of 5 to 13 years.
Sixty-one percent of the children were female. Approximately 64% of the children were
identified by their parents as White/Caucasian, 17% as Black/African American, 3% as
Hispanic/Latino, 3% as Asian, and 14% as Mixed/Other.

Participating families had an average of approximately three (range of 0 to 6) obesity-related health conditions, including Type II diabetes, high blood pressure, high cholesterol,
stroke, heart disease, and overweight/obesity. Twenty-six target children had their height and
weight measured by school nurses, and their BMI-for-age-and-sex percentiles were calculated.
Based on this calculation, approximately 12% of the children were overweight (85th – 95th BMI
percentile) and 77% were obese (>.95th BMI percentile).

Procedures

This study was conducted in collaboration with two communities in the PROSPER
network in central Pennsylvania. Both communities have active and productive PROSPER teams
with a high level of participation from local schools, community service providers, and parents,
and have demonstrated consistent recruitment success and program sustainability. Both

communities also experience a significant burden of obesity, with approximately two-thirds of adults in both communities classified as overweight or obese in 2011 (City-data.com, 2012, accessed April 31, 2014), a rate that is similar to the state average of 65% (Centers for Disease Control and Prevention, 2012).

Local PROSPER team leaders recruited families of children in kindergarten through 5th grade through flyers sent home from school, school district global calls and emails, meet-the-teacher night, letters and registration mailed home from superintendents, local media, social media (Facebook), and through recruitment by school nurses and information about the program provided to pediatricians and family nurses.

Families were randomized using a matched pair randomization based on child age, gender, and school district to one of two conditions: (1) 27 families were assigned to the GLTP condition, and (2) 21 families were assigned to a delayed intervention control condition. All group sessions were held in the evening at local schools.

Assessments were completed prior to and immediately after the intervention. Pre- and post-intervention surveys were mailed to the homes of all families that agreed to participate in the study. Parents completed surveys on their family demographic background, parenting styles and behaviors, and the behaviors and psychosocial adjustment of the target child. If parents had more than one child, the oldest child in the family was designated the target child for the study. All parents received a $10 gift card for completing each assessment. During school hours, the target children were measured for height and weight before and after the intervention by trained school nurses following standardized procedures (Lohman, Roche, & Martorell, 1988). Children were dressed in light clothing and measured without shoes. Height and weight were measured twice to the nearest 10th centimeter and kilogram, respectively. If the two measurements were

more than half of a unit apart, a third measurement was taken and the average of the two closest measurement values was recorded.

Intervention Conditions

 Adapted Group lifestyle Triple P. In preparing the American adaptation of the GLTP program, researchers from the Pennsylvania State Prevention Research Center and the Clearinghouse for Military Family Readiness reviewed the program manual and materials for appropriateness for American families and collaborated closely with the program developers at Triple P International Ltd. to make both content and process adaptations. In regards to the program content, surface-level structures (i.e. specific foods types) were modified to match the American diet, while deep-level structures (i.e. positive parenting principles) were left unchanged to preserve the efficacy of the original GLTP program. For example, a surface-level content change that had been made includes revising the *Triple P Recipe Booklet* to include foods more commonly found in the American diet and to align with the United States Department of Agriculture *MyPlate* guidelines. In regards to the process adaptation, changes were made to facilitate implementation in a community setting. For example, while the original GLTP program included three phone calls, a-GLTP eliminated the last phone call because the facilitators trained in Pennsylvania expressed discomfort about addressing clinical issues such as the parents' marital relationships and conflicts. Another process adaptation was the provision of childcare and meals at each group session, which is a common practice used in other PROSPER program to facilitate family attendance.

 Delayed Intervention. Families randomized to the delayed intervention (waitlist) conditions were promised a spot in the a-GLTP intervention groups that would begin in the following school semester (September) of 2013 after the first group had completed their post-

intervention assessments. All families in this condition were contacted following this study and invited to participate in those groups.

Intervention Facilitators

The local PROSPER teams recruited facilitators from the communities. In one of the communities, the facilitators included a middle school guidance counselor, a Head Start program assistant, and an Office manager. All had a Bachelor's degree and some had Master's degree in in counseling. Two of the facilitators had previous experience with implementation of evidence-based interventions. Backgrounds of the facilitators in the other community were not provided by to the research team.

All facilitators completed a structured training and accreditation program provided by the Triple P U.S. network. The training included detailed instructions on the theoretical and conceptual basis of the program, techniques of family lifestyle change, and practical instruction in the management of process issues that arise in working with parents of overweight and obese children. The facilitator's manual was provided for detailed guidelines to conduct GLTP.

Implementation Process Measures

Implementation fidelity. Trained observers visited two to three sessions of each of the groups and rated implementation fidelity using a structured session checklist. Observers also rated various aspects of session quality (i.e. facilitator quality, participant engagement) using a 4-point Likert rating scale with 1 indicating lowest quality and 4 indicating highest. All ratings were averaged across sessions.

Program acceptability. At post-intervention assessment, parents completed a brief, 17-item Family Satisfaction Questionnaire that assessed on a 7-point Likert scale the extent to which the program met their needs; the impact that the program had on their parenting skills and their

child's behavior; and their satisfaction with the group leaders, program format, and program content. Parents also completed the Participant Post-Study Evaluation survey to provide additional feedback about the recruitment process, curriculum, and implementation of the various components of the program.

Outcome Measures

The assessment battery used in the current study comprised of standard sets of measures used in most Triple P evaluations provided in the facilitator handbook (West & Sanders, 2010). An additional measure was added in the present study to assess parents' perception and attitudes about child weight and child feeding practices.

Family demographic background (FBQ). Information included the target child's name, date of birth, and sex, caregiver's marital status and relationship to the child, household size, and caregiver's employment and educational status. Additional question about the family's and the child's medical history were also included.

Parent's perception, attitude, and practices about weight and child feeding (CFQ). The 31-item Child Feeding Questionnaire (CFQ, (Birch et al., 2001)) was used to assess parents' perceptions and concerns regarding the child's risk for overweight and obesity and the use of controlling feeding practices. Based on a 5-point Likert-style rating scale, the CFQ measures four factors related to parental perception of child and parent weight and parental concern about child weight (perceived responsibility, perceived parent weight, perceived child weight, concern about child weight), and three factors assessing the parent's use of controlling feeding practices (monitoring, or the extent to which parents oversee their child's eating; restriction, the extent to which parents restrict their child's access to foods; pressure to eat, parents' tendency to pressure their children to eat more food, typically at meal times). The internal consistency for the seven

factors is 0.70. The CFQ scales had been shown to correlate well with actual observations of feeding behavior of mothers (Farrow & Blissett, 2005), children's actual food intake (Arredondo et al., 2006) and BMI in two small scale samples (Birch et al., 2001), providing support for the validity of the instrument.

Child lifestyle behavior problems and parent's lifestyle-specific parenting self-efficacy (LBC-Problem and -Confidence Scale). The Lifestyle Behaviour Checklist (LBC, (West & Sanders, 2009)) is a 25-item measure of the child's weight-related problem behavior and the parent's parenting self-efficacy for managing these behaviors. The scale contains 25 problem behaviors related to eating, physical activity, and emotional problems associated with overweight in children ages 4 to 11-years-old. The LBC Problem scale is obtained by summing across the 25-items of parents' rating of the extent to which they experience each of these behaviors as problems with the child (rating of 1 to 7; higher score indicates greater problems). The LBC Confidence scale is obtained by summing across the 25-items parents' rating of how confident they felt managing each of these behaviors, regardless of the presence of the problem (rating of 1 to 10; higher scores equals greater confidence). The recommended clinical cutoff for LBC Problem scale is greater than 50 (range of 25 to 175) and for LBC Confidence is less than 204 (range of 25 to 250).

Parenting style and practices (PS). The Parenting Scale (PS, (Arnold, O'Leary, Wolff, & Acker, 1993)) is a 30-item questionnaire designed to measure parents' dysfunctional discipline style. Parents rate how they would respond to a given discipline situation by choosing between an effective or ineffective course of action. In the revised version of the PS, the scale yields a PS Total score and three factors: laxness (permissive, inconsistent discipline), over-reactivity (harsh, emotional, authoritarian discipline and irritability), and hostility (use of verbal or physical force)

(Rhoades & O'Leary, 2007). These subscale factor scores are obtained by averaging the ratings for the items in the factor. PS Total is obtained by average ratings of all 30 items.

Child psychosocial adjustment (SDQ). The Strengths and Difficulties Questionnaire (SDQ, (Goodman, 1997)) is a 25-item screening measure that is used to identify children's social, emotional, and behavioral problems over the previous six months. SDQ consists of five factors: Hyperactivity, Conduct Problems, Emotional Symptoms, Peer Problems, and Prosocial Behaviors, and five additional items that assess the impact of the problems on various aspects of the child's life. Items are rated on a 3-point scale indicating parents' agreement with how correct they feel each statement is for their child (0 = not true, 1 = somewhat true, and 2 = certainly true). Each of the five subscales is obtained by summing the ratings, with adjustments for reverse-scoring, on their five component items, giving subscale scores ranging from 0 to 10. A Total Difficulties score is produced by summing all of the subscale scores except for Prosocial Behaviors, giving a total score ranging from 0 to 40. The cutoff for the normal range is 13 out of 40, with scores of 14-16 being borderline and a score of greater than 17 indicating clinically elevated difficulty. The SDQ has been shown to reliably discriminate between clinical and non-clinical children and has well-established reliability and validity in the U.S. sample (Bourdon, Goodman, Rae, Simpson, & Koretz, 2005).

Child body size. The target children were measured for height and weight before and after the intervention by trained school nurses following standardized procedures (Lohman et al., 1988). BMI z-scores (the number of SD units that the BMI deviates from the mean reference value for age and gender) were calculated using a modified least mean square technique that approximates z-scores from growth curves estimated from the 2000 National Health and Nutrition Examination Survey (NHANES) data (Kuczmarski et al., 2002). This measure was

selected because it provides a comparison of relative change in the extent of overweight to the

referent population based on age and gender, and is one of the most frequently reported relative

weight outcomes for children (Cole, Faith, Pietrobelli, & Heo, 2005). BMI percentile, which

indicates the relative position of the child's BMI among children of the same sex and age, was

also calculated to classify children's weight status using BMI percentile cutoffs as follow: less

than 5th percentile = underweight, 5th to less than 85th percentile = healthy weight, 85th – less than

95th percentile = overweight, and equal or greater than the 95th percentile = obese (Ogden &

Flegal, 2010).

<div align="center">**Results**</div>

Implementation Process Results

Implementation fidelity. Implementation records for the intervention period were

returned from only one of the two community sites. A total of nine session records were

obtained. Ratings showed that the facilitators completed 100% of the prescribed program content

in the allotted time. In general, participants showed positive attitudes toward the session content

($M = 3.6$ on a scale of 1 to 4; $SD = 0.89$), sustained interest in program materials and activities

($M = 3.6$; $SD = 0.89$), demonstrated positive and respectful behaviors during every session, and

were willing to discuss and process the sessions ($M = 3.6$; $SD = .89$). Facilitators appeared

comfortable and knowledgeable at delivering the activities ($M = 3.8$; $SD = .45$). These

implementation documents indicate a high quality implementation for the group sessions that

were observed. Implementation quality in the other community could not be evaluated due to

missing documents.

Program acceptability. Eight participants from one of the communities (the same

community that returned the implementation documents) completed the Family Satisfaction

Questionnaires and five participants completed the Participant Post-Study Evaluation regarding the intervention. On average, participants rated the overall program quality highly (M = 6.63, SD =.74). Based on average ratings on three questions, the program had met the needs of the participants' families (M = 6.25, SD = .99). Participants found the content of parent meetings, recipe books, and activity guides as highly helpful (M = 6, SD = 1.22), indicated that the program helped them to learn skills to guide their child and families to a healthier lifestyle (M = 6.25, SD = .68), believed that their children's behaviors had improved (M = 5.71, SD = 1), and were highly satisfied with their children's progress (M = 6, SD = 1.20). Participants further agreed that they would recommend this program to other families in their community (M = 6.23, SD = .52). The predominant theme that parents expressed in the open-ended feedback section was their desire to have the children included in the classes in order to learn and practice activities together.

Outcome Results

Missing data in outcomes measures. Multiple imputation procedure was used for the outcome measures in order to reduce bias associated with parents who did not complete pre- or post-intervention assessments and to conduct analysis based on all families in the sample (Schafer, 1997). This procedure is recommended as best practice for developmental psychology research with pattern of missing data in which both predictor and outcome variables have missing values (Widaman, 2006). Fifty complete datasets were generated based on study design characteristics (intervention group, team, school), demographic characters (child's age, sex, family income, number of family medical problems), pre-intervention assessment of total dysfunctional parenting and total child adjustment difficulties scores, child baseline BMI z-score, and pre- and post-intervention assessment of the outcome measure. Outcomes were averaged

results across these 50 complete datasets, adjusting for standard errors to account for the variability in the imputed estimates of the variable values.

Intervention effects. To examine the efficacy of the a-GLTP intervention, series of multiple regression analyses were estimated with the pre-intervention score on the outcome as a covariate, intervention condition was coded as two dummy variables, and all of the covariates used to build the multiple imputation models (child's age, sex, family income coded using four ordinal levels, number of family medical problems, and baseline assessment of total dysfunctional parenting and total child adjustment difficulties scores, , and BMI z-score). This approach is comparable to an analysis of covariance (ANCOVA), but more flexible and better suited to the unequal number of families in our two study conditions (Cohen, 1986). All outcome variables were standardized with mean of 0 and standard deviation of 1 so that parameter estimates for intervention condition were comparable to effect sizes, adjusted for pre-intervention differences on the same measure. This allows for interpretation these coefficients using the commonly accepted criteria of small (d = .2), medium (d = .5) and large (d = .8) (Cohen, 1988). Effect size estimates provide important information about intervention effects especially when small sample sizes, such the one in the present study, reduce the power to detect statistically significant effects.

Table 3 presents the pre- and post-intervention means and standard deviations for all study variables separately for families in the two study conditions. Table 4 presents effect size estimates/standardized betas comparing the a-GLTP group against the control group on various parent and child outcomes. Mean-level pre- to post-intervention changes (Table 3) were generally toward reduction in parents' dysfunctional attitudes and perceptions about child weight

and feeding, ineffective parenting practices, and toward improvements in parental confidence, child psychosocial adjustment, and BMI z-score.

Lifestyle-specific parenting self-efficacy. In the present study, lifestyle-specific parenting self-efficacy was operationalized as parents' self-reported confidence in their ability to manage their children's lifestyle problems. Parents in the a-GLTP condition reported a mean-level increase in LBC Confidence over the course of the intervention, whereas parents in the control condition reported a mean-level decline. Effect size estimates (Table 4) indicate that change in parent-reported confidence in the a-GLTP condition was more than one standard deviation greater than in the control condition (β = 1.22, *p* < .001), indicating a "large" intervention effect.

Parents' attitudes and perceptions about weight and child feeding. On average, parents in the a-GLP condition generally reported a downward change for all outcomes in this domain except for perceived parent weight, which increased slightly. By contrast, parents in the control conditions reported upward mean changes (Table 3). Across these variables, medium to large effects were found for comparison of a-GLTP with control. The large intervention effect size for the reduction of parents' Concern about child weight was statistically significant (β = -.80, *p* < .01). Reduction in Perceived parent weight (β = -.44, *p* < .1) and Perceived responsibility for child feeding (β = -.67, *p* < .1) showed trend toward statistical significance.

Child feeding practices. Mean level increase in monitoring of child's food intake was observed in both the a-GLTP and the control groups (Table 3). Mean-level Pressure to eat and Restriction of food decreased in the a-GLTP group but increased in the control group. Effect size estimates did not show statistically significant changes for any of these outcomes (Table 4).

General parenting style and practices. In the a-GLTP group, mean-level decrease was observed in total dysfunctional parenting practices and its subscales--Hostility, Laxness, and

Over-reactivity. By contrast, the control group showed mean-level increase in these dysfunctional parenting practices (Table 3). Effect size estimates show that reduction in dysfunctional parenting was driven by the medium-to-large effect on Over-reactivity (β = -.79, p < .05).

Child lifestyle behavior problems. Parents in the a-GLTP group reported mean-level increase in children's lifestyle behavior problems while parents in the control group reported mean-level decrease on this outcome (Table 3). The effect size estimate for lifestyle behavior problems was positive, but not statistically significant (β = .26, p = ns).

Child psychosocial adjustment. Parents in the a-GLTP group reported a mean-level decrease in total child adjustment difficulties (Total Difficulties), while parents in the control group reported a mean-level increase in their children's problems (Table 3). On average, children of the a-GLTP group showed decreases in conduct problems and peer problems subscales but slight increase in emotional problems and hyperactivity. Prosocial behaviors decreased slightly. Parents in the control group reported mean-level increase in all measures of child social, emotional, and behavioral difficulties and decrease in prosocial behavior. Effect size estimates show that the intervention had significantly reduced conduct problems ((β = -.74, p < .05) and increased prosocial behaviors (β = .49, p < .05). The reduction of Total Difficulties was trending significance ((β = -.50, p < .1).

Child body size. Target children in the a-GLTP group showed a mean-level decrease in BMI z-score while target children in the control group showed a mean-level increase in BMI z-score (Table 3). The effect size estimates were not statistically significant (β = -.30, p = ns).

Mediation analyses. To test the hypothesis that change in lifestyle-specific parenting self-efficacy, LBC Confidence, mediated the effect of intervention on parenting styles and

behaviors and child outcomes, mediation analysis (Baron & Kenny, 1986; Dearing & Hamilton, 2006) was used to determine whether the a-GLTP intervention had an indirect effect on parent and child outcomes that operated through changes in LBC Confidence. These analyses involved tests of joint significance of the two parameter estimates comprising the indirect effect (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002). RMediation online calculation tool (Tofighi & MacKinnon, 2011) was used to perform these tests. RMediation generates confidence intervals using methods based on the distribution of product, Monte Carlo simulation, and an asymptotic normal distribution, and improves upon the widely-used PRODCLIN software because the former is based on the widely available R software, includes several capabilities not available in PRODCLIN, and provides accurate results that PRODCLIN could not produce (Tofighi & MacKinnon, 2011). If the product of the partial regression coefficients linking the distal predictor to the mediator and mediator to the outcome are different from zero and statistically significant, mediation is supported. In the present study, being in the a-GLTP condition was the distal predictor and change in LBC Confidence was the hypothesized mediator.

All imputation models were re-estimated as described previously but also including pre- and post-intervention LBC Confidence scores, which controls for individual differences in baseline outcome variables and LBC Confidence and make inferences about change LBC Confidence as the mediating mechanism. Figure 3 for the variable Concern about child weight depicts the partition of the intervention effect on distal outcome into direct effect (path C) and an indirect effect (path A x path C). Mediation analyses focused on outcomes that showed statistically significant intervention effects.

Table 5 presents the results of the mediation analyses. The first column presents the partial regression coefficient for the relation between change in LBC Confidence and change in each study outcome, controlling for the intervention effect and all covariates used to estimate the multiple imputation model. This procedure provides estimates of whether changes in LBC Confidence are related to changes in outcomes irrespective of intervention condition and covariates (represented by path B in Fig. 3). The coefficient representing the indirect effect of being in GLTP vs the control condition for each outcome, as operating through changes in LBC Confidence (path A x path B), is also represented.

As presented in Table 5 and Figure 3, the indirect effect of being in the a-GLTP condition on change in Concern about child weight was large and statistically significant ($1.54 \times -.57 = -.87$, $p < .05$). In contrast, changes in Perceived parental weight or Perceived responsibility for child feeding did not operate through change in LBC Confidence ($\beta = .13$, $p = $ ns; $\beta = .23$, $p = $ ns, respectively), suggesting that alternative mechanism of change may have operated. For parenting practices, changes in Over-reactivity was not mediated by changes in LBC Confidence ($\beta = .24$, $p = $ ns). For child outcomes, only changes in Hyperactivity had marginally significant mediation by changes in LBC Confidence ($\beta = -.32$, $p < .10$), suggesting that other mechanisms of change may have operated for changes in child Conduct problems, Total Difficulties, and Prosocial behaviors. No other parent or child outcomes showed significant mediation by changes in LBC Confidence.

Discussion

This study tested a version of the lifestyle-specific parenting program Group Lifestyle Triple P that was adapted for implementation with American families (a-GLTP) through a community setting compared to a delayed intervention (waitlist) control group. The findings

contribute to and extend the small body of literature on the effectiveness of GLTP (West et al. 2010; Gerards et al. 2011, 2013). Specifically, the a-GLTP intervention showed promising results in three overarching areas: (1) First, in the community that had returned implementation data, the a-GLTP was acceptable to the participants and feasible for high-quality delivery by the PROSPER network. (2) Second, the intervention also produced positive effects in several outcome areas. The intervention increased parenting self-efficacy for managing child lifestyle behaviors and reduced parents' concern about child weight. The intervention also reduced parents' over-reactive disciplining style. In addition, the intervention reduced child conduct problems and increased child prosocial behaviors. Although not statistically significant, the a-GLTP group displayed a trend toward reduction in ineffective parenting practices in both weight-specific and general domains. Various child psychosocial adjustment problems and child BMI z-scores also showed a downward trend. (3) Third, mediation analysis suggested that the GLTP intervention operated by changing parenting self-efficacy for managing child lifestyle behaviors, which in turn was associated with parents' concern about child weight and child hyperactivity. Because the majority of outcomes did not show significant mediation by parenting self-efficacy, additional mediation analyses were performed to test whether the intervention had bypassed changes in parenting self-efficacy and instead operated through changes in particular parenting behaviors. Total dysfunctional parenting practices and restrictive feeding practices were examined because these scores correlated highly with changes in child outcomes. These analyses also failed to show significant mediation, which suggests that alternative mechanisms of change may be present.

The first hypothesis in the present study predicted that the version of GLTP that was adapted for an American audience will be useful and acceptable to the American families. While

the assessment of participants' reaction to the program was limited by the small sample of evaluation surveys available, feedback from the participants were highly positive. It could be possible that the feedback was not representative of the ranges of participant experiences. Follow-up qualitative studies, such as focus groups and interviews, would be needed to fully understand the experience of other participants who participated in the intervention.

The second hypothesis predicted that the adapted GLTP will be successfully embedded into the community setting. Again, the assessment of community fit was limited by the small sample of process documentation available, due to missing documentations from one of the communities. It is unclear whether this community had completed these measures during the intervention period, suggesting that more implementation support might be warranted to coordinate with the different needs and capabilities of each community in delivering this program. In the community site that had provided implementation documentation, however, ratings on fidelity, facilitator ability, and group dynamics were high, which provide some preliminary evidence for a successful fit within this community setting.

The third hypothesis in the present study predicted improvements in parents' outcomes. As predicted, parents in a-GLTP reported a large improvement in their confidence in managing child weight-related problem behaviors (Cohen's d = 1.22). Mean LBC Confidence score increased for parents in the a-GLTP group from pre- to post-intervention (166 to 192), while the score decreased for parents in the control group (186 to 134). The LBC Confidence scores in the present sample were comparable to those in the efficacy trial (West et al. 2010) and the Dutch replication trial (Gerards et al. 2013). The present study's finding that LBC Confidence was associated with the largest effect of all variables was also consistent with the findings from the

efficacy trial, providing further support that an important outcome of this program is improving parents' belief that they can effectively manage their children's weight-related behaviors.

A unique contribution of the present study was the assessment of parents' attitudes and perceptions about child weight and child feeding practices in order to provide additional dimensions of parental self-efficacy. Other studies that examined parents' confidence for managing child lifestyle behaviors found that parents of obese children had lower levels of LBC Confidence (West & Sanders, 2009) and higher levels of stress on the Depression Anxiety Stress Scale-21 (Gerards et al. 2013). One area in which this stress can manifest is in concern about child weight. The present intervention's large effect on lowering parents' levels of concern about child weight ($d = -.80$) helps to reinforce the finding of increased parental self-efficacy, suggesting that parents may worry less about their children's weight because they are more confident about managing their children's weight-related behaviors. Other weight-related parenting variables mostly changed in favorable direction: from pre- to post-intervention, mean scores on perceived parent weight and perceived child weight for a-GLTP group decreased while those for control group increased. While parental modeling of healthy lifestyle behaviors was a key component of the intervention, parents' weight and lifestyle behaviors were not assessed in this study. Therefore, parents' self-reported weight reduction provides a promising indication that the intervention may also have helped parents to adopt healthier lifestyle behaviors.

Some unexpected changes were found in reports of weight-related parenting practices. The a-GLTP intervention seems to have decreased parents' Perceived responsibility for child feeding ($d = -.67$). Two possible interpretations for this finding were explored. It is possible that the intervention had reduced parents' controlling behavior toward their children's eating patterns. The decrease in levels of monitoring and food restriction would support this interpretation.

Because parents learned effective skills for managing children's weight-related problems in the intervention, they may feel more confident in their abilities, less concerned about children becoming overweight, and thus less reliant on controlling behaviors around their children's eating. Alternatively, participants' divergent interpretations of the survey items may have created the unexpected finding. Survey items in the Perceived responsibility subscale include questions about how often the parent is responsible for determining their child's portion sizes and if the child has eaten the "right kind of food." As the level of control parents exert over child eating may be contingent upon the type or perceptions of the food (i.e. parents may exert less control over their children's fruit and vegetable than they would over high fat and/or sugary foods intake; Vollmer & Mobley, 2013), parents may have inferred different kinds of foods about which these questions asked. A similar interpretation was considered for the small increase in level of the Pressure to eat subscale, which also contained items that did not specify the kind of foods that parents would pressure the children to eat (i.e. parents may have interpreted the question as increasing encouragement for their child to eat an adequate amount of nutritious foods). These unexpected findings suggest that further refinement of measures of child feeding is needed to more accurately detect nuances in feeding behaviors in the context of different type of foods, locations, and occasions.

For general parenting practices, the intervention produced a large effect (d = -.79) on reducing over-reactive discipline style and small to medium effects on reducing lax and hostile styles (d = -.24 and .46, respectively). These results cannot be compared to that in the original efficacy trial (West et al. 2010) because the original study did not analyze subscale-level changes. The total dysfunctional parenting practices in the present study showed a smaller magnitude of effect size (d = .43) compared to that in the efficacy trial (d = 1.05). In the present

study, the intervention dosage was lower compared to the original (i.e. eliminated one clinically-focused phone call) and was delivered by community members rather than clinical psychologists and accredited GLTP provider; therefore the effect on parenting might have been diluted in the effectiveness trial.

The fourth hypothesis of this study pertained to improvements in the children's outcomes as a result of their parents participating in a-GLTP. As predicted, a-GLTP produced medium to large effects on child behavior problems and prosocial behavior. While West et al. (2010) did not assess child psychosocial adjustment, a few other intervention trials using the standard Triple P (Leung, Fan, & Sanders, 2013; Leung, Sanders, Leung, Mak, & Lau, 2003; Martin & Sanders, 2003) showed similar improvements in general child behavior problems. Another positive child outcome was the mean reduction in BMI z-score in the a-GLTP children, with a medium effect size of -.30. This effect size was surprisingly large given that the effect size in the efficacy trial was 0.13 at the end of the 12-week intervention. It is difficult to compare the effect size found in the present study with previous studies due to differences in research design and measurement, intervention intensity, and intervention context. Many multicomponent family interventions calculated effect sizes based on BMI (Wilfley et al., 2007; Young, Northern, Lister, Drummond, & O'Brien, 2007). Only a few programs evaluated interventions using BMI z-scores. Epstein, Paluch, Roemmich, and Beecher (2007) presented a summary of outcomes of eight studies evaluating family-based behavioral program for childhood obesity treatment that were conducted over the last 25 years. The authors found effect sizes for BMI z-score of -1.20 to -0.67 between 6 and 120 months. These effects are larger than that found in the present study; however, the duration of Epstein and colleagues' treatments were longer than that of the present study, which, unlike the treatment programs of Epstein and colleagues, did not include dieting or weight-loss

goals. The children's BMI z-scores will need to be tracked for a longer period of time in order to better observe the intervention effect.

The present study also found an increase in parent-reported child weight-related problems behaviors, which contradicted with finding in the original efficacy trial that found a decrease in this variable. The Lifestyle Behaviour Checklist instrument relied on parents to report their perception of their children's problems. Since intervention aimed to raise awareness and knowledge about problematic lifestyle behaviors, the increased problems ratings may reflect parents' heightened awareness of negative effects of children's pre-existing lifestyle behaviors problems and the frequency at which they occurred. Nonetheless, the possibility of whether the intervention might have had an iatrogenic effect in increasing lifestyle problems should be further examined. Objective measures of eating (food recall or food diary) and physical activity (exercise log or accelerometer) would be helpful to avoid biases due to parental perception and increase the accuracy of the measurement of these outcomes.

Finally, the fifth hypothesis of this present study was that lifestyle-specific parenting self-efficacy, operationalized as LBC Confidence, would mediate the effect of a-GLTP on parent and child outcomes. Mediation was found for parents' Concern about child weight and child Hyperactivity only. It could be possible that the sample size was too small to detect mediation. Alternatively, other pathways may have been operating. For example, knowledge about nutrition, physical activity, and positive parenting may also affect parents' and children's attitudes and behaviors. Thus, assessments of parents' mastery of the subject matters (i.e. nutrition and physical activity facts, positive parenting principles) would be informative. Another possible explanation may be individual differences in the way self-efficacy operates. Chang et al. (2008) found that task-specific parenting self-efficacy around lifestyle behaviors exhibited a different

pattern of association with various lifestyle behaviors for African American and White Caucasian low-income mothers. It could be possible that demographic differences in the construct of lifestyle-specific parenting self-efficacy existed in the present sample as well. Future studies with larger sample will need to examine possible psycho-demographic in the lifestyle parenting self-efficacy construct. To date, no other studies involving Triple P programs have tested the mediational hypothesis involving parenting self-efficacy.

This study contributes to the growing body of literature on the effectiveness of GLTP through supporting the link between parenting and childhood obesity and the approach to improve child health and behaviors through improving parenting competence. This study also extends upon the previous study by applying GLTP in the American population, including additional measures of weight-related parenting practices, and delivering the program through a sustainable community infrastructure by engaging local stakeholders in the PROSPER network.

As a pilot trial conducted under limited funds and support, the present study had several limitations. The duration of this this intervention was considerably shorter than that of other family-based interventions for childhood obesity (Gerards, Sleddens, Dagnelie, de Vries, & Kremers, 2011; Goldfield, Epstein, Kilanowski, Paluch, & Kogut-Bossler, 2001; West et al., 2010). The present study also did not include longer term follow-up due to constraints on the pilot study duration. It may have been possible that changes in the more distal outcomes, child lifestyle behavior and BMI z-score, require a longer time to emerge. Also, most of the outcome measurements were perceptions reported by parents. In the future, objective reports from multiple informants (i.e. children, clinicians, spouses) will be needed to gain a more accurate understanding of the effects of the intervention. Furthermore, a-GLTP was not designed to address the multifaceted, multi-causal nature of childhood obesity that is affected by a multitude

of ecological factors (Barnes, 2010). In particular, socioeconomic disadvantage can affect childhood obesity through affecting the availability and accessibility of healthy foods (Drewnowski, 2012; Drewnowski, Aggarwal, Hurvitz, Monsivais, & Moudon, 2012; Drewnowski & Specter, 2004) and safe living environment for physical activity (Galvez, Pearl, & Yen, 2010; Singh, Siahpush, & Kogan, 2010) and disruptions in family functioning (Kinston, Loader, Miller, & Rein, 1988). Given that both communities in the present study had poverty rates at or above the state-wide poverty level (U.S. Census Bureau), this study may have involved a higher-risk sample compared to sample in the original efficacy trial. Additional assessments of socioeconomic conditions such as family economic strain and food availability would be needed to examine how ecological factors might interact with the intervention.

In conclusion, the adapted Group Lifestyle Triple P appeared to be a feasible, acceptable, and potentially efficacious treatment option for American parents of overweight and obese elementary school children, if the parents are willing and able to make lifestyle changes in their families and if the communities are willing and able to implement the program with high quality. Further trials using a larger, more diverse sample are needed to evaluate the long-term effectiveness of this intervention and to elucidate the mechanisms of change.

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Appendix A

Table 1		
Overview of the Original GLTP Curriculum and Session Contents		
Session	Content	Duration
1. Preparing for Change	• Working as a group • What does 'overweight' mean? • How can overweight be treated? • Readiness for change • Keeping track	90 minutes
2. Understanding Nutrition	• Increasing children's self-esteem • Changing eating behavior • Food groups • Nutrients • Daily food serves • Nutrition goals	90 minutes
3. Understanding Physical Activity	• Encouraging healthy behavior • Trying new foods • Importance of physical activity • Physical activity goals • Increasing incidental activity • Reducing sugar intake	90 minutes
4. Using Rewards and Modifying Recipes	• Motivating children to be healthy • Types of fat • Reducing fat intake	90 minutes
5. Limiting Sedentary Activity	• Reducing television and computer time • Preventing problem behavior • Understanding food labels	90 minutes
6. Playing Active Games	• Increasing energetic play	90 minutes
7. Providing Healthy Meals and Snacks	• Preventing hunger and overeating • Preparing healthy food • Increasing involvement in sport	90 minutes
8. Managing Problem Behavior	• Managing problem behavior • Developing parenting routines • Preparing for the weekly telephone sessions	90 minutes
9. Using Lifestyle Triple P Strategies 1	• Preparing for the session • Update on progress • Other issues	15-30 minutes
10. Using Lifestyle Triple P Strategies 2	• Preparing for the session • Update on progress • Other issues	15-30 minutes
11. Planning Ahead	• Family survival tips • High-risk situations • Planning activities • Preparing for the fortnightly telephone sessions	90 minutes

12. Using Planned Activities 1	• Preparing for the session • Update on progress • Other issues	15-30 minutes
13. Using Planned Activities 2	• Preparing for the session • Update on progress • Other issues	15-30 minutes
14. Program Close	• Progress review • Keeping up the healthy changes • Problem solving for the future • Satisfaction with the program	90 minutes

Appendix B

Table 2

Participant Demographic Characteristics N=36

Parents (Mothers)	
Age (years)	M = 38 (SD = 9.2)
Education (% completed at least some post-secondary education)	67
Marital status (% currently married)	56
Employment status (% full-time employment)	50
Weekly out-of-home work (hours)	M = 35 (SD = 9)
Household size (number of people)	M = 5 (SD = 2)
Household structure (% single-parent)	22
Annual household income (%)	
<$20,000	34
$20,000-$50,000	34
$50,000 - $75,000	20
>$75,000	11
Target Children	
Age (years)	M = 8.67 (SD = 1.85)
Sex (% Female)	61
Race (% White/Caucasian)	64
Overweight (N = 26; % Overweight)	12
Obesity (N = 26; % Obese)	77

M = Mean; SD = Standard deviation

Appendix C

Table 3

Means and Standard Deviations of Outcome Variables

	Control		a-GLTP	
Lifestyle-Specific Parenting Self-Efficacy				
Confidence for managing child lifestyle behavior problems				
Pre-test	185.7	(55.26)	166.11	(63.48)
Post-test	133.65	(80.53)	191.59	(65.74)
Parental Attitudes and Perceptions				
Perceived parent weight				
Pre-test	3.83	(0.72)	3.49	(0.75)
Post-test	4.1	(0.71)	3.51	(0.83)
Perceived child weight				
Pre-test	3.42	(0.52)	3.26	(0.40)
Post-test	3.52	(0.44)	3.18	(0.50)
Concern about child weight				
Pre-test	3.18	(1.24)	3.62	(1.06)
Post-test	3.76	(1.25)	3.01	(1.32)
Perceived responsibility for child feeding				
Pre-test	4.31	(0.87)	4.57	(0.46)
Post-test	4.57	(0.57)	4.15	(0.68)
Lifestyle-Related Parenting Practices (Child Feeding)				
Monitoring				
Pre-test	3.67	(0.94)	3.87	(0.74)
Post-test	3.8	(1.19)	3.96	(0.83)
Pressure to eat				
Pre-test	2.33	(0.92)	2.64	(0.78)
Post-test	2.13	(0.89)	2.29	(0.85)
Restriction				
Pre-test	3.31	(0.83)	3.7	(0.42)
Post-test	3.34	(0.93)	3.29	(0.82)
General Parenting Practices				
Total dysfunctional parenting practices				
Pre-test	3.44	(0.77)	3.18	(0.57)
Post-test	3.45	(0.70)	2.92	(0.75)
Subscale: Hostility				
Pre-test	2.69	(1.81)	1.98	(1.25)
Post-test	2.75	(1.46)	1.73	(0.87)
Subscale: Laxness				
Pre-test	3.24	(1.50)	2.65	(1.04)
Post-test	3.33	(1.22)	2.61	(1.30)

Subscale: Over-reactivity				
Pre-test	3	(0.79)	3.44	(0.92)
Post-test	3.71	(1.10)	3.14	(1.29)
<u>Child Psychosocial Adjustment</u>				
Total behavioral, emotional, and social difficulties				
Pre-test	16.27	(5.07)	16.86	(5.82)
Post-test	19.42	(7.87)	16.05	(7.52)
Subscale: Conduct problems				
Pre-test	2.7	(1.53)	3.29	(1.93)
Post-test	4.02	(2.43)	2.77	(2.17)
Subscale: Emotional problems				
Pre-test	2.93	(2.38)	2.57	(1.71)
Post-test	3.74	(2.99)	2.77	(2.44)
Subscale: Hyperactivity				
Pre-test	6.13	(2.28)	6.1	(2.31)
Post-test	6.25	(2.13)	6.31	(2.64)
Subscale: Peer problems				
Pre-test	4.5	(2.12)	4.76	(2.07)
Post-test	5.25	(2.65)	4.18	(2.18)
Prosocial behavior				
Pre-test	8.2	(1.94)	8.33	(1.99)
Post-test	7.25	(2.62)	8.21	(2.54)
<u>Child Lifestyle Behaviors</u>				
Lifestyle behavior problems				
Pre-test	74.93	(28.62)	68.86	(22.06)
Post-test	67.96	(30.04)	72.96	(28.57)
<u>Child Body Size</u>				
BMI z-score				
Pre-test	2.12	(0.70)	1.81	(1.03)
Post-test	2.29	(0.66)	1.77	(0.95)

Appendix D

Table 4

Intervention Effects

Measure	Effect Size a-GLTP vs. Control
Lifestyle-Specific Parenting Self-Efficacy	
Confidence for managing child lifestyle behavior problems	1.22***
Parental Attitudes and Perceptions	
Perceived parent weight	-0.44[+]
Perceived child weight	-0.39
Concern about child weight	-0.80**
Perceived responsibility for child feeding	-0.67[+]
Lifestyle-Related Parenting Practices (Child Feeding)	
Monitoring	-0.52
Pressure to eat	0.25
Restriction	-0.33
General Parenting Practices	
Total dysfunctional parenting practices	-0.43
Subscale: Hostility	-0.46
Subscale: Laxness	-0.24
Subscale: Over-reactivity	-0.79*
Child Psychosocial Adjustment	
Total behavioral, emotional, and social difficulties	-0.50[+]
Subscale: Conduct problems	-0.74*
Subscale: Emotional problems	-0.38
Subscale: Hyperactivity	0.14
Subscale: Peer problems	0.14
Prosocial behavior	0.49*
Child Lifestyle Behaviors	
Lifestyle behavior problems	0.26
Child Body Size	
BMI z-score	-0.30

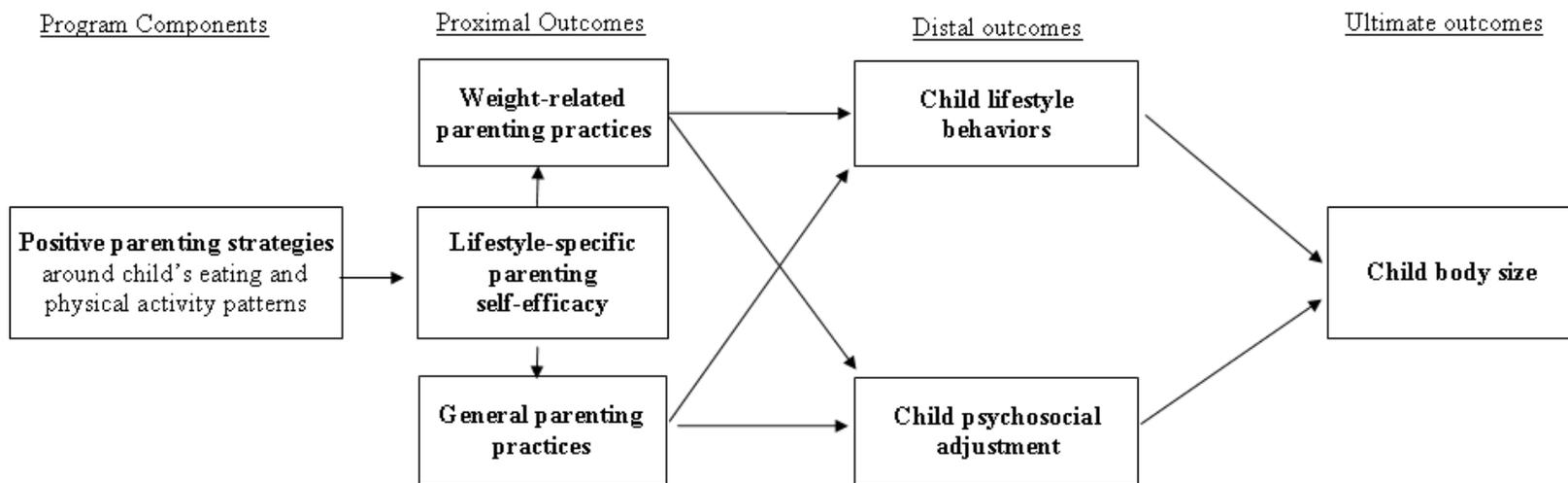[+] $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Appendix E

Table 5

Coefficients for Tests of Mediation

	Effect of change in LBC Confidence on outcome	Indirect effect of a-GLTP (vs. control) on outcome
Parental Attitudes and Perceptions		
Perceived parent weight	0.26	0.13
Perceived child weight	-0.12	-0.07
Concern about child weight	-0.57*	-0.87*
Perceived responsibility for child feeding	0.22	0.30
Lifestyle-Related Parenting Practices (Child Feeding)		
Monitoring	-0.08	-0.09
Pressure to eat	-0.37	-0.45
Restriction	-0.13	-0.13
General Parenting Practices		
Total dysfunctional parenting practices	-0.14	-0.16
Subscale: Hostility	-0.24	-0.18
Subscale: Laxness	0.04	0.05
Subscale: Over-reactivity	-0.15	
Child Psychosocial Adjustment		
Total behavioral, emotional, and social difficulties	-0.16	-0.11
Subscale: Conduct problems	-0.20	-0.20
Subscale: Emotional problems	-0.27	-0.24
Subscale: Hyperactivity	-0.30^{+}	-0.32^{+}
Subscale: Peer problems	0.06	0.05
Prosocial behavior	0.04	0.04
Child Lifestyle Behaviors		
Lifestyle behavior problems	-0.32^{+}	-0.19
Child Body Size		
BMI z-score	-0.06	-0.04

$^{+}p < .10.$ * $p < .05.$ ** $p < .01.$ *** $p < .001.$

Appendix F

Program Components   Proximal Outcomes   Distal outcomes   Ultimate outcomes

Weight-related parenting practices

Positive parenting strategies around child's eating and physical activity patterns

Lifestyle-specific parenting self-efficacy

General parenting practices

Child lifestyle behaviors

Child psychosocial adjustment

Child body size

Figure 1. Group Lifestyle Triple P Intervention Logic Model
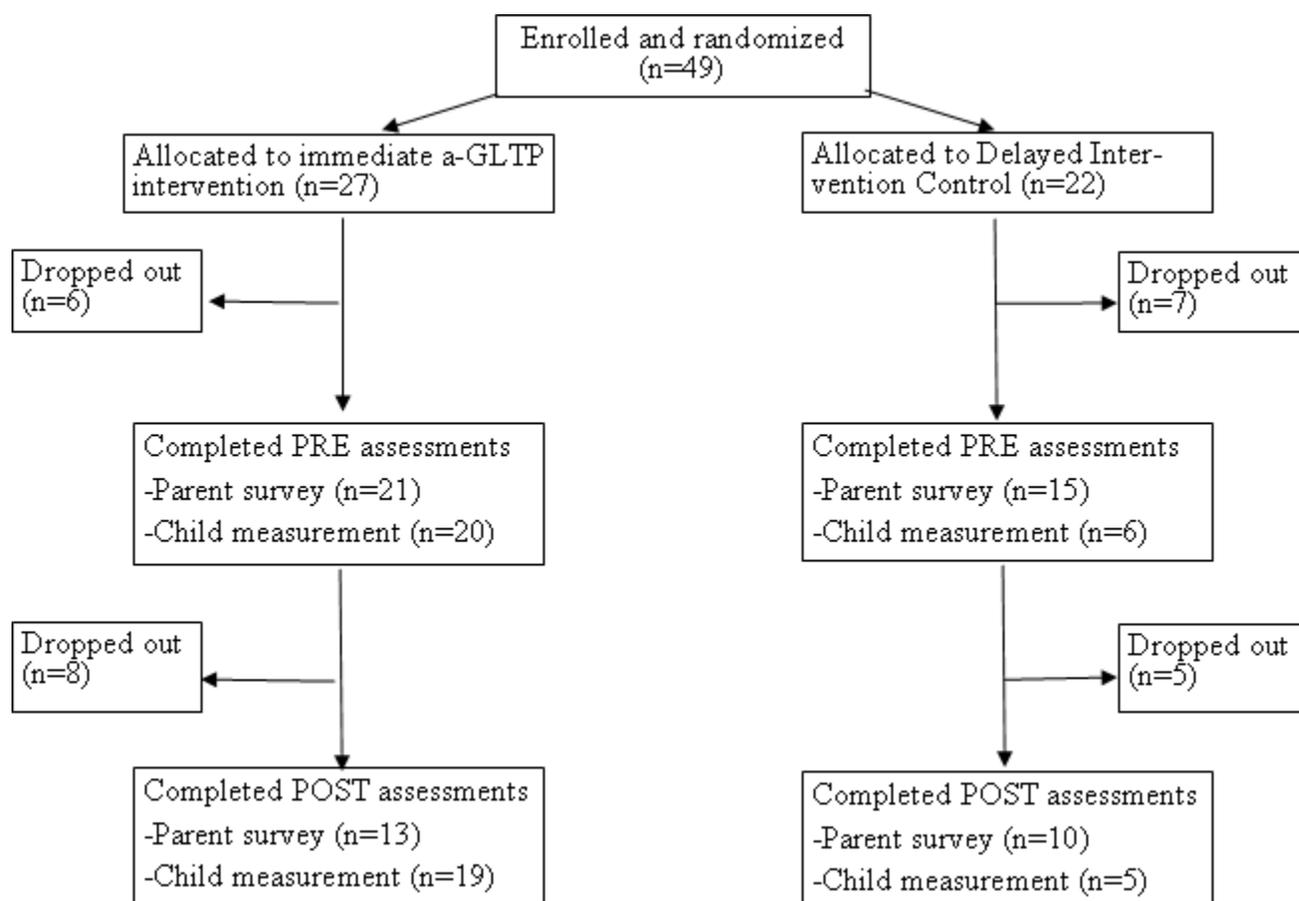
Appendix G

Figure 2. Flow of Participants Through Intervention
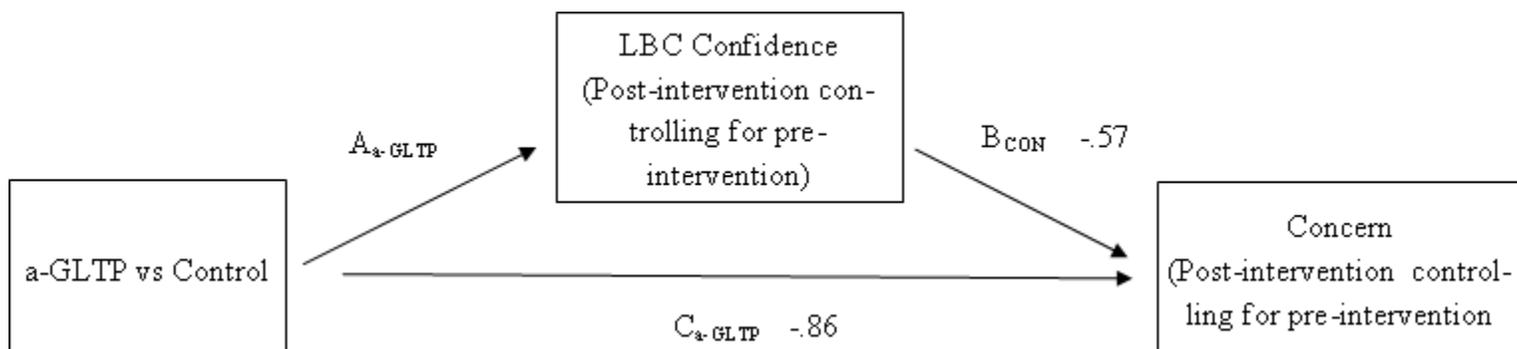
Appendix H

Figure 3. Example of Intervention's Direct Effect on Program Outcome and Indirect Effect on Outcome Operating Through LBC Confidence