2014

Project SHINE: A Family-Based Intervention for Improving Physical Activity, Sedentary Behavior, and Diet in African American Adolescents

Sara M. St. George
University of South Carolina - Columbia

PROJECT SHINE: A FAMILY-BASED INTERVENTION FOR IMPROVING PHYSICAL ACTIVITY, SEDENTARY BEHAVIOR, AND DIET IN AFRICAN AMERICAN ADOLESCENTS

by

Sara M. St. George

Bachelor of Arts
University of Missouri-Columbia, 2007

Master of Arts,
University of South Carolina, 2010

Submitted in Partial Fulfillment of the Requirements

For the Degree of Doctor of Philosophy in

Clinical-Community Psychology

College of Arts and Sciences

University of South Carolina

2014

Accepted by:

Dawn K. Wilson, Major Professor

Ronald J. Prinz, Committee Member

Nicole Zarrett, Committee Member

Darcy Freedman, Committee Member

Lacy Ford, Vice Provost and Dean of Graduate Studies

DEDICATION

To my devoted husband, John: Thank you for your infinite patience, unwavering support, selfless love, and surprise cupcakes. This PhD was truly a team effort and belongs to us both. I love you, honorary Dr. John St. George!

ACKNOWLEDGEMENTS

This research was supported by the National Institute of Child Health and Human Development (F31 HD 066944 to Sara M. St. George, M.A., and Dawn K. Wilson, Ph.D.; R01 HD 072153 to Dawn K. Wilson, Ph.D.).

I would especially like to thank my mentor, Dr. Dawn K. Wilson, whose tremendous guidance and support challenged me to grow as both a scholar and human being throughout this incredible journey. I would also like to offer thanks to the other members of my dissertation committee, Drs. Darcy Freedman, Ron Prinz, and Nicole Zarrett, for their insightful feedback. This project would certainly not have been possible without the assistance of a phenomenal team of graduate students, undergraduate students, and professional staff, including Kassy Alia, Phyllis Allen, Ben Bailey, Sandra Coulon, Jawanda Davis, Brianna Elliot, Keely Flynn, Jennifer Harper, VaShawn Heatley, Caitlin Hucks, Artis Johnson, Franklin Jones, Hannah Lawman, Tyler McDaniel, Karo Omodior, Kaya Outen, Amanda Paluch, Tanya Pandorf, Mosam Patel, Lindsay Patton, Morgan Penzler, Marin Peplinski, Shamika Robinson, Annie Rogerson, Becky Siceloff, Rebecca Schimmel, Elizabeth Schneider, Bailey Tacket, Lauren Talley, Neve Trumpeter, Phil Watts, Brittany Wearing, and Lee Woods. Lastly, and certainly not least, I would like to extend a heartfelt "thank you" to all the families who participated in this study. It was an honor to meet and serve you. Thank you all for helping me SHINE!

ABSTRACT

This study examined the effects of a family-based intervention for improving moderate-to-vigorous physical activity (MVPA), sedentary behavior (SB), and fruit and vegetable (F&V) intake in African American adolescents. The intervention (Project SHINE: Supporting Health Interactively through Nutrition and Exercise) integrated Social Cognitive (SCT), Self Determination (SDT), and Family Systems Theories (FST) to improve healthy physical activity and dietary behaviors. Behavioral strategies from SCT (i.e., self-monitoring, goal-setting, self-regulatory skill-building), elements involved in facilitating intrinsic motivation for health behavior change from SDT (i.e., autonomy, competence, belongingness), and positive parenting practices from FST for integrating parent and peer systems (e.g., parental monitoring, parent-adolescent communication, parental management of peers) were combined to promote the development of a positive social environment supportive of improvements in adolescent MVPA, SB, and F&V intake. A total of 89 adolescents (12.5±1.4 yrs; 61% girls; 48% obese) and their caregivers (41.5±8.5 yrs; 92% females; 74% obese) were randomized to either the 6-week parenting intervention or general health program. Process evaluation measures were developed to assess intervention social climate and behavioral skills implementation. Data were collected at baseline and post-intervention and included demographics, anthropometrics (height, weight), 7-day acclerometry estimates of MVPA, self-reported SB (e.g., screen time, sitting, inactive hobbies), and psychosocial scales. Missing data were handled using multiple imputation (m=20), and multilevel regression models

predicting post-intervention outcomes accounted for individuals nested within 10 groups. Models examined between-group differences in behavioral (i.e., MVPA, SB, F&V intake) and psychosocial outcomes (e.g., parent-adolescent communication, parental monitoring, parental management of peers) as well as whether changes in psychosocial scales were predictive of changes in behavioral outcomes. Process evaluation data indicated the intervention was implemented with adequate dose and fidelity and modest reach. There was a significant intervention effect on adolescent SB (B = -28.76, *SE* = 9.65, t = 2.98, $p < .01$), such that adolescents in the intervention condition reported ~28 less weekly hours of SB than did those in the comparison condition. No effects were found for adolescent MVPA or F&V intake. With regard to psychosocial outcomes, there was a significant intervention effect on parent-reported health communication (B = 0.52, *SE* = 0.15, t = 3.47, $p < .01$) and parent support for diet (B = 0.49, *SE* = 0.22, t = 2.19, $p < .05$) as well as trends for adolescent-reported health communication (B = 0.33, *SE* = 0.18, t = 1.83, $p < .10$) and parent support for physical activity at post intervention (B = 0.42, *SE* = 0.24, t = 1.75, $p < .10$). None of the other psychosocial variables were significantly different between groups at post intervention and changes in psychosocial variables did not predict changes in adolescent SB. Secondary analyses examining parent MVPA and F&V intake resulted in a significant effect of the intervention on parent MVPA (B = 9.43, *SE* = 4.21, $p < .05$), such that parents in the intervention condition engaged in ~8 more minutes per day of MVPA than did those in the comparison condition. Overall, findings suggest that an intervention designed to promote positive parenting practices, including communication around health, and behavioral skills may facilitate improvements in adolescent SB and parent MVPA.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

List of Abbreviations

BMI ..... Body mass index

F&V ..... Fruit and vegetable

FST ..... Family Systems Theory

GHE ..... General health education (comparison condition)

IPB ..... Interactive, parent-based (intervention condition)

MVPA ..... Moderate-to-vigorous physical activity

PA ..... Physical activity

SB ..... Sedentary behavior

SCT ..... Social Cognitive Theory

SDT ..... Self-Determination Theory

CHAPTER 1

INTRODUCTION

Obesity rates have drastically increased in youth over the past three decades, especially in ethnic minority populations (Ogden, Carroll, Curtin, Lamb, & Flegal, 2010; Ogden, Carroll, & Flegal, 2008; Ogden et al., 2006; Ogden, Carroll, Kit, & Flegal, 2012). Currently, an alarming 41.2% of African American adolescents in the US between the ages of 12-19 years are either overweight or obese (Ogden, et al., 2012). Research showing adolescent obesity tracks into adulthood (Kvaavik, Tell, & Klepp, 2003; Power, Lake, & Cole, 1997) highlights the need for effective health promotion interventions during the adolescent developmental period. Although increasing physical activity (PA), decreasing sedentary behavior (SB), and consuming a healthy diet have been recommended as strategies for preventing youth obesity (Davis et al., 2007; Tsiros, Sinn, Coates, Howe, & Buckley, 2008), only 8% of adolescents meet national recommendations for PA (Troiano et al., 2008) and only 19.5% and 10.5% meet recommendations for fruit and vegetable intake, respectively (Lorson, Melgar-Quinonez, & Taylor, 2009). Furthermore, as many as 34% of youth have reported watching three or more hours of television per day (Eaton et al., 2012). Given ongoing social transitions during adolescence (i.e., the growing need for autonomy support from families and increased involvement with peers), developing more integrated intervention approaches that link multiple relevant social contexts, such as parents and peers, may improve health-related outcomes in ethnic minority adolescents (Wilson, 2009).

PA and eating habits are shaped, in part, by an adolescent's daily interactions with parents and peers (Booth et al., 2001; French, Story, & Jeffery, 2001; Kumanyika, 2001). Although both parents and peers are particularly important for promoting youth PA, SB, and F&V intake (Hohepa, Scragg, Schofield, Kolt, & Schaaf, 2007; Zabinski, Norman, Sallis, Calfas, & Patrick, 2007), few health promotion studies have effectively linked these two systems into adolescent intervention programs. In a recent qualitative study examining parent and peer factors related to adolescent weight status, PA, and diet, African American adolescents acknowledged unique ways in which both parents and peers could provide them with support for healthy behaviors (St. George & Wilson, 2012). Interestingly, adolescents in this qualitative study viewed parental monitoring as a favorable part of their relationship with parents. Research on adolescent risk-taking behaviors (e.g., drug use, sexual risk-taking) suggests parents may play an important role in shaping adolescent behaviors by effectively monitoring their own child's behavior in addition to their child's peer relationships (Mounts, 2001; Richards, Miller, O'Donnel, Wasserman, & Colder, 2002). While interventions that have sought to decrease SB in African American families have included parent components related to monitoring adolescent behaviors (e.g., Robinson, 2003), none have specifically used parental monitoring as an integrated strategy to manage peer relationships for the improvement of PA, SB, or F&V intake. Thus, utilizing parental monitoring as a technique to integrate parent- and peer- systems presents a novel and potentially promising direction for the field of obesity prevention. The present study expands on previous work by evaluating the efficacy of an innovative family-based intervention known as Project SHINE ("Supporting Health Interactively through Nutrition and Exercise") that targeted parental

monitoring of both youth and their peer interactions around PA, SB, and dietary behaviors.

In addition to parental monitoring of peer relationships, very little research to date describes how parents and adolescents negotiate parental control and the adolescent's increasing autonomy with regard to PA patterns, SB, and food choices. Previous studies indicate autonomy around health behaviors may be co-constructed, or based on a set of interactions in which adolescents and parents negotiate and respond to one another (Bassett, Chapman, & Beagan, 2008). African American adolescents who participated in St. George and Wilson's (2012) qualitative study reported wanting increased autonomy from families. In addition, boys reported receiving more constructive feedback from parents about their weight status than did girls, while girls reported receiving more honest feedback from their peers about their weight status than did boys. Overall, these findings highlight the need to both increase and refine aspects of parent-adolescent communication around weight and related health behaviors. Thus, the present study tests an innovative intervention that expands on previous research by targeting autonomy support, parent-adolescent communication, and parental monitoring (of youth and peers) specific to obesity-related health behaviors to improve adolescent PA, SB, and F&V consumption.

1.1 THEORETICAL FRAMEWORK

The theoretical framework used to develop the SHINE intervention integrated elements from Social Cognitive Theory (SCT) (Bandura, 1986, 2004), Self-Determination Theory (SDT) (Ryan & Deci, 2000), and Family Systems Theory (FST) (Broderick, 1993). SCT and SDT are two theoretical frameworks which each posit

specific mechanisms for behavior change. According to SCT, dynamic relationships between social-environmental factors (e.g., parent and peer social support) and personal cognitive factors (e.g., self-efficacy) are important predictors of positive health trajectories across the lifespan (Bandura, 2004). SDT suggests intrinsically motivated behavior changes, facilitated by supporting an individual's autonomy (i.e., feeling of having choice and control over one's own behavior), competence (i.e., feeling that one has proper skills to engage in a specified behavior), and belongingness (i.e., feeling valued and cared for by others), will be sustained longer than extrinsically motivated behaviors (Ryan & Deci, 2000). Finally, FST provides a framework to more specifically explore how the family system and its functioning may influence health behaviors in children and adolescents (Kitzman-Ulrich et al., 2010). FST views the family as a dynamic system, in which interactions affect each individual family member (Barbarin & Tirado, 1984; Cox & Paley, 2003).

Health promotion and treatment interventions which include SCT, SDT, and FST variables have been shown to be effective in increasing PA, reducing SB and improving dietary behaviors in youth (Baranowski et al., 2002; Jago et al., 2006; Kitzman-Ulrich, Wilson, St. George, et al., 2010; Patrick et al., 2006; Roemmich, Gurgol, & Epstein, 2004; Wilson et al., 2005; Wilson et al., 2002). Thus, unique constructs from each theory were integrated as essential intervention elements in the present study (see Table 1.1). Specifically, behavioral strategies from SCT (i.e., self-monitoring, goal-setting, self-regulatory skill-building), elements involved in facilitating intrinsic motivation for health behavior change from SDT (i.e., autonomy, competence, belongingness), and positive parenting practices from FST (e.g., parental monitoring, parent-adolescent

communication) were combined to promote the development of a positive social environment supportive of improvements in adolescent PA, SB, and F&V intake.

In addition to each theory's unique contributions to the SHINE intervention, SCT, SDT, and FST also intersect in their emphasis on improving the social environment related to health behaviors. It has recently been argued that nurturing environments which simultaneously foster pro-social behaviors (e.g., self-regulatory skill-building) and monitor opportunities for problem behavior are critical in promoting youth health and well-being across a variety of domains (Biglan, Flay, Embry, & Sandler, 2012). The SHINE intervention was designed to foster a nurturing family environment for adolescents by improving the family's capacity to effectively change health behaviors together (self-monitoring, goal-setting, self-regulation, competence, self-efficacy), increasing effective parent-adolescent communication around health behaviors (belongingness), and encouraging parents to balance their level of autonomy support and monitoring of adolescent health behaviors (autonomy support, social support, monitoring). Overall, the focus of SHINE was on developing a positive social climate in the home by improving positive parenting practices which influence both parent-adolescent and peer-adolescent interactions specific to PA, SB and F&V intake.

Given that for African Americans especially, behaviors such as PA, SB, and diet are rooted in historical and social-cultural contexts (Kumanyika et al., 2007), the integration of these theories further allowed for the intervention to meet families' unique cultural needs. Cultural targeting strategies (e.g., peripheral, evidential, constituent-involving) have been shown to enhance intervention appropriateness and effectiveness (Kreuter, Lukwago, Bucholtz, Clark, & Sanders-Thompson, 2003; Wilson, 2009) and

were used to enhance intervention relevance for African American families. Due largely to the emphasis on autonomy from SDT, families were encouraged to personalize intervention components in order to integrate them into their existing family climate. Furthermore, and as posited by FST, families fall along a continuum of functioning, ranging from healthy functioning (i.e., operating as an efficient system which manages daily tasks and stressors within a supportive, responsive climate; (Beavers & Hampson, 1990; Kitzman-Ulrich, Wilson, St. George, et al., 2010) to dysfunctional family interactions. To maximize healthy family functioning, families were given options for utilizing parenting strategies and changing health behaviors. Overall, the flexibility of the SHINE intervention allowed families to choose how they integrated intervention elements into their lives which allowed for sensitivity to existing family and cultural values.

1.2 INTEGRATION OF PARENTS AND PEERS IN HEALTH PROMOTION

Although parents and peers each influence the adoption and maintenance of obesity-related health behaviors, there is limited research on how parent- and peer-related variables come together to impact health behavior change in adolescents. Furthermore, there are limited examples of intervention studies which have systematically integrated parent and peer variables to change obesity-related health behaviors in adolescents.

Parental Monitoring and Management of Peer Relationships. An individual's peer network has been shown to have an impact on obesity and related health behaviors (Beets, Vogel, Forlaw, Pitetti, & Cardinal, 2006; Davison & Jago, 2009; Martin & McCaughtry, 2008; Springer, Kelder, & Hoelscher, 2006). A 32-year longitudinal study of a network of 12,067 individuals determined that having a friend who became obese

increased an individual's chances of becoming obese by 57% (Christakis & Fowler, 2007). During adolescence, friendships become increasingly important as does the need to belong to and be accepted by a peer group (Coleman, 1980). Both friendship and peer acceptance have been positively associated with PA in adolescents (De La Haye, Robins, Mohr, & Wilson, 2011; Jago et al., 2011; Macdonald-Wallis, Jago, Page, Brockman, & Thompson, 2011; Smith, 1998; Smith, 1999, 2003; Smith, Ullrich-French, Walker, & Hurley, 2006). A recent systematic review synthesizing social network analyses of youth PA found strong evidence for similarities in youth PA behaviors within friendships, noting friendship ties between children and adolescents are more likely to exist between individuals with similar PA behaviors (Macdonald-Wallis, Jago, & Sterne, 2012). Similar patterns have been found for SB and vegetable intake in predominantly ethnic minority adolescents, with youth screen time and vegetable intake positively associated with that of their friends (Bruening et al., 2012; Sirard et al., 2013). Peer social support has also been shown to be a stronger predictor of PA in children than parent or sibling support (Duncan, Duncan, & Strycker, 2005) and a predictor of healthy dietary intake in a sample of ethnically diverse sixth graders (Stanton, Green, & Fries, 2007). Given adolescents spend a large portion of their time with friends (Eccles, 1999), facilitating peer interactions that promote the adoption of healthy behaviors may be important in promoting positive changes in PA, SB, and diet.

One way to facilitate adolescent peer relationships that discourage unhealthy behaviors and support healthy behaviors is through promoting positive parenting practices. Parke & Bhavnagri (1989) suggest parents might influence a child's relationship with his or her peers either indirectly or directly. For example, parenting

style (i.e., authoritative; Baumrind, 1966), which does not focus specifically on peer relationships, may be considered an indirect influence on peer interactions in that parents create a generally supportive climate for fostering positive peer relationships. Contrastingly, a direct impact occurs when a parent's goal is to influence peer relationships. Parental monitoring is considered a parenting practice with which parents directly manage peer relationships by enabling or restricting access to peers (Parke & O'Neil, 1999). For example, unsupervised time spent with peers has been related to negative health behaviors (e.g., risky sexual behaviors), whereas parental monitoring has been related to decreased risky sexual behaviors and drug use in adolescent males (Borawski, Ievers-Landis, Lovegreen, & Trapl, 2003). Other parenting strategies associated with adolescent peer relationships include guiding (i.e., parents talk to adolescents about the consequences of being friends with particular peers) and supporting (i.e., parents foster peer relationships such as by providing an environment at home for adolescents to invite friends) (Mounts, 2000, 2002). The use of the parent supporting strategy has been associated with positive adolescent outcomes including less affiliation with deviant peers (Tilton Weaver & Galambos, 2003). In addition, adolescent friendship quality may be better when parents provide advice about peer relationships (Mounts, 2004).

With regard to health behaviors, parental monitoring has been associated with improvements in activity and dietary behaviors. For example, studies have shown that when parents monitor adolescent SB, adolescents are less likely to engage in these behaviors (Ramirez et al., 2011; Salmon, Timperio, Telford, Carver, & Crawford, 2012). Previous interventions which have included a monitoring component related to SB for

African American adolescents have found significant decreases in screen time (Ford, McDonald, Owens, & Robinson, 2002; Robinson et al., 2003). Moderate (vs. high or low) levels of parental monitoring have also been associated with positive behaviors such as less extreme dieting in overweight girls and eating breakfast in overweight boys (Mellin, Neumark-Sztainer, Story, Ireland, & Resnick, 2002). These studies suggest that the use of parental monitoring may help to protect adolescents from engaging in unhealthy behaviors. However, few studies to date have used parental monitoring as a specific strategy for managing peer relationships around PA, SB and dietary behaviors. Thus, the SHINE intervention expands on previous research by using parental monitoring not only to improve adolescent health behaviors but also to facilitate positive peer interactions related to their adolescents' PA, SB and F&V intake.

Autonomy Support and Parent-Adolescent Communication. A challenge parents often face during the adolescent developmental period is managing the adolescent's growing need for autonomy with the parents' desire to protect the adolescent from negative experiences (Eccles et al., 1991). One study found that adolescents who made their own food choices were more likely to skip breakfast than those who reported that their parents made dietary decisions for them (Videon & Manning, 2003). In this case, adolescent autonomy in food choices was associated with poor nutrition decisions. However, when parents set more rules and limits around SB, adolescents were less likely to engage in greater levels of these behaviors (Zabinski, et al., 2007). While setting limits and rules around health behaviors may be effective, it is important for parents to foster an adolescent's sense of autonomy by including them in the decision-making process (Grolnick, 2003). Parental peer management strategies are associated with more

positive peer affiliations when the adolescent perceives them as less intruding and controlling (Soenens, Vansteenkiste, Smits, Lowet, & Goossens, 2007). Thus, there appears to be a need to effectively balance providing rules with providing autonomy support, which may require shared decision-making between adolescents and their parents (Bassett, et al., 2008).

One way to facilitate this balance is through engaging in positive communication. Communication, defined as an exchange in which individuals openly express and receive ideas (Robin, 1979), is an important feature of evolving parent-adolescent relationships (Laursen & Collins, 2004; Robin & Foster, 2002). Family health communication has been shown to reduce child health risk factors (Hutchinson, Jemmott, Sweet Jemmott, Braverman, & Fong, 2003; Marta, 1997; Reimuller, Hussong, & Ennett, 2011; Whitaker & Miller, 2000). For example, parent-adolescent communication around risk-taking behaviors has not only reduced these behaviors (e.g., alcohol use, sex) (Hutchinson, et al., 2003; Reimuller, et al., 2011), it has also influenced the effect of peers on adolescent risk-taking (Whitaker & Miller, 2000). While recommendations that future dietary interventions help parents and adolescents recognize the process by which they make decisions about family food practices (Bassett, et al., 2008), few studies outside of those on adolescent risk-behaviors have tested communication-centered approaches for improving health behaviors in African American families. The SHINE intervention tested an interactive approach wherein parents and adolescents actively practiced shared-decision making around autonomy and rules specific to PA, SB and F&V consumption.

Health Promotion Intervention Studies Integrating Parent and Peer Components. As previously noted, there are limited examples of intervention studies

which have integrated parent and peer variables to change obesity-related health behaviors in youth. Overall, studies involving parent and peer components appear to lack an integrated theoretical approach which systematically combines parent and peer variables. Instead, when parent and peer variables have been included in health behavior interventions, they are targeted separately. These interventions have been primarily conducted in school settings (where peers are involved to a greater degree than parents) (Lubans, Morgan, Callister, & Collins, 2009; Lytle et al., 2004; Wilson et al., 2011; Young, Phillips, Yu, & Haythornthwaite, 2006), or in clinical/community-based settings (where parents are involved to a greater degree than peers) (Baranowski et al., 1990; Kitzman-Ulrich, Wilson, St. George, et al., 2010; L. B. Ransdell, A. Taylor, et al., 2003). Thus, the present study fills an important gap in the literature by theoretically integrating parent and peer systems through the use of improved parent-adolescent communication and parental monitoring and management of peer relationships as the key strategies to positively influence adolescent health behaviors.

Many health promotion interventions integrating parent and peer elements have been conducted in school settings and have taken either an ecological approach by implementing school-wide environmental changes (e.g., increasing the amount of PA time during PE class, increasing the availability of F&V in the school cafeteria; (Pate et al., 2005; Sallis et al., 2003; te Velde et al., 2007) or have included elements from SCT (e.g., social support from parents and peers) (Lubans, et al., 2009; Lytle, et al., 2004; Neumark-Sztainer, Story, Hannan, & Rex, 2003; Wilson, et al., 2011). Given that youth are exposed to similar changes in the school environment, peers automatically become involved in these health promotion efforts (Foster et al., 2008; Haerens, De

Bourdeaudhuij, Maes, Cardon, & Deforche, 2007; Simon et al., 2004; te Velde, et al., 2007). For example, in the School Nutrition Policy Initiative (Foster, et al., 2008), peers participated in classroom nutrition education, were exposed to school food policy changes, and could receive social marketing incentives when they purchased or brought healthy food items. Other studies have involved peers more directly in the behavior change process via peer engagement in PA and healthy snack consumption (Baranowski, et al., 2002; French et al., 2005; Jago, et al., 2006; Lubans, et al., 2009; Neumark-Sztainer, et al., 2003; Young, et al., 2006), or by involving elected peer leaders in intervention delivery (Lytle, et al., 2004).

Parent involvement across these studies, however, has been limited and done primarily via parent outreach components. Parent outreach involves attempts to establish contact with parents directly or by teaching adolescents how to navigate their social environments so as to elicit support from their parents. For example, parents have been sent incentive booklets with stickers for monitoring and tracking adolescent nutrition (Burke et al., 1998), computer-tailored CD-ROMs for tracking PA and fat intake (Haerens, et al., 2007), and behavioral coupons, which could be returned for a monetary incentive (Lytle, et al., 2004). Parent outreach in school-based programs has also been done through home-school meetings that included activities such taste-testing, media displays, and literature distribution (Nicklas, Johnson, Myers, Farris, & Cunningham, 1998), as well as sessions on providing support and role-modeling PA (Simon, et al., 2004; Young, et al., 2006). One major problem with this approach to parent involvement is that the actual degree of parental involvement is often less than theoretically intended or desired (Lubans, et al., 2009; Nicklas & O'Neil, 2000; Saunders, Ward, Felton,

Dowda, & Pate, 2006; Story, Lytle, Birnbaum, & Perry, 2002; te Velde, et al., 2007). For example, two thirds of adolescents in one program noted that parents had never read or signed their PA or nutrition handbooks (Lubans, et al., 2009) as advised by the intervention, and only 30% of parents in the Teens Eating for Energy and Nutrition Study (TEENS) participated in the behavioral coupon activity (Adkins, Sherwood, Story, & Davis, 2004; Story, et al., 2002).

An alternative to school based-approaches is clinical family-based studies that include high parental involvement but lower peer integration. These studies have involved the use of several parenting practices associated with a positive, authoritative parenting style (e.g., shared decision-making, reinforcement of health behaviors, and autonomy support). For example, in one study, family goal-setting was conducted during family- or home-based group sessions and aimed to encourage shared decision-making between parents and adolescents (Janicke et al., 2008). Other studies have used behaviorally-based parent materials to encourage praise, support, or positive role-modeling (Patrick, et al., 2006), or used stimulus control and reinforcement techniques (Saelens et al., 2002). Patrick et al.'s (2006) "PACE+ for Adolescents" additionally targeted adolescent autonomy by allowing adolescents to determine whether to include parents in a brief PA and nutrition feedback session with a health provider after receiving computer-tailored feedback. Other studies have involved direct family engagement in health behaviors, and thus parental modeling of positive PA and dietary behaviors (Baranowski, et al., 1990; Nader et al., 1989; L. Ransdell et al., 2003). The "San Diego Health Project," grounded in SCT and principles of self-management, trained 206 Caucasian and Mexican-American families in self-monitoring, goal setting, and family

support to help families make long-term changes in PA and diet (Nader et al., 1992; Nader, et al., 1989; Nader et al., 1986). Families engaged in aerobic activity, participated in behavioral management and rehearsal, and were taught skills in giving positive support. However, other than adolescents potentially being in a group with their same-age peers, the integration of peer variables in these programs was generally lacking. Thus, the present study will expand on past research by theoretically integrating both family- and peer-systems into the intervention approach for improving PA and F&V intake.

Family-Based Intervention Studies Targeting African American Youth. Wilson (2009) has argued that family-based interventions for improving health behaviors in ethnic minorities should include family support and parent involvement as key conceptual factors. Although parent involvement in interventions may be an effective approach for changing health behaviors in African American youth (Beech et al., 2003; Robinson et al., 2003; Stolley & Fitzgibbon, 1997), there have not been many family-based interventions conducted specifically with African Americans families. Robinson and colleagues (2003) randomized African American girls to either dance classes plus a family-based intervention to reduce physical inactivity versus a health education comparison group. The family-based component consisted of five lessons delivered during home visits in which adolescents and any available family members were taught strategies for reducing TV viewing; families also received electronic TV time managers (i.e., devices that budget viewing time for each member of the household). The intervention resulted in greater reductions of household TV viewing and fewer dinners eaten while watching TV than did the comparison condition. In another study, Beech et al. (2003) randomized pre-Adolescent African American girls to one of three groups:

child-only, parent-only, or self-esteem focused comparison group. The intervention consisted of interactive modules for increasing knowledge and developing behavior change skills to promote healthy eating and greater amounts of PA in parents and youth. Results for the combined intervention groups showed increases in minutes of moderate-to-vigorous PA (MVPA) as well as a decrease in servings of sweetened beverages. Although these studies target health behaviors and involve family components, very few of them specifically intervene on parent variables such as autonomy support or parent-adolescent communication and none of them intervene on parental monitoring or management of peer relationships.

1.3 STUDY PURPOSE (AIMS AND HYPOTHESES)

The overall goal of this study is to expand on previous research by integrating important parent, peer, and adolescent variables (i.e., parental monitoring, parental management of peer relationships, autonomy support, parent-adolescent communication, adolescent self-efficacy, adolescent motivation) into an interactive, family-based intervention designed to improve MVPA, SB, and F&V consumption in African American adolescents (see Figure 1.1). The primary aims and hypotheses of the study were:

(1) To determine the effectiveness of intervention implementation using the process evaluation elements of reach (proportion of intended audience receiving intervention), dose (completeness of implementation), and fidelity (extent to which essential elements were delivered as planned).

(2) To determine if adolescents in a 6-week interactive, parent-based (IPB) intervention would show greater improvements in MVPA (7-day accelerometry),

SB (self-reported) and F&V consumption (three random 24-hour dietary recalls) than adolescents in a general health education (GHE) comparison program from baseline to 6-weeks post-intervention. It was hypothesized that adolescents in the IPB group would show significantly greater improvements across behavioral outcomes.

(3) To determine whether families in the IPB intervention would show greater improvements in key theoretical psychosocial variables (i.e., parental monitoring, parental management of peer relationships around health behaviors, perceptions of parent support for PA and diet, perceptions of peer support for PA and diet, autonomy support, adolescent motivation, and adolescent self-efficacy) from baseline to post-intervention as compared to adolescents in the GHE program. It was hypothesized that adolescents in the IPB group would show significantly greater improvements across psychosocial outcomes.

(4) To determine if changes in key theoretical psychosocial variables (i.e., parental monitoring, parental management of peer relationships around health behaviors, perceptions of parent support for PA and diet, perceptions of peer support for PA and diet, autonomy support, adolescent motivation, and adolescent self-efficacy) would be significantly associated with changes in behavioral outcomes for adolescents in the IPB group. It was hypothesized that changes in behavioral outcomes would be significantly associated with changes in key psychosocial variables for adolescents in the IPB condition.

Although parent-related outcome data was not the primary focus of the present study, secondary analyses examining between-group differences in parent behavioral outcomes (MVPA, F&V intake) are additionally presented.

Table 1.1

Theories, Theoretical Constructs and Essential Elements

Theory	Theoretical Constructs	Description of Intervention Essential Elements
		Behavioral Skills
SCT	Self-Monitoring	• Parents and adolescents monitor their health behaviors, using a tool of their choice.
SCT	Goal-setting	• Parents and adolescents set specific and measurable health behavior change goals together, including both long and short term goals related to national activity and dietary guidelines.
SCT	Self-regulation	• Parents and adolescents are provided with weekly feedback and are given opportunities to revise goals.
		Positive Parenting
SDT, FST	Communication skills	• Parents use communication strategies to elicit input from their adolescents and thus engage in shared decision-making. • Adolescents use communication strategies to elicit social support from parents and peers for improving health behaviors. • Parents and adolescents use problem-solving skills to set family rules around health behaviors. • Parents use problem-solving skills to navigate adolescent-peer relationships around health behaviors. • Parents and adolescents are provided with opportunities to self-evaluate family communication/climate changes.
SCT, SDT, FST	Social support	• Parents are provided strategies for providing adolescents with social support for changing health behaviors. • Adolescents are provided strategies for eliciting social support for health behaviors from their parents and peers.
SDT, FST	Autonomy support	• Parents seek input from adolescents and negotiate rules and behavior changes together. • Adolescents have choices and are provided with opportunities to provide input.
FST	Parental monitoring and management of peer relationships	• Parents keep track of adolescent health behaviors. • Parents use monitoring and other peer management strategies (supporting, guiding) to manage peer relationships around health behaviors.
		Adolescent Intrapersonal Variables
SCT	Self-efficacy	• Adolescents feel confident that they can change health behaviors. • Adolescents feel confident engaging in discussions about health behaviors with their family members and friends. • Adolescents have support from family and friends for changing behaviors.
SDT	Motivation	• Intervention creates a social climate that fulfills adolescent needs for autonomy, competence, and belongingness.

Note. SCT = Social Cognitive Theory; SDT = Self-Determination Theory; FST = Family Systems Theory

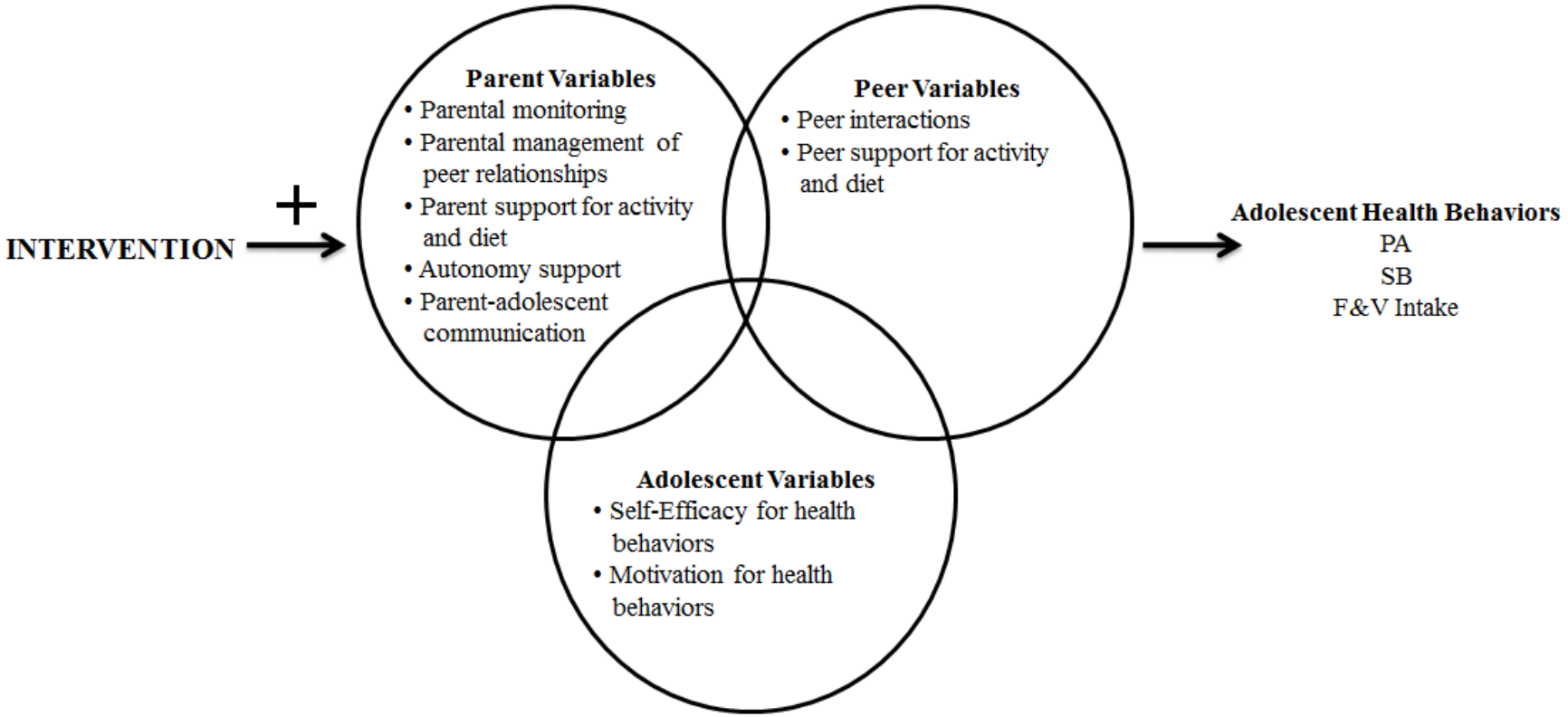


Figure 1.1 Integration of parent, peer, and adolescent variables in an interactive, family-based intervention to improve PA, SB and F&V consumption in African American adolescents

CHAPTER 2

METHOD

2.1 PARTICIPANTS

Participants were African American adolescent-caregiver dyads who volunteered to participate in a family-based health promotion study conducted across five cohorts. Of 124 total adolescent-caregiver dyads enrolled into the study, 35 were lost to a two-week run-in period resulting in a total intent-to-treat sample of 89 parent-adolescent dyads randomized to either the IPB intervention (n = 49) or GHE comparison program (n = 40; see Table 2.1 for sample details by cohort and Figure 2.1 for the CONSORT flow diagram).

Families were eligible to participate if (1) they had an African American adolescent (defined as having three African American grandparents), (2) the adolescent was between the ages of 11-15, (3) there was at least one primary caregiver living in the same household as the adolescent willing to participate, and (4) they were willing to be randomized to both an evening (i.e., Tuesday or Thursday) and a study condition (i.e., IPB or GHE groups). Families were excluded from the study if (1) they were currently enrolled in a formal health or weight loss program, (2) the adolescent had a chronic medical condition (e.g., Type 2 Diabetes), (3) the adolescent had a psychiatric condition that would interfere with engaging in moderate amounts of PA or changing eating behaviors, or (4) the adolescent had a developmental delay that would interfere with understanding program materials.

2.2 RECRUITMENT

Families were recruited using a variety of methods (see Table 2.2 for a summary of recruitment methods by participant status). The majority of enrolled participants were recruited by trained study staff at local community events including health fairs, community family events, and school-based functions. Project SHINE was described as a research study designed to promote healthy lifestyles and prevent chronic illnesses, such as Type 2 Diabetes, in African American adolescents. Families who expressed interest in the program were subsequently contacted via phone and screened for eligibility using a standardized protocol. Eligible families were then invited to enroll in the study. Print (e.g., brochures, flyers, newsletters) and multimedia (i.e., radio, television, website) advertisements were disseminated throughout the community, and referrals were made by healthcare providers at local pediatric clinics, school nurses, and research staff from other studies. Passive consent procedures were additionally employed to gain direct access to African American patients in the specified age range at a local pediatric clinic. Letters informing patients of the study were mailed by the pediatric clinic with directions on how to opt out of having their contact information released to study staff. Two weeks after letters were mailed, families who did not opt out were contacted via phone and invited to participate.

Across all recruitment methods, study staff attempted a total of 582 phone contacts. Of those, 21% of families were eligible and enrolled, 16% were ineligible (see Table 2.3 for a summary of reasons for participant ineligibility), 19% refused, 8% failed to attend their scheduled appointment, and 36% were unable to be reached (due to either

having wrong or disconnected phone numbers or exceeding the study protocol of five phone call attempts).

2.3 STUDY DESIGN AND PROCEDURE

The present study was implemented over 2 years (see Figure 2.2 for study timeline) and used a multiple cohort design wherein ten groups of 5-12 families per group were run across a series of five cohorts (with one intervention and one comparison group in each cohort). Approval from the University of South Carolina Institutional Review Board as well as informed parental consent and adolescent assent were obtained prior to data collection. By signing the informed consent document, families agreed to be randomized to either a "specialized nutrition and exercise program" which also included parenting strategies for promoting positive adolescent health behaviors (i.e., the IPB condition) or a "comprehensive health program" covering information on a broad range of health topics (i.e., the GHE condition).

A team of trained measurement staff (blind to randomization) collected baseline measures prior to the start of the intervention and immediately post-intervention for all participants. Measures included demographics, objectively-measured anthropometric data (height, weight, waist circumference), 7-day accelerometry estimates, three random 24-hour dietary recall phone calls (2 weekday, 1 weekend), and psychosocial surveys. Confidentiality of participant responses was emphasized prior to completion of psychosocial measures to decrease social desirability response bias. Participants were given a $20 incentive upon the completion of measures at each of the two time points (baseline, post-intervention).

After completing baseline measures, families in each cohort were stratified by adolescent sex and weight status and randomly assigned to one of two possible intervention evenings (i.e., Tuesdays or Thursdays) using a digital coin flip. Families then participated in a two-week run-in period, which was used to eliminate non-compliant participants and has been shown to reduce participant drop-and and improve retention rates (Ulmer, Robinaugh, Friedberg, Lipsitz, & Natarajan, 2008). Attendance at the two run-in sessions was required (though make-up sessions were permitted) for continued study participation. During the first week of the run-in period, facilitators were introduced, an overview of the program structure was provided, and participants engaged in "ice-breaker" activities. The second week of the run-in period was conducted by a local African American dietician and focused on providing families with education only on national recommendations for PA, SB, and diet. It should be noted that of the 35 families lost to the run-in period in the present study, 80% did not attend either of the run-in sessions, 17% attended one session only, and 3% attended both run-in sessions.

Each evening was subsequently randomized to either the six-week IPB or GHE conditions using a digital coin flip. In a previous motivational and parenting intervention for low-income and ethnic minority families, improvements in adolescent health outcomes (i.e., BMI and dietary behaviors) were demonstrated within a six-week intervention period (Kitzman-Ulrich et al., 2011). Because attrition and attendance rates have been shown to suffer in interventions with ethnic minority families (Baranowski, et al., 1990; Zeller et al., 2004), Project SHINE specifically tested the effects of six brief weekly sessions. All weekly sessions across both conditions lasted one and a half hours, were held at the research team's office, and were jointly attended by both adolescents and

their caregivers. To encourage participant attendance and punctuality in both conditions, door prizes were raffled at the beginning of all sessions and free childcare was provided for younger siblings of study participants. Additionally, healthy snacks (e.g., smoothies, fruits, vegetables) were served at all sessions. Finally, participants in both conditions were provided with a Project SHINE workbook and colorful handouts tailored to each session's unique topic (see Appendix A for sample workbook pages from the IPB condition).

2.4 GROUP FACILITATORS AND FACILITATOR TRAINING

In order to minimize group effects, each cohort (i.e., one intervention group and one comparison group) was led by the same intervention facilitators. Intervention facilitators were graduate students in either clinical psychology or public health who volunteered their time (n=6, 83% female, 50% African American, 33% Caucasian, 17% Hispanic). A single lead facilitator was responsible for delivering weekly content, and 1-2 co-facilitators were responsible for assisting the lead facilitator in managing the group (e.g., taking attendance, distributing and collecting materials, audio recording group sessions). During each intervention session, facilitators followed a structured guide detailing key topics, discussion points, and activities. To ensure the intervention was implemented with high fidelity, facilitators were provided with on-going feedback at weekly intervention meetings based on formative process evaluation measures.

Prior to leading sessions, facilitators were required to attend 10 hours of in-person training. Trainings consisted of discussions, observed role-plays, and activities related to the guiding theoretical model, including key behavioral (e.g., goal-setting, self-monitoring) and family-related constructs (e.g., parent-adolescent communication skills,

autonomy support). For ease of implementation by facilitators, study essential elements were simplified into a user-friendly acronym and corresponding pyramid-shaped illustration referred to as "LITE" (i.e., Lifestyle, Interactions, Together, Engaged; see Figure 2.3). Facilitators were instructed to view each level of the LITE pyramid as a necessary "building block" for the next, with the ultimate goal being for families to reach lifestyle change at the pinnacle of the pyramid. This tool was developed so facilitators could quickly assess the intervention climate at any given moment by noting whether families were engaged and having fun ("Together/Engaged"), were using positive parenting and communication skills ("Interactions"), and were working on positive behavior change skills ("Lifestyle"). In addition to auditory exercises wherein facilitators were challenged to hear "the LITE" in previously recorded intervention sessions led by the study Principal Investigator, trainings also included in-depth coverage of national recommendations for adolescent PA, SB, and diet. Furthermore, to supplement in-person training, facilitators were required to spend ~5-10 hours completing the following activities: self-monitoring an activity- or diet-related behavior of their choice for at least 24 hours, reading assigned materials related to parent-adolescent communication and clinical skills, and watching instructional videos on motivational interviewing. Facilitator certification was based on attendance at in-person training sessions and successful completion of supplemental training activities.

2.5 IPB INTERVENTION DESCRIPTION

The IPB intervention was based on integrated aspects of SCT, SDT, and FST to develop a positive family climate for health promotion in adolescents. Overall, the intervention targeted behavioral and parenting variables through interactive sessions

designed to teach parents how to refine their positive parenting practices (e.g., parental monitoring and management of peer relationships, communication skills, social support, autonomy support) in order to improve adolescent PA, SB, and F&V intake. Each of the essential elements was expanded into session objectives, activities, and interactive components (see Table 2.4 for the curriculum matrix).

Each week, families were challenged to work on one of the specified activity and/or diet-related behaviors of their choice by self-monitoring, setting goals, and implementing new skills learned. The first two weeks of the intervention focused largely on communication skills (e.g., active listening, using "I" statements, taking turns making brief statements, using a neutral tone of voice, making eye contact), monitoring of health behaviors, goal-setting, and skills to elicit social support for health behaviors from parents and peers. Parents and adolescents (separately) participated in discussions related to how family members and friends influenced adolescent health behaviors. Parents were also provided with specific behaviorally-based parenting strategies (e.g., descriptive praise, shared decision-making) associated with supporting their adolescent in meeting health behavior goals. In the third week, the concept of energy balance was discussed, and families engaged in a group problem-solving activity. The fourth week emphasized the importance of peer relationships during adolescence and the role parents play in managing peer relationships around health behaviors. Adolescents were encouraged to bring a friend to this session, and friends were integrated into activities. During the fifth week, families examined their progress and readjusted goals as needed. A local African American community leader and author specializing in youth development shared his personal health testimonial and discussed parenting concepts (e.g., parental monitoring)

from his book on parenting. Lastly, the sixth week focused on maintaining health behavior changes through relapse prevention strategies.

All weekly sessions had an interactive component wherein parents and adolescents were given opportunities to discuss concepts from the session, engage in role-plays, and negotiate weekly contracts for health behaviors. For example, "Family Walk and Talk" sessions were implemented during the first and third sessions, wherein families communicated about relevant topics while on a brief walk. "Family Bonding Activities" were also assigned weekly (e.g., check in with family on self-monitoring, negotiate family health rules, engage in a healthy activity together with family and friends) to reinforce communication skills and session content.

Various cultural targeting strategies (e.g., peripheral, constituent-involving) were additionally implemented to enhance intervention appropriateness for participating families (Kreuter, et al., 2003). For example, peripheral strategies (i.e., packaging materials so they convey relevance to a group) were used such that photos of African American adults, adolescents, and families were featured on study brochures, the program website, and intervention handouts and workbook pages (see Appendix A for workbook page examples). Evidential strategies (i.e., presenting evidence of the impact of health issues on the target group) were employed during weekly sessions by providing national prevalence data related to the health behaviors of African American youth (e.g., weekly hours of television viewing). Similarly, by hiring an African American dietician and community leader as outside speakers, constituent-involving (i.e., involving those indigenous to the population being served) and linguistic strategies (i.e., use of the

dominant language of the target group) were used to enhance the salience of information presented.

Throughout the intervention, families were also provided with a variety of opportunities to culturally tailor intervention elements based on their unique perspectives. Using an autonomy-supportive approach wherein families were offered choice throughout the intervention allowed for cultural beliefs, values, and behaviors to be recognized an integrated into the intervention at the level of the individual. Parents and adolescents chose their own self-monitoring tools and target health behaviors. In addition, family discussions held during the intervention were utilized to customize subsequent sessions. For example, topics covered during separate parent and adolescent "focus group" discussions in the second week were used to develop tailored examples for the problem solving exercise covered in the third week. Intervention facilitators also met individually with families for 5-15 minutes weekly to review progress, discuss ways to overcome the family's unique barriers to change, and reinforce change through brief, customized action planning. Furthermore, workbooks and handouts for this group were designed such that families could work through their health behavior goals at their own pace beyond the intervention period.

2.6 GHE (COMPARISON) PROGRAM DESCRIPTION

Adolescents and caregivers in the GHE comparison program covered one of six general health topics each week after randomization: sleep, stress management, hypertension, positive self-concept and life skills, diabetes, and cancer. The same local African American community leader and author referenced above led the session on positive self-concept and life skills, a graduate student in clinical psychology with

expertise in cardiovascular disease led the session on hypertension, and group facilitators led remaining sessions. Weekly sessions incorporated didactics and group activities focused on reinforcing session content. No behavioral strategies or information on parental monitoring and management of peer relationships, communication skills, social support, or autonomy support were provided.

2.7 PROCESS EVALUTION

To assess intervention implementation, the process evaluation elements of reach, dose, and fidelity were examined in the present study. Similar to the process evaluation approach taken in the Active By Choice Today (ACT) school-based randomized trial to improve physical activity in underserved sixth graders (Wilson et al., 2009; Wilson et al., 2008; Wilson, et al., 2011), quantitative checklists and rating scales designed to capture how well intervention facilitators characterized a positive, autonomy-supportive social climate based on study essential elements were developed for the present study (see Appendix B for process evaluation forms).

Reach. Reach was assessed using participant recruitment and attendance data, including response rate, weekly session attendance, retention data, and follow-up interviews with families who dropped out of the study. The a priori attendance goal was for 75% of families to attend at least 5 of 6 total intervention sessions. Although the importance of attending in-person sessions was emphasized, if extenuating circumstances prevented families from attending sessions, make-up sessions were permitted. Attendance was thus calculated both including and excluding the completion of make-up sessions. Furthermore, a study staff member not directly involved in intervention delivery conducted brief follow-up phone interviews with parents and youth (separately) who

dropped out from the study concerning their reasons for study discontinuation. Interviews were audio recorded and transcribed by a professional transcription agency. Reasons for dropout provided by parents and adolescents were organized into themes.

Dose. A trained, independent process evaluator systematically observed all one and a half hour weekly intervention sessions to assess both dose delivered and intervention fidelity. Dose was assessed using yes/no response options around key session content. Percentages of "yes" responses were used to summarize results. Achieving adequate dose was defined a priori as ≥ 90% of the intended intervention actually delivered to each cohort.

Fidelity. Ratings for fidelity assessed the extent to which families were provided with opportunities to be actively engaged in their health behavior change (i.e., set goals, self-monitor, receive feedback) and the extent to which the social environment fostered positive communication, social support, and autonomy support. Ratings for fidelity were made on each of four components (behavioral skills (6 items), communication skills (13 items), social support (6 items), and autonomy support (3 items)) using a 4-point scale ranging from 1=low implementation to 4=high implementation. An overall average as well as an average for each individual component was calculated across five study cohorts. Achieving fidelity was defined a priori as a value of ≥3 for each essential element.

2.8 MEASURES

Demographic data. Demographic data was collected from adolescents and their caregivers at baseline and included items such as date of birth, education level (for parents), household income, and total number of family members living in the household.

Anthropometric measures. Height was measured using a Shorr Height Measuring Board, weight was measured with a SECA 880 digital scale, and waist circumference was measured using a tape measure marked in centimeters. Two measures of height, weight, and waist circumference were taken by trained study staff at baseline and post-intervention on both adolescents and their caregivers, and the average scores were used in anthropometric calculations. Adult BMI was calculated using the following standardized formula: BMI = weight (in kg) divided by height (in meters^2). BMI percentiles and zBMI were calculated for adolescents with EpiInfo (Version 3.5.1) using the most recently available CDC growth reference curves (Kuczmarski et al., 2002).

Moderate-to-vigorous physical activity. Adolescent MVPA was assessed at baseline and post intervention with the Actical omni-directional accelerometers (Mini-Mitter, Bend, OR), which was strapped onto an elastic belt and worn above the right hip. Actical has been previously validated as a measure of children's PA (Puyau, Adolph, Vohra, Zakeri, & Butte, 2004). Participants were instructed to wear the Actical for seven consecutive days. Each day of Actical data is divided into five time intervals: 6-9 am, 9-2 pm, 2-5 pm, 5-8 pm, and 8 pm to midnight. Data were recorded in one-minute epochs (Welk, Schaben, & Morrow, 2004), and 60 minutes of consecutive zeros were used to define non-wear (Evenson & Terry, 2009; Troiano, et al., 2008). Raw activity data were converted into time spent in MVPA (3 to <9 METS) based on Actical-specific activity count thresholds for children (where MVPA = 1,500 to < 6,500) as identified by Puyau and colleagues (2004). Missing data for a given participant were identified by periods during which the Actical was worn for less than 80% of the interval (see table 2.5 for a summary of missing accelerometry data). Multiple imputation methods (see Data

Analysis for details) were applied to missing accelerometer data (Catellier et al., 2005; Schafer & Olsen, 1988). After data imputation, one MVPA variable was calculated by summing the time points for each day and averaging the seven days.

Sedentary behavior. Adolescent self-reported SB was assessed at baseline and post-intervention using the *Sedentary Behavior Scale* modified by Rosenburg et al. (2010) from other measures (Norman, Schmid, Sallis, Calfas, & Patrick, 2005; Robinson, 1999). The *Sedentary Behavior Scale* contains a total of 22 items assessing SB in time per typical week (as reflective of the past two months) that the adolescent spent engaged in a variety of SBs (e.g., watching TV/videos/DVDs, playing computer or video games, using the internet or emailing, sitting listening to music, sitting talking on the telephone or texting, doing inactive hobbies such as music, art, crafts, clubs, etc.). The measure contains two subscales, one for weekday and one for weekend SB. Response options included: None, 15 minutes, 30 minutes, 1 hour, 2 hours, 3 hours, or 4 or more hours. Responses were recoded into duration of time spent engaged in the SB (e.g., 30 minutes recoded as 0.5 hours) then summed across subscale items (separately for the weekday and weekend items) and multiplied by the corresponding number of days (5 for the weekday subscale, 2 for the weekend subscale). The products of each subscale were summed to yield a composite score reflecting total weekly hours of SB. Cronbach's alpha for this scale in the present study ($\alpha = 0.86$) demonstrated adequate internal consistency, and the scale has been positively associated with the Home Electronic Equipment Scale (Rosenberg et al., 2010), which assesses the home environment as it relates to availability of electronic equipment (e.g., televisions, video game players, computers).

Fruit & vegetable intake. Three 24-hour dietary recall assessments (two weekday, one weekend day) were conducted at baseline and post intervention to estimate adolescent F&V intake separately. Twenty-four hour dietary recall assessments have been widely used to assess youth dietary intake in national surveys (Deshmukh-Taskar et al., 2010; Nicklas, Yang, Baranowski, Zakeri, & Berenson, 2003; Troiano, Briefel, Carroll, & Bialostosky, 2000). In addition, previous research supports the use of at least three 24-hour recalls to reliably estimate intake (Basiotis, Welsh, Cronin, Kelsay, & Mertz, 1987). In the present study, the Automated Self-Administered 24-hour Recall (ASA24) system developed by the National Cancer Institute (Subar et al., 2012) served as a cost-effective tool for the collection of dietary intake data. The ASA24 is a free online dietary interview system modeled after the validated Automated Multiple Pass Method that codes foods items into nutrient intake (Subar et al., 2010; Subar, et al., 2012; Subar et al., 2007; Zimmerman et al., 2009). Preliminary examination of the ASA24 suggests it provides food group estimates consistent with those found in the National Health and Nutrition Examination Survey (Subar, et al., 2012). Furthermore, mean reported intakes of various foods on the ASA24, including fruits and vegetables, were found to be similar to those reported using the Automated Multiple Pass Method in a sample of 1,200 adults (Thompson et al., 2013)

Because the ASA24 youth version ("ASA24-Kids-2012;" released September 2012) was unavailable for this study, administration protocols using the adult self-administered "Beta" and "ASA24-2011" versions were modified for use with adolescents. Trained and certified study staff members contacted participants via phone on three random days (two weekdays, one weekend day) and entered the dietary recall

information into the automated system on participants' behalf. Once food items are entered into the automated self-administered 24-hour recall (ASA24) system, they are broken down into their respective food groups to calculate intake. Prior to conducting recalls, study staff completed extensive training on the ASA24, including a detailed overview of the system, live demo, and various practice sessions. Certification was based on achieving a minimum of 80% agreement on two standardized menus as compared to two "gold-standard" recalls. Participants were provided with serving size handouts and prompted by interviewers to reference these prior to each recall interview. Interviewers were instructed to contact participants a maximum of three times on their randomly determined days and continue calling on random back-up days should families be difficult to reach. There were a handful of participants who completed four recalls at each time point. For these participants, two weekdays and one weekend were randomly selected for data analyses. Multiple imputation methods (see Data Analysis for details) were applied to missing dietary data.

Parent and peer psychosocial variables. See Appendix C for measures related to parent and peer variables (i.e., parental monitoring, parental management of peer relationships, social support from parents and peers around PA and diet, autonomy support, parent-adolescent communication, peer interactions around health).

Parental monitoring (parent-reported). Parental monitoring of adolescent health behaviors was assessed at baseline and post-intervention using the monitoring subscale of the *Parenting Strategies for Eating and Activity Scale* (Arredondo et al., 2006; Larios, Ayala, Arredondo, Baquero, & Elder, 2009). Six items were averaged to assess the degree to which parents keep track of a range of their child's activity, sedentary, and

dietary behaviors. Sample items include: "How much do you keep track of the amount of exercise your child is getting?" and "How much do you keep track of amount of TV/ videos your child is watching?" Response options range from 1 = "Never" to 5 = "Always." Cronbach's alpha as a measure of reliability for this scale in the present study ($\alpha = 0.89$) demonstrated adequate internal consistency, and construct validity has previously been supported through a significant positive association ($r = .62$, $p < .001$) with the monitoring subscale of the *Child Feeding Questionnaire* (Birch et al., 2001; Larios, et al., 2009).

Parental management of peer relationships around health behaviors (adolescent-reported). Using the *Parental Management of Peers Inventory* (Mounts, 2000, 2002, 2004, 2007, 2008, 2011), which assesses adolescent perceptions of parental management and monitoring of their peer relationships, a health-specific measure of parental management of peers was developed for this study. The original measure demonstrated construct validity through its association with lower levels of drug use and delinquent behavior between adolescents and their peers (Mounts, 2001). A total of 9 items with response options ranging from 1="Strongly disagree" to 4="Strongly agree" were modeled after various items from the original scale. Sample items for the new scale (herein referred to as the *Parental Management of Peers Inventory – Health Scale*) include: "My parents tell me that who I have for friends will affect my health" and "My parents encourage me to invite kids who are physically active over to my house." The new scale demonstrated adequate internal consistency in the current study ($\alpha = 0.87$). In addition, its construct validity was supported through significant positive associations with both the original *Parental Management of Peers Inventory* ($r = 0.53$, $p < .05$) and

the monitoring subscale of the *Parenting Strategies for Eating and Activity Scale* (r = .22, p < .05).

Parent and peer social support for PA and diet (completed by adolescents). Support from family and friends for PA and healthy eating was assessed using modified versions of the *Support for Diet and Exercise Behaviors Scales* (Sallis, Grossman, Pinski, Patterson, & Nader, 1987). Similar to previous modifications made to these scales (Peterson, Lawman, Wilson, Fairchild, & Van Horn, 2013), negatively worded items were removed, leaving a total of 18 positively worded items (11 for PA and 7 for healthy eating) used to assess adolescent perceptions of support for PA and diet from family and friends separately. Previous studies have shown that when negative items are reverse-coded, they may introduce a method bias (Lawman, Wilson, Van Horn, Resnicow, & Kitzman-Ulrich, 2011). The present study also utilized a two-month time frame (versus a three-month time frame as in the original measure) to better capture the intervention window at post measures. Participants were instructed to rate the frequency with which family and friends supported their PA and eating behaviors using response options ranging from 1="None" to 5="Very Often." Sample items include, "[During the past two months, my family (or members of my household) or friends] 'offered to exercise with me (for PA)' and 'reminded me to eat fruits and vegetables (for diet).'" The internal consistency of these scales in the current study ranged from α = 0.87-0.94. Furthermore, construct validity has been previously supported in studies showing the support for PA scale as predictive of youth PA (Kitzman-Ulrich, Wilson, Van Horn, & Lawman, 2010; Sallis, Alcaraz, McKenzie, & Hovell, 1999; Sallis, Patterson, Buono, Atkins, & Nader, 1988).

Adolescent perceptions of parental autonomy support for health behaviors (completed by adolescents). Because existing autonomy-related scales are not specific to health behaviors (Grolnick, Deci, & Ryan, 1997; Grolnick, Ryan, & Deci, 1991; Supple, Ghazarian, Peterson, & Bush, 2009), a 9-item scale designed to assess the extent to which parents allow adolescents to participate in family decision-making around health behaviors was developed for the present study. Response options range from 1="Strongly Disagree" to 4="Strongly Agree." Sample items include, "My parents allow me to choose what types of exercise activities (e.g., sports, dance) I do" and "My parents ask me what fruits and vegetables they should buy at the grocery store." Internal consistency for this scale was moderate ($\alpha = 0.75$), and it was positively associated with theoretically similar constructs including parent support for PA ($r = 0.43$, $p < .01$), parent support for diet ($r = 0.48$, $p < .01$), adolescent-reported communication around health behaviors ($r = 0.47$, $p < .01$), and parent-reported communication around health behaviors ($r = 0.22$, $p < .01$).

Parent-adolescent communication around health behaviors (completed by both parents and adolescents). Using an existing 20-item measure of the frequency and quality of parent-child communication around drug use and other problem behaviors (e.g., birth control, sex, HIV/AIDS) as a model (Wills, Gibbons, Gerrard, Murry, & Brody, 2003), a measure of both the frequency and quality of communication between parents and adolescents around various obesity-related health behaviors (PA, SB, diet) was developed for this study. The original measure demonstrated adequate reliability (α = .80 - .88) and construct validity through significant inverse associations with substance use (Wills, et al., 2003). For the purposes of the current study, relevant obesity-related

health behaviors and discussion topics targeted as a part of the intervention (e.g., "being physically active," "decreasing how much TV you watch," "eating fruits and vegetables") were substituted for risk-taking behaviors. Response options were kept the same as the original scale. Overall, sixteen items were used to create one measure of communication completed by both parents and adolescents at baseline and post-intervention. The scale consists of two 8-item subscales, one of which addressed parent-adolescent communication specific to the adolescent's health behaviors and another that addressed parent-adolescent communication around engaging in health behaviors with friends. Parents and adolescents responded to the following prompt, "In the past two months, how often have you and your parent/adolescent talked about (health behavior) and how did the conversation go?" Sample items include: "decreasing how much TV he/she/you watch(es)" and "playing less video games with his/her/my friends." Frequency of communication for each item was assessed with a 4-point scale ranging from 0 = "Never" to 4 = "Many times." Quality of communication for each item was assessed on a 4-point scale ranging from 0 = "Do not discuss this topic" to 4 = "Usually talk about it openly and each say what we think." Higher scores on the measure indicated increases in frequency and quality of family communication. Cronbach's alpha in the present study ($\alpha = 0.88$ for adolescent-reported communication; $\alpha = 0.91$ for parent-reported communication) demonstrated adequate internal consistency. In addition, both adolescent- and parent-reported communication were positively associated with parent support for PA ($r = 0.62$, $p < .01$ for adolescents; $r = 0.33$, $p < .01$ for parents) and parent support for diet ($r = 0.62$, $p < .01$ for adolescents; $r = 0.31$, $p < .01$ for parents)

Adolescent psychosocial variables. See Appendix D for measures related to adolescent psychosocial variables (i.e., self-efficacy for PA and diet, regulatory motivation for PA and diet).

Self-efficacy for PA and diet. Self-efficacy for PA and diet were assessed with modified versions of the *Self-Efficacy for Exercise and Eating Behavior Scales* (Sallis, Pinski, Grossman, Patterson, & Nader, 1988). Although the original scales were developed for adults, modified versions of the scales have been examined in underserved, primarily African American adolescents (Lawman, 2013; Peterson, et al., 2013; Wilson, et al., 2005; Wilson, et al., 2002). Participants were asked to respond to items indicating their confidence in their ability to consistently overcome barriers for making healthy decisions around PA (9 items) and F&V intake (10 items). Sample items include, "How sure are you that you can stick to your exercise program when your family is demanding more time from you?" (PA), and "How sure are you that you can stick to eating fruits and vegetables when you feel depressed, bored, or tense?" (diet). Participants responded on a three-point scale ranging from "A little sure" to "Sure" to "Very sure." Items were averaged to create separate measures of self-efficacy for PA and diet. Sallis et al. (1988) demonstrated adequate internal consistency (ranging from $\alpha = 0.85$ to 0.93), and previous studies conducted with African American youth have demonstrated adequate reliability and validity of the instrument (Wilson et al., 2005). Previous research in underserved youth has also shown the PA and diet scales to be predictive of PA and F&V intake, respectively (Wilson, et al., 2005; Wilson, et al., 2002). Internal consistency for both scales in the present study was adequate ($\alpha = 0.84$ for PA; $\alpha = 0.85$ for diet).

Regulatory motivation for PA and diet. Regulatory motivation for PA and diet were measured using scales originally developed by Wilson and colleagues (Wilson, et al., 2005; Wilson, et al., 2002) and later modified to improve their psychometric properties (Lawman, et al., 2011; Lawman, Wilson, Van Horn, & Zarrett, 2012; St. George, Wilson, Lawman, & Van Horn, 2013). Regulatory motivation reflects participants' willingness and desire to be active and eat healthy foods on a daily basis and to incorporate these behaviors into their regular routines. Participants completed two 8-item measures, each of which assessed either regulatory motivation for PA or diet using 3-point response scales (1 = "Not like me," 2 = "A little like me," 3 = "A lot like me"). Sample items include, "It is important to be active every day" (PA), and "I plan how I can eat healthy every day" (diet). Reliability estimates for the revised scales have ranged from 0.82 – 0.88 (Lawman, et al., 2011; Lawman, et al., 2012; Sara M. St. George, et al., 2013). Furthermore, construct validity of these scales has been previously established through significant associations with PA (Lawman, et al., 2011; Lawman, et al., 2012; Sara M. St. George, et al., 2013) and dietary outcomes (Wilson, et al., 2002) in primarily African American adolescents. Internal consistency for both scales in the present study was adequate ($\alpha = 0.88$ for PA; $\alpha = 0.88$ for diet).

2.9 DATA ANALYSES

Missing Data. Missing data were assumed to be missing at random and were thus dealt with using multiple imputation (m=20) to provide unbiased parameter estimates and standard errors (Schafer & Olsen, 1998). Overall, 18.18% of baseline and 33.43% of post accelerometry interval-level data were missing due to non-compliance. In addition, 6.74% of adolescents at baseline and 17.98% at post were missing all accelerometry data

due to device malfunction or drop out (see Table 2.5 for a summary of missing accelerometer data by condition). With regard to dietary recall data, 66% and 58% of adolescents completed at least three recalls at baseline and post measures, respectively (Table 2.6 provides a summary of dietary recall completion data by condition). Finally, 6% of psychosocial data were missing due primarily to participant drop out.

Analyses with multiply imputed data involve a three-step process wherein multiple data sets are first generated, analyst models are estimated separately for each of the data sets, and pooled estimates of parameters and standard errors across analyst models are computed (Acock, 2005). Because this study contains a nested data structure (individuals within 10 groups), an imputation function that modeled multilevel data was used (van Buuren & Groothuis-Oudshoorn, 2011). Specifically, the "mice.impute.2l.norm" function of the package "mice" in the statistical program R (Version 2.15.1) allowed for specification of the class variable (i.e., group) as well as inclusion of a random effect in each of the imputation models. Given the computation intensity of multiple imputation procedures, imputations were run across six phases for this study, with MVPA imputed in the first four phases, dietary data in the fifth phase, and self-reported psychosocial data (including SB) in the final phase. Demographic variables were included in all imputation prediction models, activity-specific psychosocial variables were included in MVPA models, diet-specific psychosocial variables were included in dietary models, and both MVPA and dietary outcomes were included in psychosocial models (see Table 2.7 for a detailed summary of variables included in each of the imputation phases).

Diagnostics were performed before and after imputation to ensure successful performance of imputation procedures. Histograms were used to examine variable distributions. Variables with non-normal distributions (i.e., MVPA, fruit intake, vegetable intake) were square root transformed prior to imputation and subsequently back-transformed into their original metric (i.e., minutes for MVPA, cups for F&V) after imputation. Because imputation performance can be excessively influenced by the presence of outliers (Elliott, 2006), potential outliers were screened by examining variable z-scores. Based on the sample size in the current study, it was determined that values with z-scores exceeding ±3.7 would be removed prior to data imputation (Cousineau & Chartier, 2010). No values met these criteria and thus none were removed prior to imputation. Across all imputation phases, 250 iterations were used, and plots of imputed values across iterations indicated adequate convergence. Fractions of missing information are reported for each parameter to provide estimates of the accuracy of imputations.

Preliminary Analyses and Model Assumptions. Following data imputation, diagnostics using a single imputation were conducted to test potential violations to the assumptions of multilevel regression (see Appendix E for sample graphs related to model assumptions). Histograms and density plots were used to examine residuals corresponding to each model to ensure they were generally normally distributed. Scatterplots of standardized residuals versus predicted values were used to examine constant variance of residuals (i.e., homoscedasticity). Scatterplots were also used to examine variability between clusters (i.e., groups), scan for potential outliers, and assess whether error was randomly distributed across levels of each model predictor. Finally,

correlations between independent variables were used to assess for potential multicollinearity.

Overall, histograms and density plots of residuals for all models indicated relatively normal distributions. Count variables of minutes per day of MVPA and cups of fruits and vegetables showed minimal positive skew. Although regression is fairly robust against violations of the assumption of normality, models for these variables were run both with and without square-root transformed outcomes as an additional check. None of the model results using transformed data differed from those with raw data. As a result, models with non-transformed data are presented for ease of interpretation. No severe outliers were detected. In addition, the highest correlational magnitude between independent variables in study models was $r = 0.43$ between parent education and parent income.

Process Evaluation. The first study aim examined the process evaluation elements of reach, dose, and fidelity. Response rate, weekly session attendance, retention data, and follow-up interviews were used to assess reach. Response rate was calculated as a percentage of eligible families reached by phone that enrolled in the study. Participant attendance at weekly sessions was coded as either 0 = family not in attendance, 0.5 = only one member of the adolescent-caregiver dyad in attendance, or 1 = family in attendance, and a sum was calculated for each family. The percentage of families attending either ≤2, 3-4, or >5 sessions post randomization was subsequently calculated both including and excluding make-up sessions. Themes emerging from transcribed interviews with study drop outs were tallied and frequencies were calculated. Finally,

frequencies and means were calculated to assess the external evaluator's dose and fidelity ratings, respectively.

Adolescent Behavioral and Psychosocial Outcomes. The second aim of this study tested the hypotheses that adolescents in the IPB intervention would have greater improvements in behavioral outcomes (i.e., MVPA, SB, fruit intake, and vegetable intake) compared to adolescents in the GHE comparison group from baseline to post-intervention. Similarly, the third aim tested the hypotheses that adolescents in the IPB intervention would have greater improvements in key psychosocial variables (i.e., monitoring, parental management of peers, parent and peer social support for PA and diet, autonomy support, communication, self-efficacy for PA and diet, motivation for PA and diet; aim 3) compared to adolescents in the GHE group from baseline to post-intervention. Given the nested study design (individuals within groups), these hypotheses were tested using four (aim 2) and 13 (aim 3) random intercept multilevel regression models, each of which controlled for adolescent sex, age, household income, parent education, zBMI, parent BMI, cohort, and baseline values of the outcome of interest. Variables were either contrast coded (sex, cohort), mean centered (age, zBMI, income, parent education, parent BMI, baseline value of outcome), standardized (psychosocial scales) or dummy coded (treatment; 0 = comparison, 1 = intervention) to facilitate model interpretation, with the intercept representing the mean value of the outcome variable across groups for the average adolescent in the intervention condition. The multilevel regression equation for the final models predicting intervention behavioral and psychosocial outcomes is shown below:

$$\text{Level 1:} \quad \text{Post}_{(\text{outcome variable})ij} = \beta_{0j} + \beta_{1j}\,\text{Sex} + \beta_{2j}\,\text{Age.c} + \beta_{3j}\,\text{Income.c} + \beta_{4j}\,\text{Parent Education.c} + \beta_{5j}\,\text{BMIz.c} + \beta_{6j}\,\text{Parent BMI.c} + \beta_{7j}$$

$\text{Cohort1.con} + \beta_{8j}\,\text{Cohort2.con} + \beta_{9j}\,\text{Cohort3.con} + \beta_{10j}$
$\text{Cohort4.con} + \beta_{11j}\,\text{Baseline}_{(\text{outcome variable})} + r_{ij}$

Level 2: $\beta_{0j} = \gamma_{00} + \gamma_{01}\,\text{Tx} + u_{0j}$
$\beta_{1j}\ \text{Sex} = \gamma_{10}$
$\beta_{2j}\ \text{Age.c} = \gamma_{20}$
$\beta_{3j}\ \text{Income.c} = \gamma_{30}$
$\beta_{4j}\,\text{Parent Education.c} = \gamma_{40}$
$\beta_{5j}\,\text{BMIz.c} = \gamma_{50}$
$\beta_{6j}\,\text{Parent BMI.c} = \gamma_{60}$
$\beta_{7j}\,\text{Cohort1.con} = \gamma_{70}$
$\beta_{8j}\,\text{Cohort2.con} = \gamma_{80}$
$\beta_{9j}\,\text{Cohort3.con} = \gamma_{90}$
$\beta_{10j}\,\text{Cohort4.con} = \gamma_{100}$
$\beta_{11j}\ \text{Baseline}_{(\text{outcome variable})} = \gamma_{110}$

wherein "$\text{Post}_{(\text{outcome variable})}$" represents the value of the outcome variable at post for individual *i* in group *j*, γ_{00} is the average value of the outcome variable across groups, γ_{01} is the change in the outcome variable associated with being in the comparison condition versus being in the intervention condition, and γ_{10} - γ_{110} are the effects of control variables on the outcome variable, holding all other variables constant. The random effect u_{0j} represents each group's deviation from the average value of the outcome variable and allows intercepts to differ among groups, thus accounting for any non-independence in the outcomes within groups. To minimize the risk of excessive Type 1 error resulting from multiple comparisons, a Bonferroni corrected p-value was calculated for each parameter of interest (Ludbrook, 1998). Specifically, $\alpha = 0.05$ was divided by the number of comparisons (four for aim 2, 13 for aim 3) to determine the corrected p-values of $p = 0.01$ for aim 2 and $p = 0.004$ for aim 3.

Residuals as Outcomes. The fourth aim of this study tested the hypothesis that changes in key theoretical psychosocial variables (i.e., parental monitoring, parental management of peer relationships around health behaviors, perceptions of parent support

for PA and diet, perceptions of peer support for PA and diet, autonomy support, adolescent motivation, and adolescent self-efficacy) would be significantly associated with changes in behavioral outcomes for adolescents in the IPB group. This aim was only examined for variables demonstrating significant effects of treatment at post-intervention (as determined by results from aims 2 and 3). To examine this aim, post-intervention values of behavioral and psychosocial outcomes were first individually regressed onto baseline values of the outcomes for each imputation separately. Residuals from each separate model were subsequently extracted and averaged to create a single residualized score for each variable. Residualized scores for behavioral outcomes were then used as outcomes and regressed onto residualized scores for psychosocial variables in order to determine if "changes" in psychosocial variables would predict "changes" in behavioral outcomes for participants in the IPB condition.

Table 2.1

Participant Sample Details by Cohort

	Cohort 1	Cohort 2	Cohort 3	Cohort 4	Cohort 5	Total
Participants Recruited†	23	28	21	26	27	124
Participants Randomized	20	23	13	17	16	89
Participants at Post Measures	17	20	10	16	15	78
Retention Rate	85%	87%	77%	94%	94%	88%

Note. †One family recruited for Cohort 2 was lost to the run-in period but re-enrolled into Cohort 4 and completed the intervention; the total number of families recruited (n=124) reflects the total with this family counted only once

Table 2.2

Summary of Recruitment Methods by Participant Status

Recruitment Method	Participant Status (No., %)					
	Enrolled	Unable to Reach	Ineligible	Refused	No Show	Total†
Local community event	72 (23%)	122 (38%)	48 (15%)	55 (17%)	23 (7%)	320 (55%)
Passive consent – USC Healthy Lifestyles Clinic	9 (12%)	30 (40%)	15 (20%)	15 (20%)	6 (8%)	75 (13%)
Other pediatricians' offices	8 (18%)	23 (51%)	10 (22%)	3 (7%)	1 (2%)	45 (7%)
Schools	7 (58%)	2 (17%)	1 (8%)	2 (17%)	0	12 (2%)
Brochure/printed material	2 (29%)	2 (29%)	0	0	3 (43%)	7 (1%)
Multimedia (web, tv, radio)	5 (45%)	2 (18%)	3 (27%)	1 (9%)	0	11 (2%)
Referral from another research study	10 (13%)	21 (28%)	12 (16%)	22 (29%)	10 (13%)	75 (13%)
Other	11 (30%)	9 (24%)	4 (11%)	10 (27%)	3 (8%)	37 (6%)
Total†	124 (21%)	211 (36%)	93 (16%)	108 (19%)	46 (8%)	582 (100%)

Note: Percentages may not all add to 100% due to rounding; †Percentages in these columns reflect proportion of total attempted phone contacts made by study staff (n=582); all other percentages reflect proportion of figures listed in the "Total" column

Table 2.3

Reasons for Participant Ineligibility (n=93)

Reason	No. Families	% Families
< 3 African American grandparents	11	12%
Outside specified age range of 11-15	20	22%
Diagnosed medical condition	2	2%
Diagnosed psychiatric condition	2	2%
Diagnosed developmental delay	3	3%
Caregiver not in household; not willing to participate	3	3%
Family unable to attend both program evenings	32	34%
Multiple reasons	17	18%
Other	3	3%
Total	93	

Table 2.4

Intervention Curriculum Matrix

Session	Theoretical Constructs	Content	Application
Run-in		Program orientation	
Run-in		National health behavior recommendations	Review physical activity, sedentary behavior, and dietary recommendations
Week 1	FST (communication); SCT (self-monitoring); SDT (autonomy, belongingness)	Positive family communication Self-monitoring	• Set group ground rules for positive communication • Review 4 target health behaviors • Family "Walk & Talk": discuss family health behaviors • Take home "Family Bonding Activity": Choose 1 behavior /tool for self-monitoring, check-in with family
Week 2	FST (communication, positive parenting); SCT (self-monitoring, goal-setting); SDT (autonomy, belongingness)	Positive family communication Goal-setting Positive parenting skills Social support	• Feedback on previous week's self-monitoring • Choose first target behavior, complete behavior contract • Take home "Family Bonding Activity": Complete behavior contact, check-in with family *Separate Small Group Sessions for Parents/Adolescents* • Parents: Discuss how parents and peers influence adolescent health; review positive parenting skills • Adolescents: Discuss how to elicit social support
Week 3	FST (communication, problem-solving); SCT (self-monitoring, goal-setting); SDT (autonomy, belongingness)	Energy balance Family problem solving	• Feedback on previous week's self-monitoring and goals • Family "Walk & Talk": Discuss addition of second target behavior (on opposite side of energy balance equation) • In session family problem-solving activity • Take home "Family Bonding Activity": Add second behavior to contract, negotiate family health rules
Week 4	FST (communication, positive parenting, support); SCT (self-monitoring, goal-setting); SDT (autonomy, belongingness)	Integration of family and peers for positive health Parental management of peer relationships specific to health behaviors	• Adolescents encouraged to bring a friend to the session • Feedback on previous week's self-monitoring and goals • Take home "Family and Friend Bonding Activity": Engage in healthy activity together with family/friends *Separate Small Group Sessions for Parents/Adolescents*

			• Parents: Review skills for parental management of peers • Adolescents: Set goals with friends
Week 5	FST (communication); SCT (self-monitoring, goal-setting); SDT (autonomy, belongingness, competence)	Evaluation of progress (parent, adolescent, family) Positive parenting skills	• Feedback on previous week's self-monitoring and goals • Self-evaluation (discuss adolescents' role, parents' role, and family progress) • Review parent support strategies – guest speaker to discuss parenting book • Take home "Family Bonding Activity": Add third behavior to contract, prepare family health testimonial
Week 6	FST (communication); SCT (self-monitoring, goal-setting); SDT (autonomy, belongingness, competence)	Relapse prevention	• Feedback on previous week's self-monitoring and goals • Discuss strategies for continuing and maintaining change • Add fourth behavior to contract • Family pot-luck and health testimonial

Note. FST = Family Systems Theory, SCT = Social Cognitive Theory, SDT = Self-Determination Theory

Table 2.5

Summary of Missing Accelerometer Data by Condition

	Intervention (n=49)	Control (n=40)	Total (n=89)
Missing due to device malfunction			
Adolescents Baseline	5 (10.20%)	1 (2.50%)	6 (6.74%)
Adolescents Post	1 (2.04%)	4 (10%)	5 (5.62%)
Parents Baseline	3 (6.12%)	3 (7.50%)	6 (6.74%)
Parents Post	4 (8.16%)	3 (7.50%)	7 (7.87%)
Missing due to drop out or lost actical*			
Adolescents Baseline	0	0	0
Adolescents Post	6 (12.24%)	5 (12.50%)	11 (12.36%)
Parents Baseline	0	0	0
Parents Post (n=1 lost actical)	7 (14.29%)*	5 (12.50%)	12 (13.48%)
Missing due to noncompliance (% PA intervals missing)			
Adolescents Baseline	18.39%	17.94%	18.18%
Adolescents Post	38.45%	27.73%	33.43%
Parents Baseline	16.83%	11.64%	14.44%
Parents Post	30.20%	19.48%	25.18%

Table 2.6

Summary of Completed Dietary Recalls by Condition

# Recalls Completed	Control (n=40)		Intervention (n=49)		Total (n=89)	
	No.	%	No	%	No.	%
Adolescents Baseline						
0	0	0	4	8%	4	4%
1	3	8%	3	6%	6	7%
2	7	18%	13	27%	20	22%
3+	30	75%	29	59%	59	66%
Adolescents Post						
0	5	13%	8	16%	13	15%
1	2	5%	1	2%	3	3%
2	8	20%	13	27%	21	24%
3+	25	63%	27	55%	52	58%
Parents Baseline						
0	0	0%	4	8%	4	4%
1	1	3%	3	6%	4	4%
2	11	28%	14	29%	25	28%
3+	28	70%	28	57%	56	62%
Parents Post						
0	6	15%	9	18%	15	17%
1	3	8%	2	4%	5	6%
2	6	15%	12	24%	18	20%
3+	25	63%	26	53%	51	57%

Table 2.7

Variables Included in Adolescent Imputation Prediction Models

Imputation Phase	Variables Imputed	Variables Included in Imputation Prediction Model
1	Baseline MVPA (interval level)	• Demographics • 35 MVPA intervals at baseline • MVPA summary scores at post • PA-related psychosocial variables at baseline and post (e.g., self-efficacy for PA, support for PA) • Self-reported SB at baseline and post
2	Baseline MVPA (summary score level)	• Demographics • Imputed (phase 1) baseline MVPA summary scores • MVPA summary scores at post • PA-related psychosocial variables at baseline and post • Self-reported SB at baseline and post
3	Post MVPA (interval level)	• Demographics • 35 MVPA intervals at post • Imputed (phase 2) MVPA summary scores at baseline • PA-related psychosocial variables at baseline and post • Self-reported SB at baseline and post
4	Post MVPA (summary score level)	• Demographics • Imputed (phase 3) post MVPA summary scores • Imputed (phase 2) MVPA summary scores at baseline • PA-related psychosocial variables at baseline and post • Self-reported SB at baseline and post
5	Baseline and post dietary data (recall level)	• Demographics • Dietary variables by recall (e.g., fruit intake) at baseline and post • Diet-related psychosocial variables at baseline and post (e.g., self-efficacy for diet, support for diet) • Imputed (phase 2) MVPA summary scores at baseline • Imputed (phase 4) MVPA summary scores at post • Self-reported SB at baseline and post
6	Baseline and post psychosocial data (summary score level)	• Demographics • Imputed (phase 2) MVPA summary scores at baseline • Imputed (phase 4) MVPA summary scores at post • Imputed (phase 5) dietary variables by summary scores • Summary scores of all psychosocial variables at baseline and post • Self-reported SB at baseline and post

Note. MVPA = Moderate-to-vigorous physical activity, SB = Sedentary behavior

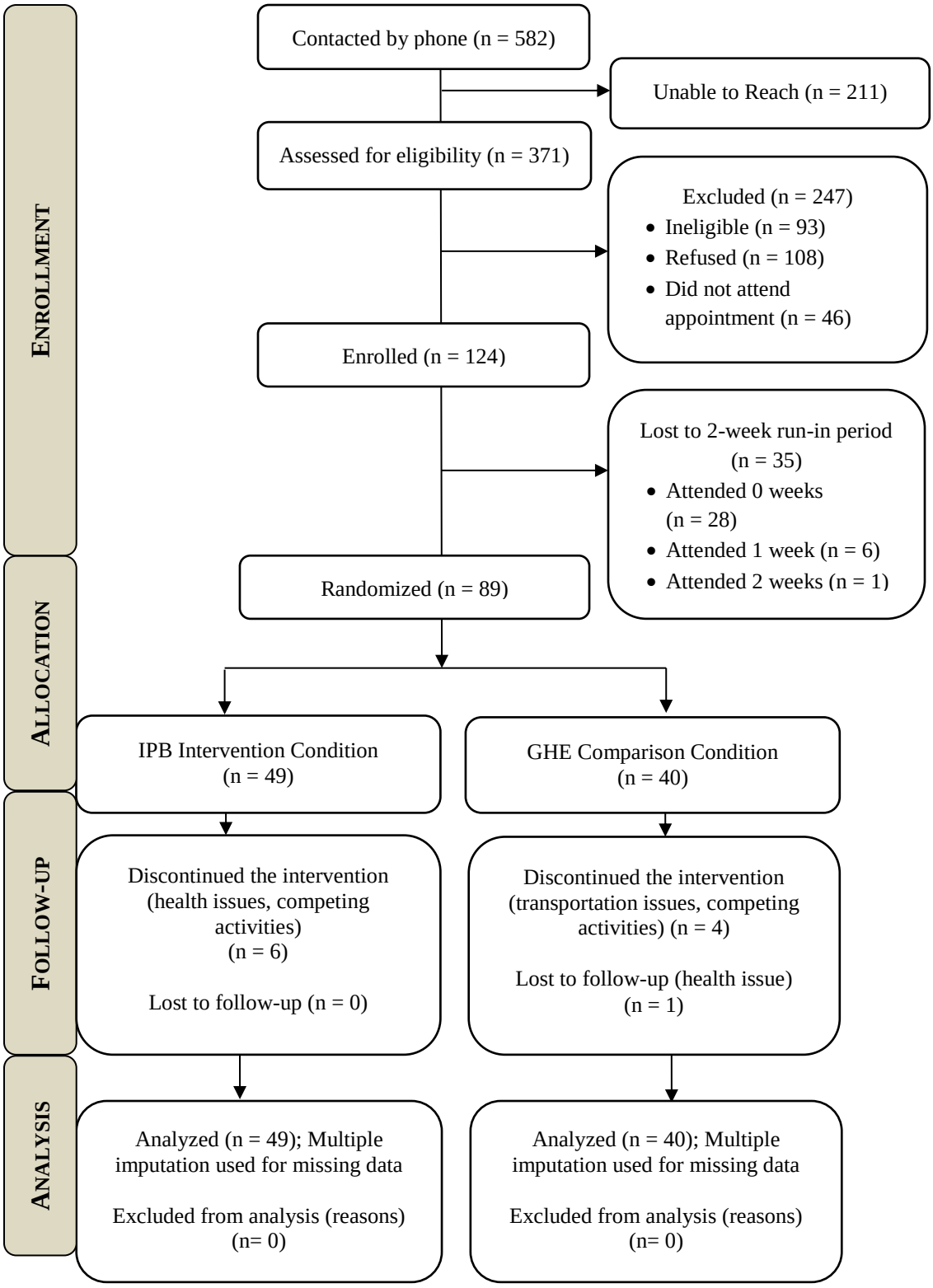


Figure 2.1 Participant flow diagram based on the Consolidated Standards for Reporting Trials (CONSORT)

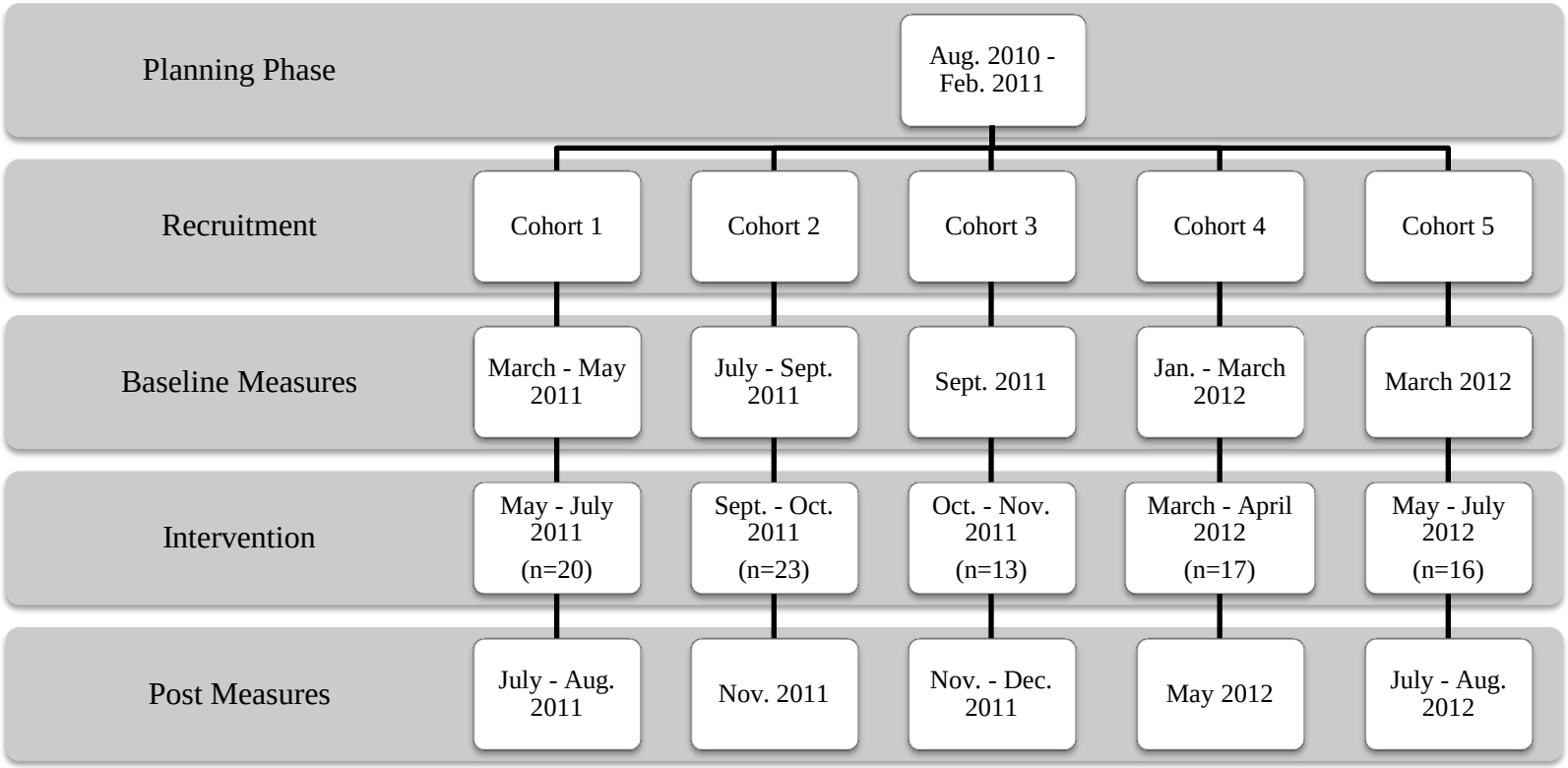


Figure 2.2 Study timeline

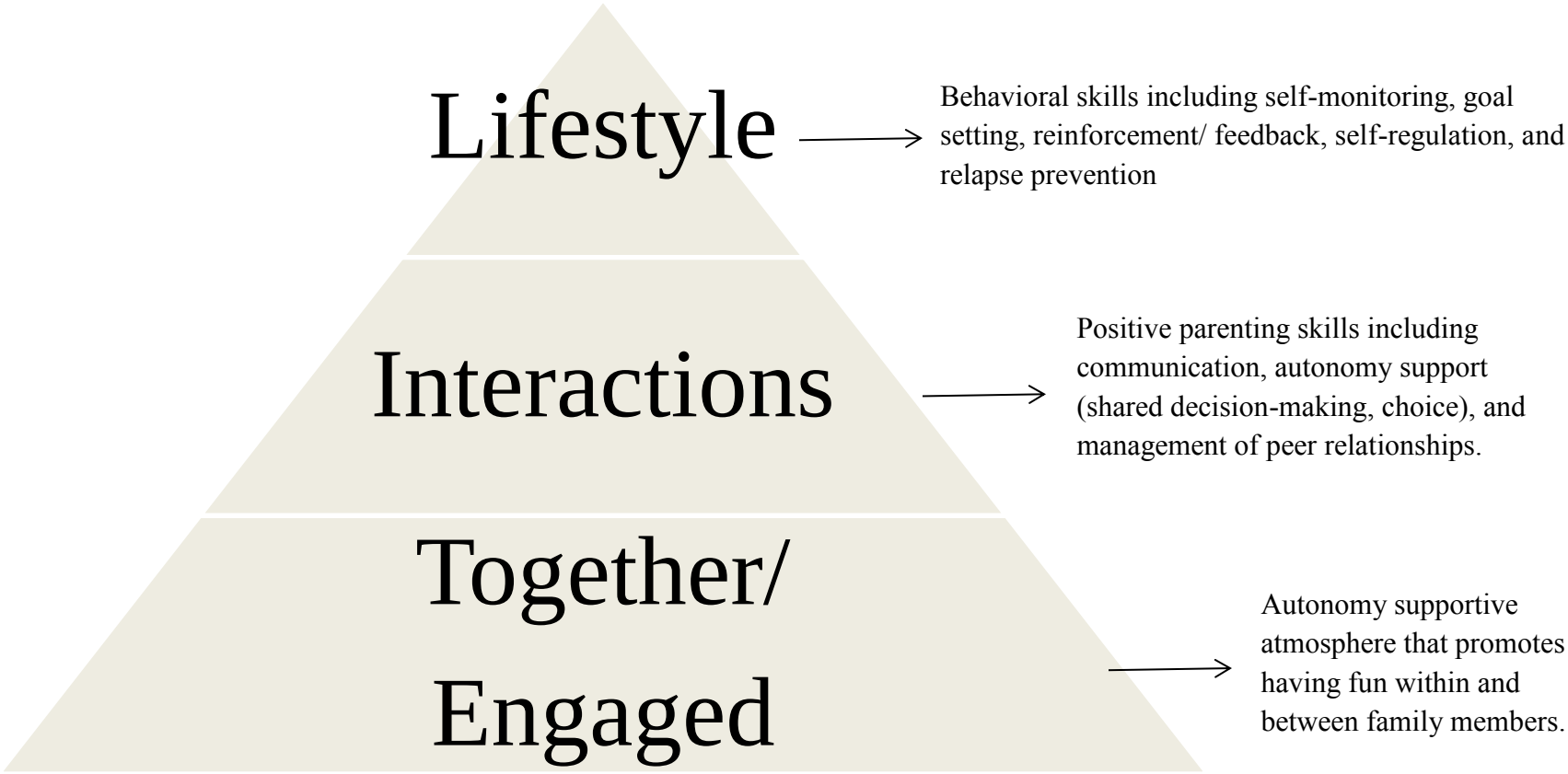


Figure 2.3 Simplified essential elements “LITE” (Lifestyle, Interactions, Together, Engaged)

CHAPTER 3

RESULTS

3.1 DEMOGRAPHIC, BEHAVIORAL, AND PSYCHOSOCIAL CHARACTERISTICS

Participant demographic, behavioral, and psychosocial characteristics are presented in Tables 3.1 – 3.4 by condition. There were no significant demographic differences between conditions at baseline. The average adolescent was 12.53 ± 1.42 years old. Sixty-one percent of adolescents were female (61%) and most were above the 85th percentile for BMI (13% overweight, 48% obese). To adjust for clustering within groups and for use of multiple imputation procedures, a series of unconditional random intercept models were used to calculate means and standard errors (*SE*) for PA, SB, dietary, and psychosocial variables. At baseline, youth in the intervention condition engaged in an average of 30.50 (*SE* = 4.23) minutes/day of MVPA and 123.75 (*SE* = 13.53) self-reported hours/week of SB. They also reported consuming 1.07 (*SE* = 0.14) servings of fruit and 1.08 (*SE* = 0.12) servings of vegetables. Youth in the comparison condition reported engaging in an average of 30.47 (*SE* = 4.15) minutes/day of MVPA and 113.28 (*SE* = 12.75) self-reported hours/week of SB. They reported consuming 0.94 (*SE* = 0.14) servings of fruit and 1.02 (*SE* = 0.17) servings of vegetables.

Caregivers were predominantly female (92%) and had an average age of 41.52 ± 8.54 years. They had an average BMI of 36.34 ± 9.24 and 74% fell into the obese weight category. Caregivers identified themselves as parents (92%) who were either married

(36%), never married or in an unmarried couple (37%), or separated/divorced (23%). Forty-seven percent of caregivers reported some college, 24% were college graduates, and 16% reported receiving graduate training or professional degrees. The average household consisted of 3.6 individuals (including the adolescent participating in the study). Fifty-six percent of caregivers reported working full time at baseline, and 63% percent of the sample reported annual household income levels under $39,000. At baseline, caregivers in the intervention condition engaged in an average of 18.98 (*SE* = 1.93) minutes/day of MVPA. They also reported consuming 0.96 (*SE* = 0.17) servings of fruit and 1.30 (*SE* = 0.16) servings of vegetables. Caregivers in the comparison condition reported engaging in an average of 20.88 (*SE* = 2.49) minutes/day of MVPA. They reported consuming 0.81 (*SE* = 0.18) servings of fruit and 1.59 (*SE* = 0.33) servings of vegetables.

3.2 CORRELATIONS

Correlational analyses of the relations between adolescent demographic, PA, SB, dietary, and psychosocial variables were calculated using a single dataset derived by averaging across 20 imputations. Because correlations do not account for between imputation variance, p-values may be inaccurate and were thus omitted. Correlation magnitudes among study variables are presented in Tables 3.5.1-3.5.4 in order to examine potential multicollinearity. As previously noted, the highest correlational magnitude between independent variables included in study models was $r = 0.43$ between parent education and parent income.

3.3 PROCESS EVALUATION

Reach. Study reach was assessed using several indicators, including recruitment response rate, session attendance, retention rate, and follow-up interviews conducted with study drop-outs. Recruitment data indicated an overall response rate of 45% (refer to Figure 2.1 for the CONSORT flow diagram). Specifically, 124 of the total number of eligible families reached by phone (n = 278) were enrolled in the study. The a priori attendance goal of 75% of families attending at least five of six sessions post randomization was met for the intervention condition when make-up sessions were included in attendance estimates (see Table 3.6 for attendance rates by cohort, including and excluding make-up sessions). Specifically, when make-up sessions were included in attendance calculations, 79% of intervention families and 70% of comparison families covered material from at least five of six sessions. Thirty-nine percent of intervention families and 40% of comparison families covered material from all six sessions. Make-up sessions lasted between 10-50 minutes, with an average duration of 28 minutes per session. When make-up sessions were not included in attendance estimates, 57% of intervention families and 55% of comparison families attended at least five of six total group sessions at their scheduled times. Twenty percent of intervention families and 28% of control families attended all six sessions in person.

Of the 89 families randomized to a condition, 88% were retained and completed post measures while 12% of families dropped out of the study (see Table 2.1; Figure 2.1). An independent study staff member not directly involved in intervention delivery contacted the families who discontinued study participation to assess their reasons for drop-out. Follow-up phone interviews were conducted with 64% percent of caregivers

(n=7) and 45% of adolescents (n = 5) from families who left the study. Although several families were unable to complete formal follow-up phone interviews, study staff members were able to document reasons for drop out on 91% of families (e.g., through emails received from caregivers or informal phone calls with study staff). Table 3.7 summarizes the frequency with which various reasons for study discontinuation were cited during phone interviews. Health-related reasons (e.g., caregiver cancer diagnoses) and time conflicts (e.g., extracurricular activities) were the most commonly endorsed barriers to continued study participation. Other reasons included resource/transportation issues, perceptions that the program was not beneficial or did not meet the families' expectations, family emergencies, and school-related issues.

Dose. Achieving adequate dose (completeness of implementation) for the intervention condition was defined a priori as ≥90% of the intended intervention actually delivered to each cohort. Elements of dose included starting sessions on time, offering families healthy snacks, raffling the weekly door prize, displaying ground rules, reviewing the session agenda, explaining and demonstrating key topics/skills as outlined in the facilitators' guide, engaging in an interactive activity, assigning the "Family Bonding" activity, and conducting a summary/closure of the session. As shown in Table 3.8, dose delivered was consistently high, with the average dose ranging from 98% to 100% across cohorts.

Fidelity. Achieving fidelity (extent to which essential elements were delivered by facilitators as planned) for the intervention condition was defined a priori as a value of ≥3 on a rating scale ranging from 1-4 for each of the following essential elements: behavioral skills, communication, social support, and autonomy support. As shown in

Table 3.9, average fidelity ratings indicated goals were met for all essential elements (behavioral skills = 3.88; communication = 3.97; social support = 3.69; autonomy support = 3.96). Averages of all essential elements by cohort indicated goals were also met across all study cohorts (cohort 1 = 3.78; cohort 2 = 3.89; cohort 3 = 3.89; cohort 4 = 3.91; cohort 5 = 3.90).

3.4 BEHAVIORAL OUTCOMES (MVPA, SB, F&V)

As previously outlined, hypothesis 2 (which postulated that significant improvements in adolescent health behavior outcomes would be observed in the intervention versus comparison condition) was assessed using four random intercept multilevel regression models. Outcomes were evaluated for MVPA, SB, fruit intake, and vegetable intake.

Intervention Effects on Adolescent MVPA. Table 3.10 presents results of the multilevel regression model used to examine differences between groups in adolescent MVPA at post-intervention. There was no significant effect of treatment on adolescent MVPA at post-intervention (hypothesis 2). MVPA at baseline significantly predicted MVPA at post, such that engaging in greater amounts of MVPA at baseline was associated with greater minutes per day of MVPA at post intervention (B = 0.41, *SE* = 0.11, t = 3.72, $p < .05$). No other covarietes (i.e., sex, age, income, parent education, zBMI, parent BMI, cohort) were significant predictors of adolescent MVPA at post-intervention.

Intervention Effects on Adolescent SB. Table 3.10 presents results of the multilevel regression model used to examine differences between groups in adolescent self-reported SB at post-intervention. Treatment significantly predicted SB at post, such

that adolescents in the IPB intervention self-reported less weekly hours of SB than did those in the comparison condition (B = -28.76, *SE* = 9.65, t = 2.98, $p < 0.01$; hypothesis 2). An examination of the exact p-value for the treatment parameter in this model ($p = 0.00$) indicated that the effects of the intervention on adolescent SB remained significant after correcting for multiple comparisons. This model demonstrated significant associations between covariates and SB at post. Adolescents with a lower zBMI (B = -9.04, se = 3.92, t = 2.31, $p < .05$) and greater SB at baseline (B = 0.39, *SE* = 0.10, t = 3.90, $p < .01$) reported more hours per week of SB at post-intervention.

Intervention Effects on Adolescent Diet. Table 3.11 presents results of multilevel regression models used to examine differences between groups in adolescent fruit and vegetable intake, respectively, at post-intervention. There was no observed effect of treatment on either adolescent fruit or vegetable intake at post intervention (hypothesis 2). No significant effects of any of the variables in the fruit intake model were observed. In terms of vegetable intake, consuming greater amounts of vegetables at baseline was the only variable significantly associated with greater vegetable intake at post intervention (B = 0.21, *SE* = 0.10, t = 2.10, $p < .05$).

3.5 PSYCHOSOCIAL OUTCOMES

Thirteen random intercept multilevel regression models were used to test hypothesis 3, which postulated that significant improvements in adolescent psychosocial outcomes would be observed in the intervention versus comparison condition. No effects of treatment were found for parental monitoring, parental management of peer relationships around health, social support from friends for PA, social support from friends for diet, autonomy support, adolescent regulatory motivation for PA and diet, and

adolescent self-efficacy for PA and diet. Only models with an observed effect of treatment on the psychosocial outcome at post-interventoin are presented below.

Intervention Effects on Parent Support for Adolescent PA and Diet.

Table 3.12 presents results of the multilevel regression models used to examine differences between groups in adolescent-reported parent support for PA and diet at post-intervention. For the model predicting parent support for PA, a marginal effect of treatment was observed, such that adolescents in the intervention condition reported receiving more parent support for PA than those in the comparison condition at post intervention (B = 0.42, *SE* = 0.24, t = 1.75, $p < .10$; hypothesis 3). This trend did not hold when considering the Bonferroni correction for multiple comparisons. Greater PA support at baseline was the only covariate in this model significantly associated with higher parent PA support at post (B = 0.52, *SE* = 0.13, t = 4.00, $p < .01$).

For the model predicting parent support for diet, there was an observed effect of treatment on parent support for diet at post (B = 0.49, *SE* = 0.22, t = 2.19, $p < .05$), such that adolescents in the intervention condition reported greater perceived parental support for diet at post intervention than those in the comparison condition (hypothesis 3). This effect did not hold against the Bonferroni-adjusted p-value. Parental education and parent diet support at baseline were the only covariates significantly associated with higher parent support for diet at post, such higher parent education and greater support at baseline were positively associated with parent support for diet at post (B = 0.30, *SE* = 0.14, t = 2.14, $p < .05$).

Intervention Effects on Adolescent and Parent-reported Communication.

Table 3.13 presents results of the multilevel regression models used to examine

differences between groups in adolescent- and parent-reported communication at post-intervention. In the adolescent-reported communication model, a marginal effect of treatment was observed, such that adolescents in the intervention condition reported more positive communication at post-intervention than did those in the intervention condition (B = 0.33, *SE* = 0.18, t = 1.83, $p < .10$; hypothesis 3). This trend did not hold when considering the Bonferroni correction for multiple comparisons. In this model, adolescent-reported communication at baseline was the only covariate significantly associated with communication at post (B = 0.45, *SE* = 0.09, t = 5.00, $p < .01$).

For the model predicting parent-reported communication, there was an observed effect of treatment on parent-reported communication (B = 0.52, *SE* = 0.15, t = 3.47, $p < .01$), such that parents in the intervention condition reported more positive communication at post-intervention than did those in the comparison condition. An examination of the exact p-value for the treatment parameter in this model ($p = 0.00$) indicated that the effects of the intervention on parent-reported communication remained significant after correcting for multiple comparisons. Parent-reported communication at baseline was the only covariate significantly associated with parent-reported communication at post (B = 0.37, se = 0.08, t = 4.63, $p < .01$).

3.6 RESIDUALIZED CHANGE SCORES AS OUTCOMES

Four regression models, each with residualized scores for SB as the outcome variable and residualized scores for four separate psychosocial variables as the predictor (i.e., parent support for PA, parent support for diet, adolescent- and parent-reported communication around health behaviors) were used to determine if changes in psychosocial variables would significantly predict changes in adolescent SB. None of the

models were significant, indicating that changes in parent support for PA, parent support for diet, adolescent-reported communication, and parent-reported communication were not predictive of changes in adolescent SB.

3.7 SECONDARY PARENT ACTIVITY AND DIETARY OUTCOMES

Three random intercept multilevel regression models were used to examine secondary analyses related to parent MVPA, fruit intake, and vegetable intake. Table 3.14 presents results of the multilevel regression model used to examine differences between groups in parent MVPA (assessed via 7-day accelerometry estimates) at post-intervention. Treatment significantly predicted parent MVPA at post, such that parents in the IPB intervention engaged in greater minutes per day of MVPA than did those in the comparison condition (B = 9.43, *SE* = 4.21, t = 2.23, $p < 0.05$). There were no significant effects of treatment on parent fruit or vegetable intake at post-intervention.

Table 3.1

Participant Demographic Characteristics at Baseline by Condition (n=89)

Variable	Intervention	Comparison	Total
Sample Size	49 (55%)	40 (45%)	89 (100%)
Adolescent Sex (Male/Female)	17 (35%)/ 32 (65%)	18 (45%)/ 22 (55%)	35 (39%)/ 54 (61%)
Adolescent Age (years)	12.49 (1.56)	12.58 (1.26)	12.53 (1.42)
Adolescent Weight Status			
Underweight (<5th %ile)	1 (2%)	1 (3%)	2 (2%)
Normal Weight (5th - <85th %ile)	18 (37%)	14 (35%)	32 (36%)
Overweight (85th - <95th %ile)	7 (14%)	5 (13%)	12 (13%)
Obese (≥ 95th %ile)	23 (47%)	20 (50%)	43 (48%)
Adolescent Waist Circumference (cm)	82.31 (20.92)	83.79 (20.43)	82.98 (20.60)
Caregiver Sex (Male/Female)	5 (10%)/ 44 (90%)	2 (5%)/ 38 (95%)	7 (8%)/ 82 (92%)
Caregiver Age (years)	42.51 (8.96)	40.30 (7.93)	41.52 (8.54)
Caregiver Body Mass Index (BMI)	36.03 (9.17)	36.72 (9.42)	36.34 (9.24)
Caregiver Weight Status			
Underweight (BMI < 18.5)	1 (2%)	0 (0%)	1 (1%)
Normal Weight (BMI 18.5 – 24.9)	5 (10%)	3 (8%)	8 (9%)
Overweight (BMI 25.0 - 29.9)	6 (12%)	8 (20%)	14 (16%)
Obese (BMI ≥ 30.0)	37 (76%)	29 (73%)	66 (74%)
Caregiver Waist Circumference (cm)	105.30 (19.99)	105.13 (20.62)	105.22 (20.16)
Caregiver Relationship to Adolescent			
Mother	41 (84%)	35 (88%)	76 (85%)
Father	5 (10%)	1 (3%)	6 (7%)
Other	3 (6%)	4 (10%)	7
Caregiver Relationship Status			
Married	16 (33%)	16 (40%)	32 (36%)
Separated or Divorced	16 (32%)	7 (18%)	23 (25%)
Widowed	1 (2%)	0 (0%)	1 (1%)
Never Married or In Unmarried Couple	16 (33%)	17 (43%)	33 (37%)
Caregiver Education			
Some High School	1 (2%)	0 (0%)	1 (1%)
High School Degree or GED	6 (12%)	5 (13%)	11 (12%)
Some College	25 (51%)	17 (43%)	42 (47%)
College Graduate	12 (24%)	9 (23%)	21 (24%)
Graduate Training or Professional Degree	5 (10%)	9 (23%)	14 (16%)
Household Yearly Income			
<$10,000	6 (12%)	6 (15%)	12 (13%)
$10,000 to $24,000	10 (20%)	7 (18%)	17 (19%)
$25,000 to $39,000	17 (35%)	11 (28%)	28 (31%)
$40,000 to $54,000	8 (16%)	3 (8%)	11 (12%)
$55,000 to $69,000	5 (10%)	2 (5%)	7 (8%)
$70,000 or more	3 (6%)	11 (28%)	14 (16%)
Household Size (# people)	3.76 (1.56)	3.58 (1.43)	3.67 (1.50)

Note. Values are expressed as frequencies (No., %) or means (sd). Totals may not equal 100% due to rounding. There were no significant between-group differences on demographic characteristics at baseline.

Table 3.2

Mean Levels of Activity and Dietary Variables by Condition (n=89)

	Intervention Condition (n=49)			
	Baseline		Post	
	Mean (*SE*)	95% CI	Mean (*SE*)	95% CI
Adolescents				
MVPA (min/day)	30.50 (4.23)	22.20-38.80	28.78 (2.78)	23.32-34.24
SB (hrs/week; self-report)	123.75 (13.53)	97.24-150.26	98.71 (7.07)	84.84 - 112.58
Fruits (cups)	1.07 (0.14)	0.80-1.33	0.84 (0.14)	0.57-1.12
Vegetables (cups)	1.08 (0.12)	0.85-1.30	0.89 (0.12)	0.67-1.12
Parents				
MVPA (min/day)	18.98 (1.93)	15.19- 22.77	27.26 (2.62)	22.12- 32.40
Fruits (cups)	0.96 (0.17)	0.62 (1.29)	0.90 (0.25)	0.41- 1.39
Vegetables (cups)	1.30 (0.16)	0.98- 1.61	1.34 (0.15)	1.05- 1.64
	Comparison Condition (n = 40)			
Adolescents				
MVPA (min/day)	30.47 (4.15)	22.33- 38.60	34.70 (4.96)	24.87-44.53
SB (hrs/week; self-report)	113.28 (12.75)	88.29-138.26	120.31 (9.17)	102.32-138.30
Fruits (cups)	0.94 (0.14)	0.68-1.21	0.86 (0.22)	0.42-1.30
Vegetables (cups)	1.02 (0.17)	0.69-1.35	0.94 (0.14)	0.66-1.21
Parents				
MVPA (min/day)	20.88 (2.49)	16.00- 25.76	18.75 (3.57)	11.74- 25.76
Fruits (cups)	0.81 (0.18)	0.45- 1.17	0.96 (0.33)	0.31- 1.62
Vegetables (cups)	1.59 (0.33)	0.93- 2.25	1.47 (0.25)	0.99- 1.95

Note. Standard errors (*SE*) are adjusted for clustering within groups and for multiple imputations; CI = 95% Confidence interval; MVPA = Moderate-to-vigorous physical activity; SB = Sedentary behavior

Table 3.3 *Mean Levels of Adolescent-reported Psychosocial Variables by Condition (n=89)*

	Intervention Condition (n=49)				Comparison Condition (n=40)			
	Baseline		Post		Baseline		Post	
	Mean (*SE*)	95% CI	Mean (*SE*)	95% CI	Mean (*SE*)	95% CI	Mean (*SE*)	95% CI
PMPI (Health)	1.93 (0.09)	1.74-2.11	1.98 (0.10)	1.77- 2.18	1.96 (0.11)	1.75- 2.18	1.85 (0.12)	1.62- 2.08
Family PA support	2.07 (0.24)	1.60-2.54	2.42 (0.20)	2.03-2.80	1.88 (0.15)	1.57-2.18	1.89 (0.19)	1.53-2.26
Friend PA support	1.24 (0.21)	0.84-1.64	1.40 (0.20)	1.01-1.79	1.12 (0.16)	0.80-1.44	1.25 (0.19)	0.88-1.62
Family diet support	2.44 (0.26)	1.93-2.94	2.86 (0.21)	2.45-3.28	2.46 (0.17)	2.13-2.79	2.40 (0.21)	1.99-2.81
Friend diet support	0.97 (0.20)	0.58-1.36	1.26 (0.22)	0.83-1.69	1.08 (0.18)	0.72-1.43	1.01 (0.20)	0.63-1.40
Communication	2.46 (0.14)	2.20-2.73	2.64 (0.13)	2.40-2.89	2.34 (0.10)	2.14-2.54	2.25 (0.16)	1.93-2.57
Autonomy support	2.98 (0.08)	2.82-3.13	3.08 (0.09)	2.91-3.26	2.82 (0.11)	2.61-3.04	2.91 (0.11)	2.70-3.12
PA self-efficacy	2.05 (0.07)	1.90-2.19	2.01 (0.08)	1.86-2.16	2.04 (0.11)	1.83-2.26	1.95 (0.09)	1.77-2.13
PA motivation	2.19 (0.08)	2.04-2.35	2.31 (0.09)	2.14-2.48	2.25 (0.07)	2.11-2.39	2.22 (0.10)	2.02-2.41
Diet self-efficacy	2.06 (0.07)	1.92-2.19	2.03 (0.10)	1.84-2.22	2.01 (0.09)	1.85 (2.18)	1.97 (0.09)	1.80-2.14
Diet motivation	2.09 (0.07)	1.95-2.23	2.19 (0.10)	2.00-2.38	2.05 (0.12)	1.81-2.29	2.13 (0.13)	1.87-2.39

Note. Standard errors (*SE*) are adjusted for clustering within groups and for multiple imputations; CI = 95% Confidence interval; PMPI-Health = Parental Management of Peers Inventory- Health Scale; PA = Physical activity

Table 3.4

Mean Levels of Parent-reported Psychosocial Variables by Condition (n=89)

	Intervention Condition (n=49)				Comparison Condition (n=40)			
	Baseline		Post		Baseline		Post	
	Mean (*SE*)	95% CI	Mean (*SE*)	95% CI	Mean (*SE*)	95% CI	Mean (*SE*)	95% CI
Limit-setting	4.05 (0.12)	3.82-4.29	4.28 (0.11)	4.07- 4.49	3.72 (0.21)	3.32-4.12	3.91 (0.27)	3.38-4.44
Control	1.96 (0.09)	1.78-2.15	1.99 (0.11)	1.78-2.21	2.43 (0.13)	2.18-2.68	2.33 (0.17)	1.99-2.67
Monitoring	3.48 (0.18)	3.13-3.84	3.78 (0.18)	3.43-4.13	3.21 (0.17)	2.88-3.54	3.40 (0.17)	3.06-3.74
Discipline	2.54 (0.21)	2.14-2.95	2.97 (0.25)	2.48-3.46	2.63 (0.18)	2.28-2.98	2.51 (0.17)	2.17-2.86
Reinforcement	3.83 (0.19)	3.46-4.20	4.11 (0.23)	3.65-4.57	3.35 (0.16)	3.04-3.66	3.61 (0.19)	3.24-3.98
Communication	1.52 (0.12)	1.28-1.76	2.13 (0.10)	1.93-2.33	1.40 (0.12)	1.17- 1.63	1.52 (0.13)	1.26-1.78
AAF&V	6.06 (0.28)	5.51-6.61	6.29 (0.31)	5.68-6.89	5.79 (0.35)	5.10-6.48	5.80 (0.38)	5.05-6.55
Non-portable EE	16.08 (0.82)	14.47-17.69	16.48 (0.89)	14.73-18.23	17.45 (1.04)	15.42-19.48	16.74 (1.04)	14.69-18.78
Child's room EE	2.71 (0.19)	2.35 (3.08)	2.86 (0.22)	2.42-3.31	3.15 (0.31)	2.54-3.76	3.37 (0.30)	2.78-3.95
Portable EE	7.22 (0.72)	5.81-8.63	7.36 (0.67)	6.06-8.67	6.93 (0.50)	5.94-7.91	6.68 (0.47)	5.75-7.60
PA equipment	1.09 (0.08)	0.94-1.25	1.21 (0.10)	1.02-1.40	0.95 (0.09)	0.79-1.12	1.04 (0.11)	0.82-1.26
Peer influence	2.00 (0.17)	1.66-2.33	2.37 (0.13)	2.12-2.62	2.07 (0.12)	1.84-2.30	2.17 (0.14)	1.90- 2.44
PA self-efficacy	2.12 (0.08)	1.97-2.28	1.99 (0.08)	1.83-2.15	1.87 (0.09)	1.70-2.05	1.77 (0.09)	1.60-1.94
PA motivation	2.22 (0.08)	2.05-2.38	2.39 (0.08)	2.24-2.54	2.16 (0.09)	1.99-2.33	2.26 (0 .08)	2.10-2.42
Diet self-efficacy	2.33 (0.10)	2.12-2.53	2.30 (0.08)	2.14-2.47	2.09 (0.10)	1.89- 2.29	2.09 (0.14)	1.82-2.36
Diet motivation	2.31 (0.10)	2.12-2.50	2.43 (0.07)	2.29-2.58	2.29 (0.09)	2.12-2.45	2.41 (0.12)	2.17-2.64

Note. SEs are adjusted for clustering within groups and for multiple imputations; CI = 95% Confidence interval; AAF&V = Availability and accessibility of fruits and vegetables; EE = Electronic equipment; PA = Physical activity

Table 3.5.1

Correlations among Variables at Baseline (n=89)

	Age	Income	Parent Educ	zBMI	Parent BMI	MVPA	SB	Fruit	Veggie	Monitor	PMPIH	ParSS-PA	PeerSS-PA
Age	---	0.10	0.21	0.05	-0.04	0.00	0.23	-0.34	0.04	-0.14	-0.26	-0.16	0.03
Income		---	0.43	0.06	-0.04	0.09	0.13	0.09	0.06	0.10	-0.04	0.00	-0.10
Parent Educ			---	0.01	-0.19	0.04	0.15	-0.07	-0.04	0.00	-0.12	0.06	-0.02
zBMI				---	0.27	-0.20	0.08	-0.17	-0.01	0.00	-0.03	0.15	-0.07
Parent BMI					---	-0.08	0.16	0.06	0.14	0.00	0.04	-0.13	-0.12
MVPA						---	-0.21	0.12	-0.04	0.20	0.16	0.13	0.27
SB							---	0.01	0.15	-0.09	-0.18	-0.12	0.02
Fruit								---	0.01	0.08	0.16	0.05	-0.12
Veggie									---	0.14	-0.04	-0.03	-0.01
Monitor										---	0.22	0.15	0.03
PMPIH1											---	0.49	0.26
ParSS-PA1												---	0.37
PeerSS-PA1													---
ParSS-Diet1													
PeerSS-Diet1													

Note. Correlations were derived by averaging across 20 imputations. Parent Educ = Parent education; zBMI = Age and sex-standardized body mass index; BMI = Body Mass Index; MVPA = Moderate-to-vigorous physical activity; SB = Sedentary Behavior; Monitor = Monitoring subscale; PMPIH = Parental Management of Peers Inventory – Health Scale; ParSS = Parent social support; PA = Physical activity; PeerSS = Peer social support

Table 3.5.2

Correlations among Variables at Baseline (n=89) Continued

	ParSS-Diet	PeerSS-Diet	Auto	ComA	ComP	SEPA	RMPA	SEDiet	RMDiet
Age	-0.10	0.02	-0.04	-0.26	-0.01	-0.06	-0.16	-0.05	-0.27
Income	-0.20	-0.08	-0.07	-0.05	-0.02	0.01	-0.07	-0.02	-0.09
Parent Educ	-0.19	-0.06	-0.06	-0.16	0.03	-0.06	-0.09	-0.16	-0.20
zBMI	0.14	-0.10	0.16	0.08	0.32	0.02	-0.20	0.17	-0.01
Parent BMI	-0.02	-0.21	-0.09	-0.11	0.05	0.20	0.02	0.20	0.11
MVPA	0.02	0.19	-0.07	0.07	0.05	0.14	0.35	0.01	0.16
SB	-0.13	0.04	0.14	-0.11	-0.03	-0.11	-0.14	0.11	0.00
Fruit	-0.02	-0.19	-0.05	0.05	-0.12	0.01	0.13	0.08	0.22
Veggie	0.02	0.03	-0.03	-0.01	0.02	0.17	0.10	0.18	0.05
Monitor	0.14	0.02	0.20	0.14	0.40	0.06	0.21	-0.05	0.14
PMPIH	0.46	0.13	0.32	0.46	0.16	0.40	0.47	0.18	0.47
ParSS-PA	0.74	0.35	0.43	0.62	0.33	0.19	0.34	0.09	0.43
PeerSS-PA	0.39	0.74	0.39	0.27	0.05	0.28	0.43	0.17	0.22
ParSS-Diet	---	0.40	0.48	0.62	0.31	0.30	0.40	0.12	0.43
PeerSS-Diet		---	0.26	0.32	0.03	0.24	0.31	0.15	0.27
Auto			---	0.47	0.22	0.39	0.25	0.22	0.37
ComA				---	0.23	0.25	0.42	0.26	0.54
ComP					---	0.03	0.16	-0.09	0.14
SEPA						---	0.61	0.53	0.49
RMPA							---	0.36	0.63
SEDiet								---	0.45
RMDiet									---

Note. Correlations were derived by averaging across 20 imputations. Parent Educ = Parent education; zBMI = Age and sex-standardized body mass index; BMI = Body Mass Index; MVPA = Moderate-to-vigorous physical activity; SB = Sedentary Behavior; Monitor = Monitoring subscale; PMPIH = Parental Management of Peers Inventory – Health Scale; ParSS = Parent social support; PA = Physical activity; PeerSS = Peer social support; Auto = Autonomy support; ComA = Adolescent-reported communication; ComP = Parent-reported communication; SEPA = Self-efficacy for PA; RMPA = Regulatory motivation for PA; SEDiet = Self-efficacy for diet; RMDiet = Regulatory motivation for diet

Table 3.6

Participant Attendance Data by Condition and Cohort (n=89)

# Sessions Attended	Cohort 1 (n=20)	Cohort 2 (n=23)	Cohort 3 (n=13)	Cohort 4 (n=17)	Cohort 5 (n=16)	Total (n=89)
Intervention Condition (n=49)						
Not Including Make-up Sessions						
≤ 2	2 (20%)	2 (17%)	3 (37.5%)	0	0	7 (14%)
2.5-4.5	2 (20%)	1 (8%)	2 (25%)	4 (44%)	5 (50%)	14 (29%)
5-6	6 (60%)	9 (75%)	3 (37.5%)	5 (55%)	5 (50%)	28 (57%)
Including Make-up Sessions						
≤ 2	2 (20%)	2 (16%)	2 (25%)	0	0	6 (12%)
2.5-4.5	1 (10%)	0	0	2 (22%)	1 (10%)	4 (8%)
5-6	7 (70%)	10 (83%)	6 (75%)	7 (78%)	9 (90%)	39 (79%)
Comparison Condition (n=40)						
Not Including Make-up Sessions						
≤ 2	1 (10%)	1 (9%)	0	2 (25%)	1 (17%)	5 (12.5%)
2.5-4.5	2 (20%)	3 (27%)	3 (60%)	3 (37.5%)	2 (33%)	13 (32.5%)
5-6	7 (70%)	7 (64%)	2 (40%)	3 (37.5%)	3 (50%)	22 (55%)
Including Make-up Sessions						
≤ 2	1 (10%)	1 (9%)	0	1 (12%)	1 (16%)	4 (10%)
2.5-4.5	0	3 (27%)	1 (20%)	2 (25%)	2 (33%)	8 (20%)
5-6	9 (90%)	7 (64%)	4 (80%)	5 (63%)	3 (50%)	28 (70%)

Note. Values are expressed as no. (%) of families randomized to either the intervention or comparison conditions attending specified number of sessions

Table 3.7

Summary of Reasons for Participant Drop Out

	Frequency		
Theme	Intervention	Control	Overall
Health issues	2	4	6 (35%)
Busy/ time conflicts	3	2	5 (29%)
Resource/transportation issues		2	2 (12%)
Program was not beneficial	1	1	2 (12%)
Family emergencies (e.g., death in family)	1		1 (6%)
School issues	1		1 (6%)

Note. Reasons for drop out above were drawn from qualitative interviews completed with parents (n=7) and adolescents (n=5) from the 11 total families who dropped out of the program. Several individuals cited multiple reasons for drop out.

Table 3.8

Percentage of Dose Delivered by Cohort (Goal ≥ 90%)

	Cohort				
	1	2	3	4	5
Session starts on time	100%	100%	100%	100%	75%
Healthy snack offered	100%	100%	100%	100%	100%
Door prize raffled	100%	100%	100%	100%	100%
Ground rules displayed	100%	100%	100%	100%	100%
Session agenda reviewed	100%	100%	100%	100%	100%
Key topics/skills explained	--	100%	100%	100%	100%
Key topics/skills demonstrated	--	100%	100%	100%	100%
Participants engage in Interactive activity	--	100%	100%	100%	100%
"Family Bonding Activity" assigned	--	100%	100%	100%	100%
Summary/closure	--	100%	100%	100%	100%
Average	100%	100%	100%	100%	98%

Table 3.9

Summary of Intervention Fidelity Scores by Cohort (Goal ≥ 3; Scale 1-4)

	Cohort					
	1	2	3	4	5	Average
Behavioral skills	3.71	3.86	3.94	4.00	3.84	3.88
Communication skills	3.95	3.96	4.00	3.96	3.99	3.97
Social support	3.67	3.72	3.61	3.69	3.78	3.69
Autonomy support	3.78	4.00	4.00	4.00	4.00	3.96
Average	3.78	3.89	3.89	3.91	3.90	

Table 3.10

Multilevel Models Predicting Adolescent MVPA and SB (Self-reported) at Post-Intervention

Parameter	Estimate	(*SE*)	*df*	*p*	FMI	Lower CI	Upper CI
MVPA							
Intercept	34.64**	(4.29)	58	0.00	0.59	26.06	43.22
Female	-6.58	(4.69)	89	0.16	0.26	-15.81	2.65
Age	-2.07	(1.49)	89	0.16	0.20	-4.99	0.85
Income	0.50	(1.41)	89	0.72	0.34	-2.28	3.28
Parent Education	0.33	(2.58)	89	0.90	0.23	-4.75	5.41
zBMI	-1.01	(1.74)	89	0.56	0.20	-4.43	2.40
Parent BMI	-0.01	(0.23)	89	0.96	0.17	-0.46	0.44
Cohort1.con	3.60	(7.17)	89	0.62	0.31	-10.53	17.73
Cohort2.con	8.87	(6.66)	89	0.18	0.23	-4.22	21.96
Cohort3.con	6.14	(8.03)	89	0.45	0.32	-9.70	21.98
Cohort4.con	11.96†	(7.13)	89	0.09	0.26	-2.08	25.99
Baseline MVPA	0.41**	(0.11)	89	0.00	0.26	0.20	0.63
Treatment	-4.88	(4.86)	89	0.32	0.41	-14.50	4.74
Self-Reported SB							
Intercept	123.80**	(7.28)	89	0.00	109.52	138.08	0.12
Female	12.35	(10.56)	89	0.24	-8.37	33.08	0.17
Age	3.39	(3.59)	89	0.35	-3.65	10.44	0.11
Income	-1.47	(3.05)	89	0.63	-7.45	4.50	0.14
Parent Education	-4.17	(5.90)	89	0.48	-15.73	7.40	0.08
zBMI	-9.04*	(3.92)	89	0.02	-16.73	-1.36	0.07
Parent BMI	0.06	(0.63)	89	0.92	-1.18	1.31	0.30
Cohort1.con	3.04	(15.42)	89	0.84	-27.21	33.29	0.09
Cohort2.con	-25.43†	(15.22)	89	0.09	-55.32	4.46	0.18
Cohort3.con	-5.59	(18.48)	89	0.76	-41.93	30.74	0.23
Cohort4.con	-10.95	(16.34)	89	0.50	-42.98	21.08	0.07
Baseline SB	0.39**	(0.10)	89	0.00	0.20	0.59	0.22
Treatment	-28.76**♦	(9.65)	89	0.00	-47.68	-9.84	0.10

Note. SE = Standard error of the parameter estimate adjusted for the use of multiple imputations; *df* = Estimated degrees of freedom adjusted for use of multiple imputations and capped at sample size; FMI = Fraction of missing information; CI = 95% confidence intervals; MVPA = Moderate-to-vigorouse physical activity; zBMI = age and sex-standardized Body Mass Index; SB = Sedentary Behavior; Participating in cohort 4 was marginally associated with greater adolescent MVPA at post intervention, and participating in cohort 2 was marginally associated with lower adolescent SB at post intervention

** p < .01, *p < .05, †p < .10

♦ Parameter of interest (Tx) remains significant after Bonferroni correction for multiple comparisons

Table 3.11

Multilevel Models Predicting Adolescent Fruit & Vegetable Intake at Post-Intervention

Parameter	Estimate	(*SE*)	*df*	*p*	FMI	Lower CI	Upper CI
Fruit Intake							
Intercept	0.90**	(0.23)	89	0.00	0.38	0.44	1.36
Female	-0.04	(0.19)	89	0.85	0.18	-0.41	0.34
Age	-0.02	(0.07)	89	0.83	0.24	-0.16	0.13
Income	-0.02	(0.06)	89	0.74	0.17	-0.14	0.10
Parent Education	-0.03	(0.14)	89	0.82	0.42	-0.30	0.24
zBMI	-0.05	(0.08)	89	0.53	0.15	-0.20	0.10
Parent BMI	0.00	(0.01)	89	0.95	0.22	-0.02	0.02
Cohort1.con	-0.08	(0.42)	89	0.84	0.08	-0.90	0.73
Cohort2.con	-0.04	(0.42)	89	0.93	0.14	-0.87	0.79
Cohort3.con	0.01	(0.52)	89	0.98	0.35	-1.02	1.04
Cohort4.con	0.11	(0.42)	89	0.79	0.09	-0.72	0.94
Baseline Fruit	0.19	(0.14)	89	0.18	0.35	-0.09	0.47
Treatment	-0.07	(0.30)	89	0.82	0.32	-0.67	0.53
Vegetable Intake							
Intercept	0.94**	(0.13)	89	0.00	0.09	0.69	1.20
Female	-0.05	(0.14)	89	0.73	0.10	-0.32	0.23
Age	0.03	(0.05)	89	0.62	0.20	-0.08	0.13
Income	0.06	(0.04)	89	0.17	0.13	-0.02	0.14
Parent Education	-0.07	(0.08)	89	0.43	0.10	-0.23	0.098
zBMI	-0.01	(0.06)	89	0.82	0.24	-0.13	0.12
Parent BMI	-0.01	(0.01)	89	0.16	0.18	-0.03	0.00
Cohort1.con	-0.08	(0.28)	89	0.78	0.08	-0.63	0.47
Cohort2.con	-0.32	(0.27)	89	0.24	0.07	-0.85	0.21
Cohort3.con	-0.33	(0.31)	89	0.28	0.12	-0.93	0.27
Cohort4.con	-0.14	(0.28)	89	0.62	0.06	-0.67	0.41
Baseline Veggie	0.21*	(0.10)	89	0.03	0.21	0.02	0.40
Treatment	-0.04	(0.18)	89	0.80	0.12	-0.40	0.31

Note. SE = Standard error of the parameter estimate adjusted for the use of multiple imputations; *df* = Estimated degrees of freedom adjusted for use of multiple imputations and capped at sample size; FMI = Fraction of missing information; CI = 95% confidence intervals; zBMI = Age and sex-standardized Body Mass Index

** p < .01, *p < .05, †p < .10

♦ Parameter of interest (Tx) remains significant after Bonferroni correction for multiple comparisons

Table 3.12

Multilevel Models Predicting Parent Support for Adolescent PA and Diet at Post-Intervention

Parameter	Estimate	(*SE*)	*df*	*p*	FMI	Lower CI	Upper CI
Parent Support for PA							
Intercept	1.95**	(0.17)	89	0.00	0.12	1.61	2.29
Female	-0.049	(0.24)	89	0.84	0.12	-0.52	0.43
Age	-0.01	(0.09)	89	0.90	0.18	-0.18	0.16
Income	-0.07	(0.07)	89	0.35	0.10	-0.20	0.07
Parent Education	0.08	(0.15)	89	0.56	0.16	-0.20	0.37
zBMI	0.06	(0.10)	89	0.55	0.13	-0.13	0.25
Parent BMI	0.01	(0.01)	89	0.51	0.23	-0.02	0.04
Cohort1.con	-0.36	(0.40)	89	0.37	0.22	-1.14	0.42
Cohort2.con	-0.23	(0.36)	89	0.53	0.13	-0.94	0.48
Cohort3.con	-0.42	(0.45)	89	0.35	0.23	-1.30	0.47
Cohort4.con	-0.14	(0.38)	89	0.72	0.10	-0.89	0.61
Baseline Parent PA Support	0.52**	(0.13)	89	0.00	0.20	0.26	0.77
Treatment	0.42†	(0.24)	89	0.08	0.15	-0.05	0.90
Parent Support for Diet							
Intercept	2.38**	(0.18)	89	0.00	0.25	2.018	2.73
Female	0.05	(0.22)	89	0.84	0.14	-0.39	0.49
Age	-0.04	(0.08)	89	0.60	0.18	-0.20	0.12
Income	-0.10	(0.07)	89	0.15	0.21	-0.24	0.04
Parent Education	0.30*	(0.14)	89	0.30	0.17	0.03	0.57
zBMI	0.07	(0.10)	89	0.48	0.21	-0.12	0.25
Parent BMI	0.02	(0.01)	89	0.16	0.25	-0.01	0.04
Cohort1.con	-0.51	(0.36)	89	0.16	0.14	-1.22	0.20
Cohort2.con	-0.10	(0.35)	89	0.77	0.13	-0.78	0.58
Cohort3.con	-0.20	(0.46)	89	0.67	0.35	-1.11	0.72
Cohort4.con	-0.05	(0.37)	89	0.89	0.11	-0.77	0.67
Baseline Parent Diet Support	0.66**	(0.12)	89	0.00	0.29	0.41	0.90
Treatment	0.49*	(0.22)	89	0.03	0.11	0.05	0.93

Note. SE = Standard error of the parameter estimate adjusted for the use of multiple imputations; *df* = Estimated degrees of freedom adjusted for use of multiple imputations and capped at sample size; FMI = Fraction of missing information; CI = 95% confidence intervals; zBMI = Age and sex-standardized Body Mass Index

** p < .01, **p* < .05, †*p* < .10

♦ Parameter of interest (Tx) remains significant after Bonferroni correction for multiple comparisons

Table 3.13

Multilevel Models Predicting Adolescent- and Parent-reported Communication at Post-Intervention

Parameter	Estimate	(*SE*)	*df*	*p*	FMI	Lower CI	Upper CI
Adolescent-reported Communication							
Intercept	2.30**	(0.14)	89	0.00	0.30	2.03	2.57
Female	-0.13	(0.16)	89	0.44	0.15	-0.44	0.19
Age	0.02	(0.06)	89	0.77	0.30	-0.11	0.14
Income	-0.01	(0.05)	89	0.90	0.12	-0.10	0.09
Parent Education	0.05	(0.10)	89	0.64	0.13	-0.14	0.23
zBMI	0.02	(0.07)	89	0.79	0.22	-0.12	0.15
Parent BMI	0.00	(0.01)	89	0.94	0.29	-0.02	0.02
Cohort1.con	-0.15	(0.28)	89	0.59	0.25	-0.71	0.41
Cohort2.con	-0.04	(0.25)	89	0.88	0.14	-0.54	0.47
Cohort3.con	-0.24	(0.31)	89	0.45	0.26	-0.86	0.38
Cohort4.con	-0.06	(0.26)	89	0.81	0.10	-0.58	0.45
Baseline Communication	0.45**	(0.09)	89	0.00	0.24	0.28	0.62
Treatment	0.33†	(0.18)	89	0.06	0.24	-0.02	0.68
Parent-reported Communication							
Intercept	1.58**	(0.11)	89	0.00	0.19	1.36	1.81
Female	0.01	(0.15)	89	0.95	0.12	-0.28	0.30
Age	-0.01	(0.05)	89	0.85	0.16	-0.11	0.09
Income	-0.07	(0.05)	89	0.15	0.20	-0.16	0.02
Parent Education	0.06	(0.08)	89	0.49	0.06	-0.11	0.22
zBMI	-0.06	(0.06)	89	0.38	0.17	-0.18	0.07
Parent BMI	0.00	(0.01)	89	0.86	0.26	-0.015	0.02
Cohort1.con	-0.21	(0.24)	89	0.37	0.16	-0.68	0.26
Cohort2.con	-0.23	(0.23)	89	0.31	0.13	-0.67	0.21
Cohort3.con	-0.05	(0.27)	89	0.84	0.21	-0.59	0.48
Cohort4.con	-0.050	(0.23)	89	0.83	0.03	-0.50	0.40
Baseline Communication	0.37**	(0.08)	89	0.00	0.12	0.22	0.52
Treatment	0.52**♦	(0.15)	89	0.00	0.13	0.22	0.81

Note. SE = Standard error of the parameter estimate adjusted for the use of multiple imputations; *df* = Estimated degrees of freedom adjusted for use of multiple imputations and capped at sample size; FMI = fraction of missing information; CI = 95% confidence intervals; zBMI = Age and sex-standardized Body Mass Index

** p < .01, *p < .05, †p < .10

♦ Parameter of interest (Tx) remains significant after Bonferroni correction for multiple comparisons

Table 3.14

Multilevel Model Predicting Parent MVPA at Post-Intervention

Parameter	Estimate	(*SE*)	*df*	*p*	FMI	Lower CI	Upper CI
MVPA							
Intercept	19.10**	4.20	89	0.00	0.14	10.86	27.34
Female	-2.24	6.28	89	0.72	0.08	-14.55	10.07
Age	-0.01	0.21	89	0.96	0.20	-0.41	0.39
Income	0.86	1.28	89	0.50	0.35	-1.66	3.38
Education	-0.55	2.18	89	0.80	0.15	-4.83	3.73
BMI	0.027	0.19	89	0.89	0.20	-0.35	0.40
Cohort1.con	1.22	6.83	89	0.86	0.22	-12.21	14.66
Cohort2.con	-5.12	6.66	89	0.44	0.22	-18.21	7.97
Cohort3.con	-4.92	7.95	89	0.53	0.33	-20.60	10.77
Cohort4.con	4.79	7.04	89	0.50	0.24	-9.06	18.64
Baseline MVPA	0.22	0.14	89	0.12	0.27	-0.06	0.50
Treatment	9.43*	4.21	89	0.03	0.15	1.16	17.70

Note. SE = Standard error of the parameter estimate adjusted for the use of multiple imputations; *df* = Estimated degrees of freedom adjusted for use of multiple imputations and capped at sample size; FMI = fraction of missing information; CI = 95% confidence intervals; zBMI = age and sex-standardized Body Mass Index

** p < .01, **p* < .05, †*p* < .10

♦ Parameter of interest (Tx) remains significant after Bonferroni correction for multiple comparisons

CHAPTER 4

DISCUSSION

The present study tested the effects of an interactive, parent-based intervention for improving MVPA, SB, and F&V intake in African American adolescents. The intervention integrated Social Cognitive, Self Determination, and Family Systems Theories and was designed to create a positive parenting and social climate for improving health behaviors in African American adolescents and their primary caregivers. The intervention resulted in improvements in adolescent self-reported SB and parent accelerometer-assessed MVPA at post-intervention. Specifically, adolescents and parents in the IPB intervention condition engaged in ~28 less weekly hours of SB and ~8 more minutes per day of MVPA, respectively, than did those in the comparison condition. Contrary to study hypotheses for adolescent MVPA and FV intake, the effect of the intervention was not found to be statistically significant. Results also indicated a significant intervention effect on parent support for diet and parent-reported health communication. None of the other psychosocial variables were significantly different between groups and changes in psychosocial variables did not predict changes in adolescent SB. Overall, this study only provides preliminary support for how creating a nurturing family climate, including communication specific to health behaviors, may facilitate improvements in adolescent SB and parent MVPA.

4.1 INTERVENTION IMPLEMENTATION AND PROCESS OUTCOMES

Novel process evaluation measures assessing the intervention social climate and behavioral skills implementation indicated the study was implemented with high dose and fidelity across cohorts. Given the importance of nurturing environments for promoting human well-being across a variety of mental and physical health domains (Biglan, et al., 2012), facilitators modeled a positive social climate for health promotion and consistently met a priori goals for implementation of behavioral skills, communication skills, social support and autonomy support during intervention sessions. Few family-based health promotion intervention studies in ethnic minorities have assessed the intervention social climate. For example, in the Girls health Enrichment Multisite Study (GEMS), an after school obesity-prevention program for African American girls that included a home-based family component, attendance rates and ratings of participant satisfaction were the only process measures used to assess implementation (Klesges et al., 2010; Robinson et al., 2010). Because inadequate implementation of a program can adversely impact study outcomes (Durlak & DuPre, 2008) and may result in Type III error (i.e., concluding that a program is ineffective, when in fact it was not fully implemented or implemented incorrectly) (Karachi, Abbott, Catalano, Haggerty, & Fleming, 1999), having thorough and theory-based indicators of process are important for accurate interpretation of study outcomes. The process evaluation approach used in this study was reflective of the overarching theoretical framework and represents a unique strength of the present study.

In terms of the indicators of study reach (i.e., response rate, attendance, retention rate), the 45% response rate (percentage of eligible families reached by phone that

enrolled in the study) was moderate and highlights the challenges of recruiting ethnic minority families into research studies. It has been suggested that recruiting ethnic minorities may be especially difficult due to implicit attitudinal barriers stemming from historical distrust in medical research and trend of underutilization of formal services (Brannon et al., 2013; Gorelick, Harris, Burnett, & Bonecutter, 1998; Harachi, Catalano, & Hawkins, 1997; Kumpfer, Alvarado, Smith, & Bellamy, 2002; Yancey, Ortega, & Kumanyika, 2006). Low-income populations face additional logistical barriers to participation including economic disadvantage resulting in multiple demands on their time, lack of awareness of available studies, and communication/literacy barriers, which further impede study recruitment and retention efforts (Brannon, et al., 2013). Similarly, attendance rates have been shown to suffer in interventions with ethnic minority families (Baranowski, et al., 1990; Zeller, et al., 2004). Attendance data from the present study indicated goals were only met for the intervention condition when make-up sessions were included in attendance estimates. Although intervention sessions were delivered with high dose and fidelity, the lack of consistent participant session attendance may have been associated with a reduced impact on primary study outcomes. Despite these challenges, however, the high study retention rate of 88% suggests once families were randomized to a condition, they were committed to completing the study. Furthermore, reasons most cited for study discontinuation were related to factors external to the program itself (e.g., caregiver cancer diagnoses, time constraints).

4.2 BEHAVIORAL OUTCOMES

Results related to adolescents' self-reported SB in the present study are somewhat promising and provide preliminary support for the Project SHINE intervention approach

on influencing youth SB (St. George, Wilson, Schneider, & Alia, 2013). Independent of PA, SB is associated with adverse health consequences, including increased metabolic risk (Wennberg, Gustafsson, Dunstan, Wennberg, & Hammarström, 2013). Adolescents in the intervention versus comparison condition reported engaging in an average of 4 less daily hours of SB at post intervention but made no significant improvements in MVPA or F&V intake. One possible explanation for these findings is that making changes in SB requires less effort than making changes in either MVPA or F&V intake. A meta-analysis of lifestyle interventions to prevent childhood obesity concluded that strategies attempting to reduce unhealthy behaviors (i.e., decreasing SB) may be more effective than those promoting positive behaviors (i.e. increasing MVPA and F&V intake) (Kamath et al., 2008). Decreases in SB may also serve as a precursor to increases in PA but only over time. For example, one study conducted over two years examined targeted versus non-targeted SB (e.g., television versus schoolwork time) and MVPA as part of a childhood obesity intervention (Epstein, Paluch, Gordy, & Dorn, 2000). Results showed that targeted SB was displaced by either non-targeted SB or MVPA. Due to the brief intervention time frame and lack of follow-up period in the present study, potential changes in adolescent MVPA may have gone undetected. Finally, an important consideration when interpreting adolescent behavioral outcomes in the present study is the limitation of using a self-reported measure of SB.

Interestingly, parents but not adolescents in the intervention group displayed significant improvements in MVPA as compared to those in the general health condition. Few family-based health promotion interventions in adolescents have assessed PA outcomes in both adolescents and their parents (Baranowski, et al., 1990; Nader, et al.,

1992; Ransdell, Dratt, Kennedy, O Neill, & DeVoe, 2001; L. B. Ransdell, E. Eastep, et al., 2003; Ransdell, Robertson, Ornes, & Moyer-Mileur, 2005). Findings from these studies have shown mixed results with regard to parent versus youth PA changes, with some reporting larger intervention effects across fitness indicators (e.g., aerobic capacity, muscular strength) for Caucasian mothers versus daughters (L. B. Ransdell, A. Taylor, et al., 2003) and others reporting only within-group increases in 7-day recall estimates of PA for African American parents but not youth (Baranowski, et al., 1990). A systematic review of PA interventions in African Americans found that most studies in adults reported significant within-group pre-post differences in PA while most studies in youth were null (Whitt-Glover & Kumanyika, 2009). Findings from this review are consistent with the present study, such that treatment effects were observed for parents but not youth. Review authors noted that effective programs in African Americans used randomized controlled study designs, assessed PA using an objective measure, and provided participants with opportunities to practice PA during intervention sessions. Although opportunities to practice PA within the SHINE intervention were limited to brief "Walk and Talk" sessions, the study used a randomized-controlled design and assessed PA using accelerometers. National estimates of accelerometer-assessed PA in African American adults are similar to those found at baseline in the present study and indicate African American women between the ages of 20-59 years engage in an average of 20 ± 2.2 minutes per day of MVPA (Troiano, et al., 2008). Given the majority of caregivers in this study were women in the obese weight range, an 8-minute increase in MVPA per day is a clinically meaningful amount as it closely approximates a full 10-minute bout of exercise (PhysicalActivityGuidelinesAdvisoryCommittee, 2008).

Furthermore, the mean reported minutes per day of MVPA for parents in the intervention condition at post intervention is suggestive of parents meeting the recommended weekly 150 minutes of moderate intensity PA. Overall, findings from the present study suggest the Project SHINE approach may be helpful for increasing parent MVPA only.

With regard to dietary outcomes, no significant effect of treatment was observed for F&V intake in either adolescents or their caregivers at post-intervention. The present study findings are consistent with other health promotion interventions in adolescents assessing dietary outcomes with 24-hour dietary recalls that show no significant changes in F&V intake from baseline to post-assessment (Baranowski, et al., 2002; Lytle, et al., 2004; te Velde, et al., 2007). For example, only marginal treatment effects were found for an 8-week health promotion intervention on recall-assessed total fruit, juice, and vegetable intake in African American boy scouts (Baranowski, et al., 2002). A shorter intervention duration than that reported by Baranowski and colleagues (2002) and lack of follow-up assessment in the present study may have resulted in undetected effects for dietary outcomes. It should be noted that although the present study used a non-validated dietary assessment approach, average estimates of adolescent daily F&V servings at baseline (i.e., ~1 daily serving of fruit; ~1 daily serving of vegetables) were consistent with national estimates of adolescents' F&V intake assessed by 24-hour recalls in a sample of over 50% ethnic minorities (Eaton et al., 2013). Despite finding no observed effects in actual F&V intake, adolescents in the SHINE intervention condition perceived significantly greater amounts of parental support for diet at post intervention than did those in the comparison condition. These findings are promising in light of research indicating positive family relations at age 15 may be predictive of F&V intake at age 21

(Lien, Jacobs, & Klepp, 2002). Thus, adolescents in the present study may have required more sustained amounts of parental support prior to making behavioral changes in F&V intake.

4.3 PSYCHOSOCIAL OUTCOMES

Parent-reported health communication and parent support for diet were the only two psychosocial outcomes that displayed significant intervention effects at post intervention. Various family functioning variables, including both warmth of family interactions and cohesion (emotional bonding between family members) have been associated with adolescent health behaviors (White et al., 2004). For example, family warmth has been associated with higher youth intake of fruits and vegetables (Mellin, et al., 2002), greater frequency of eating breakfast (Mellin, et al., 2002), lower caloric intake (Kitzman-Ulrich et al., 2009), and fewer negative weight-control behaviors (e.g., taking diet pills, skipping meals) (Fulkerson, Strauss, Neumark-Sztainer, Story, & Boutelle, 2007) in youth. Positive communication (i.e., frequency and quality of family discussions), as examined in the present study, can be conceptualized as an important and more specific aspect of healthy family functioning that has received less attention in health promotion interventions specific to PA, SB and dietary behaviors.

It has been suggested that effective communication may facilitate the health behavior change process by reducing risk factors, modifying parenting practices, and facilitating discussion about factors that lead to involvement in health behaviors (Riesch, Anderson, & Krueger, 2006). Communication has been recommended as a key target of interventions to prevent children's health risk behavior (Ornelas, Perreira, & Ayala, 2007; Riesch, et al., 2006). However, few adolescent interventions to date have specifically

targeted and measured parent-adolescent communication specific to adolescent activity and dietary behaviors. Preliminary analyses examining whether communication and parental monitoring would moderate the effects of the SHINE intervention on adolescent SB found a significant interaction between communication and the intervention, such that increased frequency and quality of communication for those in the intervention condition was significantly associated with decreased levels of adolescent-reported SB (S.M. St. George, et al., 2013). Although changes in parent-reported communication were not predictive of changes in adolescent SB in the present study, findings from the St. George et al. (2013) study suggest developmentally appropriate communication for adolescents which focuses on negotiation, shared-decision-making, and includes discussion of peer involvement in these behaviors may be especially important in positively shaping adolescent autonomy specific to SB (Bassett, et al., 2008). Overall, establishing a framework for positive discussion of family health management issues may improve family relationships that encourage adolescent health behaviors. Further research in larger trials is needed to better understand how health specific communication may relate to adolescent PA, SB, and dietary behaviors.

Unlike parent-adolescent communication reported by parents, there were no differences between groups in any other parent- or peer-related constructs (e.g., parental monitoring, parental management of peer relationships). Although communication is related to constructs such as monitoring and management of peer relationships, the latter may involve tracking and supervision of adolescents' behaviors beyond discussions of these behaviors. Despite support in the literature for the effectiveness of monitoring on reducing adolescent SB (Ramirez, et al., 2011; Salmon, et al., 2012; Zabinski, et al.,

2007), previous studies have failed to also measure communication. As adolescents mature, communication may become a more utilized tool than direct supervision for monitoring and regulating adolescent behavior due to an increase in adolescent activities free of direct parental supervision (Stattin & Kerr, 2000). It could be that adolescents respond more favorably to open communication rather than monitoring or management of peer relationships, which could be perceived as exerting greater amounts of parental control. Similarly, because constructs such as autonomy support and social support are transmitted, in part, through communication, changes in these constructs may have followed the observed increases in communication. Future studies should continue to examine the relationship between health communication, more direct monitoring-related constructs (e.g., management of peer relationships), and adolescent health behaviors.

4.4 STUDY LIMITATIONS AND STRENGTHS

Several limitations of the current study should be noted. First, the lack of follow up data may have been associated with a failure to detect intervention effects, especially given the brief intervention time frame. Collecting follow-up data would have also been beneficial in terms of monitoring significant observed effects over time. Second, and as previously noted, SB was measured using a self-reported scale completed by adolescents. A review of the validity and reliability of SB measures used with children and adolescents indicates that although self-reported measures of SB are generally reliable, their validity remains largely untested (Lubans et al., 2011). Similarly, cost considerations and the lack of a validated tool for youth lead to the adaptation of the ASA24 system, a measure designed to be self-administered by adults only. The adaptation of this procedure may have limited the detection of study effects on dietary

changes. In addition, although internal consistency for psychosocial scales developed specifically for this study (e.g., Parental Management of Peers Inventory – Health Scale, Adolescent Perceptions of Autonomy Support for Health Behaviors, Parent-Adolescent Communication Around Health Behaviors) was generally adequate across scales, further examination of the psychometric properties for these scales is warranted. The parent-adolescent measure may be useful in future studies given its significant association with decreased SB (S.M. St. George, et al., 2013). Finally, although various cultural targeting strategies were used to enhance intervention relevance, the majority of study staff was not culturally-matched to participants. These limitations, especially those related to the measurement of parenting constructs specific to obesity-related health behaviors, highlight several ongoing challenges in the field of obesity prevention and health promotion (Baranowski et al., 2013).

Despite the aforementioned limitations, this study also has various important strengths. Among the strengths of this study was the use of an African American sample of participants. Research examining family-based health interventions in ethnic minorities is limited (Kitzman-Ulrich et al., 2010; Wilson, 2009; Wilson & Kitzman-Ulrich, 2008), and even fewer randomized controlled trials have examined parenting variables in ethnic minority populations. The use of a family-based approach is also viewed as a study strength given family-based interventions have been shown to be more culturally appropriate for ethnic minorities (Kumpfer, et al., 2002). As has been previously noted, a novel climate-based process evaluation method reflective of the overarching study theoretical framework was used to assess intervention implementation. Similarly, this study used rigorous methods (i.e., randomization to both an evening and condition, use of 7-day accelerometry estimates for MVPA, use of three random 24-hour

dietary recalls, outcomes assessed in both parents and adolescents, multiple imputation methods to account for missing data, multilevel models to account for nesting of individuals within groups) which currently reflect gold standards in the field.

4.5 CONCLUSTION AND IMPLICATIONS

Given that Americans American adolescents have among the highest rates of overweight and obesity, there is a strong need to intervene with this population in order to prevent the onset of various co-morbid chronic health conditions (e.g., Type 2 Diabetes). The present study is one of the first to test an intervention that targets parents as the primary facilitators of a home environment and peer relationships that maximize healthy PA, SB, and dietary behaviors. Overall, study results indicated that an intervention designed to promote positive parenting practices, including communication around health, and behavioral skills may facilitate improvements in adolescent SB and parent MVPA. Although the integration of parent and peer systems within the context of family-based interventions needs further exploration, continuing to find ways for these two important social contexts to be systematically integrated may fill an existing gap in the adolescent obesity prevention literature. Results from this study pave the way for future positive parenting and communication-based interventions and will be used to refine and further develop a program of research that tests the efficacy of this innovative intervention as part of a larger group randomized trial for changing SB. A larger trial, including a longer follow up period, would allow for a more in-depth exploration of key theoretical mediators that may be successful in promoting both change and maintenance of healthy lifestyle behaviors in ethnic minority youth and their families.

REFERENCES

Acock, A. C. (2005). Working with missing values. *Journal of Marriage and Family, 67*(4), 1012-1028.

Adkins, S., Sherwood, N., Story, M., & Davis, M. (2004). Physical activity among African-American girls: the role of parents and the home environment. *Obesity, 12*, 38S-45S.

Arredondo, E., Elder, J., Ayala, G., Campbell, N., Baquero, B., & Duerksen, S. (2006). Is parenting style related to children's healthy eating and physical activity in Latino families? *Health Education Research, 21*(6), 862.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ US: Prentice-Hall, Inc.

Bandura, A. (2004). Health promotion by social cognitive means. *Health Education & Behavior, 31*(2), 143-164.

Baranowski, T., Baranowski, J., Cullen, K., demoor, C., Rittenberry, L., Hebert, D., & Jones, L. (2002). 5 a Day Achievement Badge for African-American boy scouts: Pilot outcome results. *Preventive Medicine, 34*(3), 353-363.

Baranowski, T., O'Connor, T., Hughes, S., Sleddens, E., Beltran, A., Frankel, L., . . . Baranowski, J. (2013). Houston… We have a problem! Measurement of parenting. *Childhood Obesity, 9*(s1), S-1-S-4.

Baranowski, T., Simons-Morton, B., Hooks, P., Henske, J., Tiernan, K., Kay Dunn, J., . . . Palmer, J. (1990). A center-based program for exercise change among black-American families. *Health Education & Behavior, 17*(2), 179-196.

Barbarin, O., & Tirado, M. (1984). Family involvement and successful treatment of obesity: A review. *Family Systems Medicine, 2*(1), 37-45.

Bassett, R., Chapman, G. E., & Beagan, B. L. (2008). Autonomy and control: The co-construction of adolescent food choice. *Appetite, 50*, 325-332.

Beavers, W. R., & Hampson, R. B. (1990). *Successful families: assessment and intervention*. New York: Norton.

Beech, B., Klesges, R., Kumanyika, S., Murray, D., Klesges, L., McClanahan, B., . . . McLain-Allen, B. (2003). Child-and parent-targeted interventions: the Memphis GEMS pilot study. *Ethnicity and Disease, 13*(1; SUPP/1), 1-40.

Beets, M., Vogel, R., Forlaw, L., Pitetti, K., & Cardinal, B. (2006). Social support and youth physical activity: the role of provider and type. *American Journal of Health Behavior, 30*(3), 278-289.

Biglan, A., Flay, B. R., Embry, D. D., & Sandler, I. N. (2012). The critical role of nurturing environments for promoting human well-being. *American Psychologist, 67*(4), 257-271.

Birch, L. L., Fisher, J., Grimm-Thomas, K., Markey, C., Sawyer, R., & Johnson, S. (2001). Confirmatory factor analysis of the Child Feeding Questionnaire: a measure of parental attitudes, beliefs and practices about child feeding and obesity proneness. *Appetite, 36*(3), 201-210.

Booth, S., Sallis, J., Ritenbaugh, C., Hill, J., Birch, L., Frank, L., . . . Popkin, B. (2001). Environmental and societal factors affect food choice and physical activity: rationale, influences, and leverage points. *Nutrition Reviews, 59*(3), S21-S36.

Borawski, E. A., Ievers-Landis, C. E., Lovegreen, L. D., & Trapl, E. S. (2003). Parental monitoring, negotiated unsupervised time, and parental trust: The role of perceived parenting practices in adolescent health risk behaviors. *Journal of Adolescent Health, 33*, 60-70.

Brannon, E. E., Kuhl, E. S., Boles, R. E., Aylward, B. S., Benoit Ratcliff, M., Valenzuela, J. M., . . . Powers, S. W. (2013). Strategies for recruitment and retention of families from low-income, ethnic minority backgrounds in a longitudinal study of caregiver feeding and child weight. *Children's Health Care, 42*(3), 198-213.

Broderick, C. (1993). Understanding family process: Basics of family systems theory. Thousand Oaks, CA: Sage Publications.

Bruening, M., Eisenberg, M., MacLehose, R., Nanney, M. S., Story, M., & Neumark-Sztainer, D. (2012). Relationship between adolescents' and their friends' eating behaviors: Breakfast, fruit, vegetable, whole-grain, and dairy intake. *Journal of the Academy of Nutrition and Dietetics*, *112*(10), 1608-1613.

Burke, V., Milligan, R., Thompson, C., Taggart, A., Dunbar, D., Spencer, M., . . . Beilin, L. (1998). A controlled trial of health promotion programs in 11-year-olds using physical activity. *Journal of Pediatrics, 132*(5), 840-848.

Catellier, D. J., Hannan, P. J., Murray, D. M., Addy, C. L., Conway, T. L., Song, Y., & Rice, J. C. (2005). Imputation of missing data when measuring physical activity

by accelerometry. *Medicine and Science in Sports and Exercise, 37*(11 Suppl), S555.

Christakis, N., & Fowler, J. (2007). The spread of obesity in a large social network over 32 years. *The New England Journal of Medicine, 357*(4), 370.

Coleman, J. (1980). Friendship and the peer group in adolescence. In J. Adelson (Ed.), *Handbook of Adolescent Psychology* (pp. 408-431). New York: Wiley.

Cousineau, D., & Chartier, S. (2010). Outliers detection and treatment: A review. *International Journal of Psychological Research, 3*(1), 58-67.

Cox, M. J., & Paley, B. (2003). Understanding families as systems. *Current Directions in Psychological Science, 12*(5), 193-196.

Davis, M., Gance-Cleveland, B., Hassink, S., Johnson, R., Paradis, G., & Resnicow, K. (2007). Recommendations for prevention of childhood obesity. *Pediatrics, 120*(Supplement), S229-S253.

Davison, K., & Jago, R. (2009). Change in parent and peer support across ages 9 to 15 yr and adolescent girls' physical activity. *Medicine & Science in Sports & Exercise, 41*(9), 1816-1825.

De La Haye, K., Robins, G., Mohr, P., & Wilson, C. (2011). How physical activity shapes, and is shaped by, adolescent friendships. *Social science & medicine, 73*(5), 719-728.

Deshmukh-Taskar, P. R., Nicklas, T. A., O'Neil, C. E., Keast, D. R., Radcliffe, J. D., & Cho, S. (2010). The relationship of breakfast skipping and type of breakfast consumption with nutrient intake and weight status in children and adolescents:

The National Health and Nutrition Examination Survey 1999-2006. *Journal of the American Dietetic Association, 110*(6), 869-878.

Duncan, S., Duncan, T., & Strycker, L. (2005). Sources and types of social support in youth physical activity. *Health Psychology, 24*, 3-10.

Durlak, J. A., & DuPre, E. P. (2008). Implementation matters: A review of research on the influence of implementation on program outcomes and the factors affecting implementation. *American Journal of Community Psychology, 41*(3-4), 327-350.

Eaton, D., Kann, L., Kinchen, S., Shanklin, S., Flint, K., Hawkins, J., . . . Wechsler, H. (2012). Youth risk behavior surveillance—United States, 2011. *MMWR Surveill Summ, 61*(4), 1-168.

Eaton, D. K., Olsen, E. O. M., Brener, N. D., Scanlon, K. S., Kim, S. A., Demissie, Z., & Yaroch, A. L. (2013). A comparison of fruit and vegetable intake estimates from three survey question sets to estimates from 24-hour dietary recall interviews. *Journal of the Academy of Nutrition and Dietetics, 113*(9), 1165-1174.

Eccles, J. S. (1999). The development of children ages 6 to 14. *The Future of Children, 9*, 30-44.

Elliott, M. (2006). Multiple imputation in the presence of outliers *Technical Report 06-59*. Ann Arbor: Department of Biostatistics, University of Michigan School of Public Health.

Epstein, L. H., Paluch, R. A., Gordy, C. C., & Dorn, J. (2000). Decreasing sedentary behaviors in treating pediatric obesity. *Archives of Pediatrics & Adolescent Medicine, 154*(3), 220.

Evenson, K. R., & Terry, J. W. (2009). Assessment of differing definitions of accelerometer nonwear time. *Research Quarterly for Exercise and Sport, 80*(2), 355-362.

Foster, G., Sherman, S., Borradaile, K., Grundy, K., Vander Veur, S., Nachmani, J., . . . Shults, J. (2008). A policy-based school intervention to prevent overweight and obesity. *Pediatrics, 121*(4), e794-e802.

French, S., Story, M., Fulkerson, J., Himes, J., Hannan, P., Neumark-Sztainer, D., & Ensrud, K. (2005). Increasing weight-bearing physical activity and calcium-rich foods to promote bone mass gains among 9 – 11 year old girls: outcomes of the Cal-Girls study. *International Journal of Behavioral Nutrition and Physical Activity, 2*(1), 8.

French, S., Story, M., & Jeffery, R. (2001). Environmental Influences on Eating and Phyiscal Activity. *Annual Review of Public Health, 22*(1), 309-335.

Fulkerson, J. A., Strauss, J., Neumark-Sztainer, D., Story, M., & Boutelle, K. (2007). Correlates of psychosocial well-being among overweight adolescents: the role of the family. *Journal of Consulting and Clinical Psychology, 75*(1), 181-186.

Gorelick, P. B., Harris, Y., Burnett, B., & Bonecutter, F. J. (1998). The recruitment triangle: Reasons why African Americans enroll, refuse to enroll, or voluntarily withdraw from a clinical trial. An interim report from the African-American Antiplatelet Stroke Prevention Study (AAASPS). *Journal of the National Medical Association, 90*(3), 141.

Grolnick, W. S., Deci, E. L., & Ryan, R. M. (1997). Internalization within the family: The self-determination theory perspective. *Parenting and children's internalization of values: A handbook of contemporary theory*, 135–161.

Grolnick, W. S., Ryan, R. M., & Deci, E. L. (1991). Inner resources for school achievement: Motivational mediators of children's perceptions of their parents. *Journal of Educational Psychology, 83*(4), 508-517.

Haerens, L., De Bourdeaudhuij, I., Maes, L., Cardon, G., & Deforche, B. (2007). School-Based randomized controlled trial of a physical activity intervention among adolescents. *Journal of Adolescent Health, 40*(3), 258-265. doi: 10.1016/j.jadohealth.2006.09.028

Harachi, T. W., Catalano, R. F., & Hawkins, J. D. (1997). Effective recruitment for parenting programs within ethnic minority communities. *Child and Adolescent Social Work Journal, 14*(1), 23-39.

Hohepa, M., Scragg, R., Schofield, G., Kolt, G., & Schaaf, D. (2007). Social support for youth physical activity: Importance of siblings, parents, friends and school support across a segmented school day. *International Journal of Behavioral Nutrition and Physical Activity, 4*(1), 54.

Hutchinson, M. K., Jemmott, J. B., Sweet Jemmott, L., Braverman, P., & Fong, G. T. (2003). The role of mother–daughter sexual risk communication in reducing sexual risk behaviors among urban adolescent females: a prospective study. *Journal of Adolescent Health, 33*(2), 98-107.

Jago, R., Baranowski, T., Baranowski, J., Thompson, D., Cullen, K., Watson, K., & Liu, Y. (2006). Fit for Life boy scout badge: Outcome evaluation of a troop and internet intervention. *Preventive Medicine, 42*(3), 181-187.

Jago, R., Macdonald-Wallis, K., Thompson, J. L., Page, A. S., Brockman, R., & Fox, K. R. (2011). Better with a buddy: Influence of best friends on children's physical activity. *Med Sci Sports Exerc, 43*(2), 259-265.

Janicke, D., Sallinen, B., Perri, M., Lutes, L., Huerta, M., Silverstein, J., & Brumback, B. (2008). Comparison of parent-only vs family-based interventions for overweight children in underserved rural settings: outcomes from Project STORY. *Archives of Pediatrics and Adolescent Medicine, 162*(12), 1119-1125.

Kamath, C., Vickers, K., Ehrlich, A., McGovern, L., Johnson, J., Singhal, V., . . . Montori, V. (2008). Behavioral interventions to prevent childhood obesity: A systematic review and metaanalyses of randomized trials. *Journal of Clinical Endocrinology & Metabolism, 93*(12), 4606-4615.

Karachi, T., Abbott, R., Catalano, R., Haggerty, K., & Fleming, C. (1999). Opening the black box: Using process evaluation measures to assess implementation and theory building. *American Journal of Community Psychology, 27*(5), 711-731.

Kitzman-Ulrich, H., Hampson, R., Wilson, D. K., Presnell, K., Brown, A., & O'Boyle, M. (2009). An adolescent weight-loss program integrating family variables reduces energy intake. *Journal of the American Dietetic Association, 109*(3), 491-496.

Kitzman-Ulrich, H., Wilson, D. K., St. George, S. M., Lawman, H., Segal, M., & Fairchild, A. (2010). The integration of a family systems approach for

understanding youth obesity, physical activity, and dietary programs. *Clinical Child and Family Psychology Review, 13*, 231–253.

Kitzman-Ulrich, H., Wilson, D. K., St. George, S. M., Segal, M., Schneider, E., & Kugler, K. (2011). A preliminary test of a motivational and parenting weight loss program targeting low-income and minority adolescents. *Childhood Obesity, 7*(5), 379-384.

Kitzman-Ulrich, H., Wilson, D. K., Van Horn, M. L., & Lawman, H. G. (2010). Sex differences in self-efficacy, social support and physical activity by adiposity in underserved adolescents. *Annals of Behavioral Medicine, 39*(S1).

Klesges, R. C., Obarzanek, E., Kumanyika, S., Murray, D. M., Klesges, L. M., Relyea, G. E., . . . McClanahan, B. S. (2010). The Memphis Girls' health Enrichment Multi-site Studies (GEMS): an evaluation of the efficacy of a 2-year obesity prevention program in African American girls. *Archives of Pediatrics & Adolescent Medicine, 164*(11), 1007.

Kreuter, M., Lukwago, S., Bucholtz, D., Clark, E., & Sanders-Thompson, V. (2003). Achieving cultural appropriateness in health promotion programs: targeted and tailored approaches. *Health Education & Behavior, 30*(2), 133.

Kuczmarski, R., Ogden, C., Guo, S., Grummer-Strawn, L., Flegal, K., Mei, Z., . . . Johnson, C. (2002). 2000 CDC Growth Charts for the United States: methods and development. *Vital and health statistics. Series 11, Data from the national health survey*(246), 1.

Kumanyika, S. (2001). Minisymposium on obesity: overview and some strategic considerations. *Annual Review of Public Health, 22*(1), 293-308.

Kumanyika, S., Whitt-Glover, M., Gary, T., Prewitt, T., Odoms-Young, A., Banks-Wallace, J., . . . Lancaster, K. (2007). Expanding the obesity research paradigm to reach African American communities. *Preventing Chronic Disease, 4*(4).

Kumpfer, K. L., Alvarado, R., Smith, P., & Bellamy, N. (2002). Cultural sensitivity and adaptation in family-based prevention interventions. *Prevention Science, 3*(3), 241-246.

Kvaavik, E., Tell, G., & Klepp, K. (2003). Predictors and tracking of body mass index from adolescence into adulthood: follow-up of 18 to 20 years in the Oslo Youth Study. *Archives of Pediatrics and Adolescent Medicine, 157*(12), 1212-1218.

Larios, S. E., Ayala, G. X., Arredondo, E. M., Baquero, B., & Elder, J. P. (2009). Development and validation of a scale to measure Latino parenting strategies related to children's obesigenic behaviors. The parenting strategies for eating and activity scale (PEAS). *Appetite, 52*(1), 166-172.

Laursen, B., & Collins, W. A. (2004). Parent-child communication during adolescence. *Handbook of family communication*, 333-348.

Lawman, H., Wilson, D., Van Horn, M., Resnicow, K., & Kitzman-Ulrich, H. (2011). The relationship between psychosocial correlates and physical activity in underserved adolescent boys and girls in the ACT Trial. *Journal of Physical Activity and Health, 8*(2), 253.

Lawman, H. G. (2013). *Relations among risk for metabolic syndrome, social ecological factors, nutrition, and physical activity in underserved youth.* (Order No. 3593111, University of South Carolina). *ProQuest Dissertations and Theses, 166*. Retrieved from

http://search.proquest.com/docview/1438853853?accountid=13965. (1438853853)

Lawman, H. G., Wilson, D. K., Van Horn, M. L., & Zarrett, N. (2012). The role of motivation in understanding social contextual influences on physical activity in underserved adolescents in the ACT trial: A cross-sectional study. *Childhood Obesity, 8*(6), 542-550.

Lien, N., Jacobs, D. R., & Klepp, K.-I. (2002). Exploring predictors of eating behaviour among adolescents by gender and socio-economic status. *Public health nutrition, 5*(5), 671-682.

Lorson, B., Melgar-Quinonez, H., & Taylor, C. (2009). Correlates of fruit and vegetable intakes in US children. *Journal of the American Dietetic Association, 109*(3), 474-478.

Lubans, D., Morgan, P., Callister, R., & Collins, C. (2009). Effects of integrating pedometers, parental materials, and e-mail support within an extracurricular school sport intervention. *Journal of Adolescent Health, 44*(2), 176-183.

Lubans, D. R., Hesketh, K., Cliff, D., Barnett, L., Salmon, J., Dollman, J., . . . Hardy, L. (2011). A systematic review of the validity and reliability of sedentary behaviour measures used with children and adolescents. *Obesity Reviews, 12*(10), 781-799.

Ludbrook, J. (1998). Multiple comparison procedures updated. *Clinical and Experimental Pharmacology and Physiology, 25*(12), 1032-1037.

Lytle, L., Murray, D., Perry, C., Story, M., Birnbaum, A., Kubik, M., & Varnell, S. (2004). School-based approaches to affect adolescents' diets: results from the TEENS study. *Health Education & Behavior, 31*(2), 270.

Macdonald-Wallis, K., Jago, R., Page, A. S., Brockman, R., & Thompson, J. L. (2011). School-based friendship networks and children's physical activity: A spatial analytical approach. *Social Science & Medicine, 73*(1), 6-12.

Macdonald-Wallis, K., Jago, R., & Sterne, J. A. (2012). Social network analysis of childhood and youth physical activity: A systematic review. *American journal of preventive medicine, 43*(6), 636-642.

Marta, E. (1997). Parent–adolescent interactions and psychosocial risk in adolescents: An analysis of communication, support and gender. *Journal of Adolescence, 20*(5), 473-487.

Martin, J., & McCaughtry, N. (2008). Using social cognitive theory to predict physical activity in inner-city African American school children. *Journal of Sport and Exercise Psychology, 30*(4), 378-391.

Mellin, A., Neumark-Sztainer, D., Story, M., Ireland, M., & Resnick, M. (2002). Unhealthy behaviors and psychosocial difficulties among overweight adolescents: The potential impact of familial factors. *Journal of Adolescent Health, 31*(2), 145-153.

Mounts, N. S. (2000). Parental management of adolescent peer relationships: What are its effects on friend selection. *Family and peers: Linking two social worlds*, 169–193.

Mounts, N. S. (2001). Young adolescents' perceptions of parental management of peer relationships. *The Journal of Early Adolescence, 21*(1), 92.

Mounts, N. S. (2002). Parental management of adolescent peer relationships in context: The role of parenting style. *Journal of Family Psychology, 16*(1), 58-69.

Mounts, N. S. (2004). Adolescents' perceptions of parental management of peer relationships in an ethnically diverse sample. *Journal of Adolescent Research, 19*(4), 446.

Mounts, N. S. (2007). Adolescents' and their mothers' perceptions of parental management of peer relationships. *Journal of Research on Adolescence, 17*(1), 169-178.

Mounts, N. S. (2008). Linkages between parenting and peer relationships: A model for parental management of adolescents' peer relationships. *What can parents do*, 163–190.

Mounts, N. S. (2011). Parental management of peer relationships and early adolescents' social skills. *Journal of youth and adolescence, 40*(4), 416-427.

Nader, P., Sallis, J., Abramson, I., Broyles, S., Patterson, T., Senn, K., . . . Nelson, J. (1992). Family-based cardiovascular risk reduction education among Mexican and Anglo-Americans. *Family & Community Health, 15*(1), 57-74.

Nader, P., Sallis, J., Patterson, T., Abramson, I., Rupp, J., Senn, K., . . . Wallace, J. (1989). A family approach to cardiovascular risk reduction: results from the San Diego Family Health Project. *Health Education & Behavior, 16*(2), 229-244.

Nader, P., Sallis, J., Rupp, J., Atkins, C., Patterson, T., & Abramson, I. (1986). San Diego family health project: Reaching families through the schools. *Journal of School Health, 56*(6), 227-231.

Neumark-Sztainer, D., Story, M., Hannan, P., & Rex, J. (2003). New Moves: A school-based obesity prevention program for adolescent girls. *Preventive Medicine, 37*(1), 41-51.

Nicklas, T., Johnson, C., Myers, L., Farris, R., & Cunningham, A. (1998). Outcomes of a high school program to increase fruit and vegetable consumption: Gimme 5—a fresh nutrition concept for students. *Journal of School Health, 68*(6), 248-253.

Nicklas, T., & O'Neil, C. (2000). Process of conducting a 5-a-day intervention with high school students: Gimme 5 (Louisiana). *Health Education & Behavior, 27*(2), 201-212.

Nicklas, T. A., Yang, S.-J., Baranowski, T., Zakeri, I., & Berenson, G. (2003). Eating patterns and obesity in children: The Bogalusa Heart Study. *American Journal of Preventive Medicine, 25*(1), 9-16.

Norman, G. J., Schmid, B. A., Sallis, J. F., Calfas, K. J., & Patrick, K. (2005). Psychosocial and environmental correlates of adolescent sedentary behaviors. *Pediatrics, 116*(4), 908-916.

Ogden, C., Carroll, M., Curtin, L., Lamb, M., & Flegal, K. (2010). Prevalence of high body mass index in US children and adolescents, 2007-2008. *JAMA*, 2009.2012.

Ogden, C., Carroll, M., & Flegal, K. (2008). High body mass index for age among US children and adolescents, 2003-2006. *JAMA, 299*(20), 2401.

Ogden, C., Carroll, M. D., Curtin, L. R., McDowell, M. A., Tabak, C. J., & Flegal, K. M. (2006). Prevalence of Overweight and Obesity in the United States, 1999-2004. *JAMA: Journal of the American Medical Association, 295*(13), 1549-1555.

Ogden, C. L., Carroll, M. D., Kit, B. K., & Flegal, K. M. (2012). Prevalence of obesity and trends in body mass index among US children and adolescents, 1999-2010. *JAMA, 307*(5), 483-490.

Ornelas, I., Perreira, K., & Ayala, G. (2007). Parental influences on adolescent physical activity: A longitudinal study. *International Journal of Behavioral Nutrition and Physical Activity, 4*(1), 3.

Parke, R., & O'Neil, R. (1999). Social relationships across contexts: Family-peer linkages. In W. A. Collins & B. Laursen (Eds.), *The Minnesota Symposia on Child Psychology* (Vol. 30, pp. 211-239). Mahwah, NJ: Erlbaum.

Pate, R., Ward, D., Saunders, R., Felton, G., Dishman, R., & Dowda, M. (2005). Promotion of physical activity among high-school girls: A randomized controlled trial. *American Journal of Public Health, 95*(9), 1582-1587.

Patrick, K., Calfas, K., Norman, G., Zabinski, M., Sallis, J., Rupp, J., . . . Cella, J. (2006). Randomized controlled trial of a primary care and home-based intervention for physical activity and nutrition behaviors: PACE+ for adolescents. *Archives of Pediatrics and Adolescent Medicine, 160*(2), 128-136.

Peterson, M. S., Lawman, H. G., Wilson, D. K., Fairchild, A., & Van Horn, M. L. (2013). The association of self-efficacy and parent social support on physical activity in male and female adolescents. *Health Psychology, 32*(6), 666-674.

PhysicalActivityGuidelinesAdvisoryCommittee. (2008). *Physical Activity Guidelines Advisory Committee Report*. Washignton, DC: U.S. Department of Health and Human Services.

Power, C., Lake, J., & Cole, T. (1997). Measurement and long-term health risks of child and adolescent fatness. *International Journal of Obesity, 21*(7), 507-526.

Puyau, M. R., Adolph, A. L., Vohra, F. A., Zakeri, I., & Butte, N. F. (2004). Prediction of activity energy expenditure using accelerometers in children. *Medicine And Science In Sports And Exercise, 36*(9), 1625-1631.

Ramirez, E. R., Norman, G. J., Rosenberg, D. E., Kerr, J., Saelens, B. E., Durant, N., & Sallis, J. F. (2011). Adolescent screen time and rules to limit screen time in the home. *Journal of Adolescent Health, 48*(4), 379-385.

Ransdell, L., Dratt, J., Kennedy, C., O Neill, S., & DeVoe, D. (2001). Daughters and mothers exercising together (DAMET): A 12-week pilot project designed to improve physical self-perception and increase recreational physical activity. *Women & Health, 33*(3), 113-129.

Ransdell, L., Taylor, A., Oakland, D., Schmidt, J., Moyer-Mileur, L., & Shultz, B. (2003). Daughters and mothers exercising together: effects of home-and community-based programs. *Medicine & Science in Sports & Exercise, 35*(2), 286-296.

Ransdell, L. B., Eastep, E., Taylor, A., Oakland, D., Schmidt, J., Moyer-Mileur, L., & Shultz, B. (2003). Daughters and mothers exercising together (DAMET): Effects of home-and university-based interventions on physical activity behavior and family relations. *American Journal of Health Education, 34*(1), 19-29.

Ransdell, L. B., Robertson, L. A., Ornes, L., & Moyer-Mileur, L. (2005). Generations exercising together to improve fitness (GET FIT): A pilot study designed to increase physical activity and improve health-related fitness in three generations of women. *Women & Health, 40*(3), 77-94.

Ransdell, L. B., Taylor, A., Oakland, D., Schmidt, J., Moyer-Mileur, L., & Shultz, B. (2003). Daughters and mothers exercising together: Effects of home-and community-based programs. *Medicine and Science in Sports and Exercise, 35*(2), 286-296.

Reimuller, A., Hussong, A., & Ennett, S. T. (2011). The influence of alcohol-specific communication on adolescent alcohol use and alcohol-related consequences. *Prevention Science, 12*(4), 389-400.

Richards, M. H., Miller, B. V., O'Donnel, P. C., Wasserman, M. S., & Colder, C. (2002). Parental monitoring mediates the effects of age and sex on problem behaviors among African American urban young adolescents. *Journal of Youth and Adolescence, 33*, 221-233.

Riesch, S. K., Anderson, L. S., & Krueger, H. A. (2006). Parent–Child Communication Processes: Preventing Children's Health-Risk Behavior. *Journal for Specialists in Pediatric Nursing, 11*(1), 41-56.

Robin, A. L. (1979). Problem-solving communication training: A behavioral approach to the treatment of parent-adolescent conflict. *American Journal of Family Therapy, 7*(2), 69-82.

Robin, A. L., & Foster, S. L. (2002). *Negotiating parent-adolescent conflict: A behavioral-family systems approach*: The Guilford Press.

Robinson, T. (1999). Reducing children's television viewing to prevent obesity: a randomized controlled trial. *JAMA, 282*(16), 1561-1567.

Robinson, T. N., Kraemer, H. C., Matheson, D. M., Pruitt, L. A., Owens, A. S., & Flint-Moore, N. M. (2003). Dance and reducing television viewing to prevent weight

gain in African-American girls: The Stanford GEMS pilot study. *Ethnicity & Disease, 13,* S1-65-77.

Robinson, T. N., Matheson, D. M., Kraemer, H. C., Wilson, D. M., Obarzanek, E., Thompson, N. S., . . . Fujimoto, M. (2010). A randomized controlled trial of culturally tailored dance and reducing screen time to prevent weight gain in low-income African American girls: Stanford GEMS. *Archives of Pediatrics & Adolescent Medicine, 164*(11), 995.

Roemmich, J., Gurgol, C., & Epstein, L. (2004). Open-loop feedback increases physical activity of youth. *Medicine & Science in Sports & Exercise, 36*(4), 668.

Rosenberg, D. E., Sallis, J. F., Kerr, J., Maher, J., Norman, G. J., Durant, N., . . . Saelens, B. E. (2010). Brief scales to assess physical activity and sedentary equipment in the home. *Int J Behav Nutr Phys Act, 7*(10).

Ryan, R., & Deci, E. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*(1), 68-78.

Saelens, B., Sallis, J., Wilfley, D., Patrick, K., Cella, J., & Buchta, R. (2002). Behavioral weight control for overweight adolescents initiated in primary care. *Obesity, 10*(1), 22-32.

Sallis, J., Grossman, R., Pinski, R., Patterson, T., & Nader, P. (1987). The development of scales to measure social support for diet and exercise behaviors. *Preventive Medicine, 16*(6), 825-836.

Sallis, J., McKenzie, T., Conway, T., Elder, J., Prochaska, J., Brown, M., . . . Alcaraz, J. (2003). Environmental interventions for eating and physical activity: A

randomized controlled trial in middle schools. *American Journal of Preventive Medicine, 24*(3), 209-217.

Sallis, J. F., Alcaraz, J. E., McKenzie, T. L., & Hovell, M. F. (1999). Predictors of change in children's physical activity over 20 months: Variations by gender and level of adiposity. *American Journal Of Preventive Medicine, 16*(3), 222-229.

Sallis, J. F., Patterson, T. L., Buono, M. J., Atkins, C. J., & Nader, P. R. (1988). Aggregation of physical activity habits in Mexican-American and Anglo families. *Journal of Behavioral Medicine, 11*(1), 31-41.

Salmon, J., Timperio, A., Telford, A., Carver, A., & Crawford, D. (2012). Association of family environment with children's television viewing and with low level of physical activity. *Obesity Research, 13*(11), 1939-1951.

Saunders, R., Ward, D., Felton, G., Dowda, M., & Pate, R. (2006). Examining the link between program implementation and behavior outcomes in the lifestyle education for activity program (LEAP). *Evaluation and Program Planning, 29*(4), 352-364.

Schafer, J. L., & Olsen, M. K. (1988). Multiple imputation for multivariate missing-data problems: A data analyst's perspective. *Multivariate Behavioral Research, 33*, 545-571.

Simon, C., Wagner, A., DiVita, C., Rauscher, E., Klein-Platat, C., Arveiler, D., . . . Triby, E. (2004). Intervention centred on adolescents' physical activity and sedentary behaviour (ICAPS): concept and 6-month results. *International Journal of Obesity, 28*, S96-S103.

Sirard, J. R., Bruening, M., Wall, M. M., Eisenberg, M. E., Kim, S. K., & Neumark-Sztainer, D. (2013). Physical activity and screen time in adolescents and their friends. *American journal of preventive medicine*, *44*(1), 48-55.

Smith, A. L. (1998). *Peer relationship and physical activity participation in early adolescence.* 58, ProQuest Information & Learning, US. Retrieved from https://pallas2.tcl.sc.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=psyh&AN=1998-95005-148&site=ehost-live

Smith, A. L. (1999). Perceptions of peer relationships and physical activity participation in early adolescence. *Journal of Sport & Exercise Psychology*, *21*(4), 329-350.

Smith, A. L. (2003). Peer relationships in physical activity contexts: A road less traveled in youth sport and exercise psychology research. *Psychology of Sport & Exercise*, *4*(1), 25.

Smith, A. L., Ullrich-French, S., Walker, E., & Hurley, K. S. (2006). Peer relationship profiles and motivation in youth sport. *Journal of Sport & Exercise Psychology*, *28*(3), 362-382.

Soenens, B., Vansteenkiste, M., Smits, I., Lowet, K., & Goossens, L. (2007). The role of intrusive parenting in the relationship between peer management strategies and peer affiliation. . *Journal of Applied Developmental Psychology*, *28*, 239-249.

Springer, A., Kelder, S., & Hoelscher, D. (2006). Social support, physical activity and sedentary behavior among 6th-grade girls: a cross-sectional study. *International Journal of Behavioral Nutrition and Physical Activity*, *3*(1), 8.

St. George, S. M., & Wilson, D. K. (2012). A qualitative study for understanding family and peer influences on obesity-related health behaviors in low-income African-American adolescents. *Childhood Obesity, 8*, 466-476.

St. George, S. M., Wilson, D. K., Lawman, H. G., & Van Horn, M. L. (2013). Weight status as a moderator of the relationship between motivation, emotional social support, and physical activity in underserved adolescents. *Journal of Pediatric Psychology, 38*(4), 387-397.

St. George, S. M., Wilson, D. K., Schneider, E. M., & Alia, K. A. (2013). Project SHINE: Effects of parent–adolescent communication on sedentary behavior in African American adolescents. *Journal of Pediatric Psychology, 38*, 997-1009.

Stanton, C., Green, S., & Fries, E. (2007). Diet-specific social support among rural adolescents. *J Nutr Educ Behav, 39*, 214-218.

Stattin, H., & Kerr, M. (2000). Parental monitoring: A reinterpretation. *Child development, 71*(4), 1072-1085.

Stolley, M., & Fitzgibbon, M. (1997). Effects of an obesity prevention program on the eating behavior of African American mothers and daughters. *Health Education & Behavior, 24*(2), 152.

Story, M., Lytle, L., Birnbaum, A., & Perry, C. (2002). Peer-led, school-based nutrition education for young adolescents: feasibility and process evaluation of the TEENS study. *Journal of School Health, 72*(3), 121-127.

Subar, A. F., Crafts, J., Zimmerman, T. P., Wilson, M., Mittl, B., Islam, N. G., . . . Hull, S. G. (2010). Assessment of the accuracy of portion size reports using computer-based food photographs aids in the development of an automated self-

administered 24-hour recall. *Journal of the American Dietetic Association, 110*(1), 55-64.

Subar, A. F., Kirkpatrick, S. I., Mittl, B., Zimmerman, T. P., Thompson, F. E., Bingley, C., . . . McNutt, S. (2012). The Automated Self-Administered 24-hour dietary recall (ASA24): A resource for researchers, clinicians, and educators from the National Cancer Institute. *Journal of the Academy of Nutrition and Dietetics, 112*(8), 1134-1137.

Subar, A. F., Thompson, F. E., Potischman, N., Forsyth, B. H., Buday, R., Richards, D., . . . Schatzkin, A. (2007). Formative research of a quick list for an automated self-administered 24-hour dietary recall. *Journal of the American Dietetic Association, 107*(6), 1002-1007.

Supple, A. J., Ghazarian, S. R., Peterson, G. W., & Bush, K. R. (2009). Assessing the Cross-Cultural Validity of a Parental Autonomy Granting Measure. *Journal of Cross-Cultural Psychology, 40*(5), 816.

te Velde, S., Brug, J., Wind, M., Hildonen, C., Bjelland, M., Perez-Rodrigo, C., & Klepp, K. (2007). Effects of a comprehensive fruit-and vegetable-promoting school-based intervention in three European countries: The Pro Children Study. *British Journal of Nutrition, 99*(04), 893-903.

Thompson, F., Dixit-Joshi, S., Potischman, N., Kirkpatrick, S., Alexander, G., Coleman, L., . . . Clancy, H. (2013). Feasibility and performance of NCI's Automated Self-Administered 24-Hour recall (ASA24). *American Journal of Epidemiology, 177*(11 Suppl), S1–S181.

Tilton Weaver, L. C., & Galambos, N. L. (2003). Adolescents' characteristics and parents' beliefs as predictors of parents' peer management behaviors. *Journal of Research on Adolescence, 13*(3), 269-300.

Troiano, R., Berrigan, D., Dodd, K., Masse, L., Tilert, T., & McDowell, M. (2008). Physical activity in the United States measured by accelerometer. *Medicine & Science in Sports & Exercise, 40*(1), 181-188.

Troiano, R. P., Briefel, R. R., Carroll, M. D., & Bialostosky, K. (2000). Energy and fat intakes of children and adolescents in the United States: Data from the National Health and Nutrition Examination Surveys. *American Journal of Clinical Nutrition, 72*(5), 1343s-1353s.

Tsiros, M., Sinn, N., Coates, A., Howe, P., & Buckley, J. (2008). Treatment of adolescent overweight and obesity. *European Journal of Pediatrics, 167*(1), 9-16.

Ulmer, M., Robinaugh, D., Friedberg, J. P., Lipsitz, S. R., & Natarajan, S. (2008). Usefulness of a run-in period to reduce drop-outs in a randomized controlled trial of a behavioral intervention. *Contemporary clinical trials, 29*(5), 705-710.

van Buuren, S., & Groothuis-Oudshoorn, K. (2011). MICE: Multivariate imputation by chained equations in R. *Journal of Statistical Software, 45*(3), 1-67.

Videon, T., & Manning, C. (2003). Influences on adolescent eating patterns: the importance of family meals. *Journal of Adolescent Health, 32*(5), 365-373.

Welk, G. J., Schaben, J. A., & Morrow, J. R., Jr. (2004). Reliability of accelerometry-based activity monitors: a generalizability study. *Medicine And Science In Sports And Exercise, 36*(9), 1637-1645.

Wennberg, P., Gustafsson, P. E., Dunstan, D. W., Wennberg, M., & Hammarström, A. (2013). Television viewing and low leisure-time physical activity in adolescence independently predict the metabolic syndrome in mid-adulthood. *Diabetes Care*, Advance Online Publication. doi: 10.2337/dc2312-1948.

Whitaker, D. J., & Miller, K. S. (2000). Parent-adolescent discussions about sex: Impact on peer influences of sexual behavior. *Journal of Adolescent Research, 15*, 251-274.

White, M., Martin, P., Newton, R., Walden, H., York-Crowe, E., Gordon, S., . . . Williamson, D. (2004). Mediators of weight loss in a family-based intervention presented over the internet. *Obesity, 12*(7), 1050-1059.

Whitt-Glover, M., & Kumanyika, S. (2009). Systematic review of interventions to increase physical activity and physical fitness in African-Americans. *Journal Information, 23*(6).

Wills, T. A., Gibbons, F. X., Gerrard, M., Murry, V. M. B., & Brody, G. H. (2003). Family communication and religiosity related to substance use and sexual behavior in early adolescence: a test for pathways through self-control and prototype perceptions. *Psychology of Addictive Behaviors, 17*(4), 312.

Wilson, D. K. (2009). New perspectives on health disparities and obesity interventions in youth. *Journal of Pediatric Psychology, 34*(3), 231-244.

Wilson, D. K., Evans, A. E., Williams, J., Mixon, G., Sirard, J. R., & Pate, R. (2005). A preliminary test of a student-centered intervention on increasing physical activity in underserved adolescents. *Annals of Behavioral Medicine, 30*(2), 119-124.

Wilson, D. K., Friend, R., Teasley, N., Green, S., Reaves, I. L., & Sica, D. A. (2002). Motivational versus social cognitive interventions for promoting fruit and vegetable intake and physical activity in African American adolescents. *Annals of Behavioral Medicine, 24*(4), 310-319.

Wilson, D. K., Griffin, S., Saunders, R. P., Kitzman-Ulrich, H., Meyers, D. C., & Mansard, L. (2009). Using process evaluation for program improvement in dose, fidelity and reach: the ACT trial experience. *International Journal of Behavioral Nutrition and Physical Activity, 6*(1), 79.

Wilson, D. K., Kitzman-Ulrich, H., Williams, J. E., Saunders, R., Griffin, S., Pate, R., . . . Sisson, S. B. (2008). An overview of "The Active by Choice Today" (ACT) trial for increasing physical activity. *Contemporary Clinical Trials, 29*(1), 21-31.

Wilson, D. K., Van Horn, M. L., Kitzman-Ulrich, H., Saunders, R., Pate, R., Lawman, H. G., . . . Addy, C. L. (2011). Results of the "Active by Choice Today"(ACT) randomized trial for increasing physical activity in low-income and minority adolescents. *Health Psychology, 30*(4), 463-471.

Yancey, A. K., Ortega, A. N., & Kumanyika, S. K. (2006). Effective recruitment and retention of minority research participants. *Annual Review of Public Health, 27*, 1-28.

Young, D., Phillips, J., Yu, T., & Haythornthwaite, J. (2006). Effects of a life skills intervention for increasing physical activity in adolescent girls. *Archives of Pediatrics and Adolescent Medicine, 160*(12), 1255.

Zabinski, M., Norman, G., Sallis, J., Calfas, K., & Patrick, K. (2007). Patterns of sedentary behavior among adolescents. *Health Psychology, 26*(1), 113-120.

Zeller, M., Kirk, S., Claytor, R., Khoury, P., Grieme, J., Santangelo, M., & Daniels, S. (2004). Predictors of attrition from a pediatric weight management program. *The Journal of pediatrics, 144*(4), 466-470.

Zimmerman, T. P., Hull, S. G., McNutt, S., Mittl, B., Islam, N., Guenther, P. M., . . . Subar, A. F. (2009). Challenges in converting an interviewer-administered food probe database to self-administration in the National Cancer Institute automated self-administered 24-hour recall (ASA24). *Journal of Food Composition and Analysis, 22*, S48-S51.

APPENDIX A: SAMPLE (INTERVENTION) WORKBOOK PAGES

{Options for Tracking Tools}

Good Old Fashioned Paper and Pencil!

- Calendar
- Notebook
- Daily Planner

Multimedia

- Electronic calendar
- Phone calendar
- Smart phone "apps:" Spark People, Fat Secret, Lose It!
- Websites: choosemyplate.gov, livestrong.com, fitday.com, spark-people.com, my-calorie-counter.com

{Examples of What to Track for Each Target Behavior}

- Number of fruits/ vegetables eaten daily
- Number of daily family meals that included at least one fruit or vegetable

- Amount of daily time spent engaging in physical activity
- Number and types of activities done each day

- Number of sodas consumed daily
- Number of times family eats out at fast food restaurant weekly

- Amount of time spent watching TV or playing on the computer daily
- Number of shows watched on TV daily

{Family Health Behavior Change Contract: Adolescent}

{Behavior #1}

Circle your Target Behavior:

I, [name of adolescent] _____, will achieve the following goal [identify your SMART Goal here]:

_____

_____.

To achieve my goal, I will:

A. _____

B. _____

C. _____

To track my progress towards my goal, I will [identify your tracking method/tool and how frequently you will use and review it] _____

I will review my progress towards this goal on [identify date] _____.

My reward for achieving my goal will be [identify an appropriate, realistic, desirable reward]

_____.

I, [name of parent] _____, understand that support is important when trying to achieve goals. Therefore, I will help my adolescent achieve his/her goal by:

_____

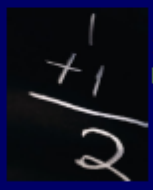
_____.

Signature of Adolescent _____

Signature of Parent Who Agrees to Provide Support _____

Date _____

{Steps in Successful Family Problem Solving}



1. Define the problem.
Family members take turns defining the problem from their perspective.

2. Brainstorm all possible solutions.
Family members each give suggestions for possible solutions. All ideas are included!

3. Make a joint decision.
Each family member rates the suggested solutions as positive or negative. Family members then take turns discussing each option and negotiating an agreement.

4. Discuss a plan for follow through.
Family members discuss the specific details of how they will follow through on their selected decision

{Parent Strategies for Managing Peer Relationships}

1. Parents as designers of the environment.

Parents might select neighborhoods, schools, etc. depending on the types of peers their children may meet in those environments.

Strategy -

Support friendships: Provide an environment at home where positive health behaviors with friends are supported.

2. Parents as mediators.

Parents can help their children meet new friends and avoid relationships with peers who are not desirable.

Strategy -

Guide friendships: Discuss the pros and cons of hanging out with friends who do and do not engage in healthy behaviors. Encourage positive health behaviors with friends.

3. Parents as supervisors.

Parents can directly supervise, intervene in, or monitor peer relationships.

Strategy -

Monitor friendships: Keep track of who, what, where, when, and why. Who is your adolescent "hanging out with"? What target health behaviors are they doing? Where are they doing them? When are they doing them (how long)? Why or why not?

4. Parents as consultants.

Parents can offer advice to their children about peer relationships that might include managing conflicts or difficulties with friends.

Strategy -

Problem-solve: See Pages 36-38 in SHINE Notebook for how to problem-solve and negotiate health behaviors that relate to friends.

{Week 6: Family & Friend Bonding Activity}

Adolescent Name: _____

Directions: *Part 1.* Think about the two behaviors you are working on improving and the goals you have set. Together with your parent and your friend, discuss ways your friends could either (a) help you with one of the behaviors/goals you already have OR (b) help you with a new target behavior/goal. *Part 2.* Plan a healthy activity that you will do that includes BOTH your parent(s) and friend(s) in the next 1-2 weeks.

Part 1.

How will your friends help you with your SMART goals?

_____

_____

How will you help your friends be more healthy?

_____

_____

Part 2.

Our family & friend healthy activity will be:

_____

_____

Date/time of family & friend healthy activity: _____

Names of family member(s) and friend(s) who will be there:

_____

_____

TO BE COMPLETED AFTER ACTIVITY:

Summarize your family & friend healthy activity (1-2 brief sentences):

_____

_____

_____

{Project SHINE Family Testimonials}

- What has your family learned during Project SHINE?
- What positive health behavior changes (and family communication changes) has your family made?
- What strategies/tips would you like to share with other families?
- How you will you (a) continue to make progress towards your health goals and (b) maintain the changes you've made?



APPENDIX B: PROCESS EVALUATION FORMS

Process Evaluation Form

Cohort (circle): 1 2 3 4 5 **Week (circle):** 3 4 5 6 7 8

Date Form Completed: _____ **Day of the Week (circle):** Tuesday Thursday

Observer: _____

Group Session

Start Time: _____ Stop Time: _____

DOSE	No	Yes	NA
1. Facilitators start session on time (or no more than 5-7 minutes past the scheduled time)	0	1	_____
2. Snack offered	0	1	_____
3. Door prize raffled	0	1	_____
4. Ground rules displayed	0	1	_____
5. Session agenda reviewed with participants	0	1	_____
6. Key topics/skills explained (see facilitator's guide for list of key topics)	0	1	_____
7. Key topics/skills demonstrated (or examples provided/elicited from participants)	0	1	_____
8. Participants engage in interactive activity (brainstorm, role play, etc.)	0	1	_____
9. "Family Bonding Activity" assigned	0	1	_____
10. Summary/closure	0	1	_____

Comments:

Process Evaluation Form

FIDELITY *(observe lead facilitator)*	None	Some	Most	All	NA
Behavioral Skills					
1. Facilitators reinforce national recommendations for target health behaviors	1	2	3	4	_____
2. Facilitators provide feedback on weekly short term goals and assignments	1	2	3	4	_____
3. Facilitators aid participants in linking short term goals to long term goals	1	2	3	4	_____
4. Facilitators reinforce progress (based on individual/family goals) towards achieving both short and long term goals	1	2	3	4	_____
5. Facilitators allow participants to self-evaluate progress and revise personal/family goals as needed	1	2	3	4	_____
6. Facilitators encourage families to support one another in setting/meeting goals through comments or questions	1	2	3	4	_____
Communication Skills					
1. Facilitator reviews session agenda with all participants	1	2	3	4	_____
2. Facilitator asks if participants have questions	1	2	3	4	_____
3. Facilitator fully answers participants' questions	1	2	3	4	_____
4. Facilitators ensure participants follow ground rules	1	2	3	4	_____
5. Facilitators have meaningful verbal interaction with participants:					
a. Calling participants by name	1	2	3	4	_____
b. Tone of voice	1	2	3	4	_____
c. Getting on participant's level	1	2	3	4	_____
6. Facilitators have meaningful nonverbal interaction with participants					
a. Good eye contact	1	2	3	4	_____
b. Orienting towards participants when they are speaking	1	2	3	4	_____
c. Using expressive facial expressions	1	2	3	4	_____
7. Facilitators engage in reciprocal communication with participants:					
a. Listen	1	2	3	4	_____
b. Verbally respond when prompted	1	2	3	4	_____
c. Respond with reflective listening statements	1	2	3	4	_____

Process Evaluation Form

Social Support

1. The atmosphere set by facilitators is welcoming, upbeat and positive					
a. Small talk	1	2	3	4	_____
b. Upbeat, enthusiastic	1	2	3	4	_____
2. Facilitators encourage positive interactions within families					
a. Acknowledge	1	2	3	4	_____
b. Reinforce	1	2	3	4	_____
3. Facilitators encourage positive interactions between families					
a. Acknowledge	1	2	3	4	_____
b. Reinforce	1	2	3	4	_____

Autonomy Support

1. Facilitators provide participants with choices	1	2	3	4	_____
1. Facilitators elicit and reinforce participant input					
a. Elicit	1	2	3	4	_____
b. Reinforce	1	2	3	4	_____

Session Content

1. Facilitators covered key topics as outlined in the facilitator's guide	1	2	3	4	_____
2. Participants engaged in interactive activity as outlined in the facilitator's guide	1	2	3	4	_____
3. Facilitators explained and assigned "Family Bonding Activity" as outlined in the facilitator's guide	1	2	3	4	_____

Comments:

APPENDIX C: MEASURES OF PARENT AND PEER PSYCHOSOCIAL VARIABLES

Parental Monitoring

G. For the following questions, please bubble in the response that best applies to you.

1. How much do you keep track of the amount of TV/videos your child is watching?				
O Never	O Rarely	O Sometimes	O Often	O Always
2. How much do you keep track of the high fat foods your child eats?				
O Never	O Rarely	O Sometimes	O Often	O Always
3. How much do you keep track of the salty snack food your child eats?				
O Never	O Rarely	O Sometimes	O Often	O Always
4. How much do you keep track of sweets that your child eats?				
O Never	O Rarely	O Sometimes	O Often	O Always
5. How much do you keep track of the amount of exercise your child is getting?				
O Never	O Rarely	O Sometimes	O Often	O Always
6. How much do you keep track of the servings of fruits and vegetables your child is eating?				
O Never	O Rarely	O Sometimes	O Often	O Always

Parental Management of Peers Inventory – Health Scale

M. Please answer the next set of questions about the parents (or guardians) you live with. If If you spend time in more than one home, answer the question about the parents (or guardians) who have the most say over your daily life.

1. My parents tell me that who I have for friends will affect my health.	O Strongly Disagree	O Disagree Somewhat	O Agree Somewhat	O Strongly Agree
2. My parents tell me to be friends with kids who exercise regularly.	O Strongly Disagree	O Disagree Somewhat	O Agree Somewhat	O Strongly Agree
3. My parents tell me to be friends with kids who eat fruits and vegetables.	O Strongly Disagree	O Disagree Somewhat	O Agree Somewhat	O Strongly Agree
4. My parents tell me they disapprove if my friends watch too much TV.	O Strongly Disagree	O Disagree Somewhat	O Agree Somewhat	O Strongly Agree
5. My parents tell me they disapprove if I hang around kids who eat too much junk food (e.g., fast food, chips, candy, soda).	O Strongly Disagree	O Disagree Somewhat	O Agree Somewhat	O Strongly Agree
6. My parents worry that if my friends are eating junk food (e.g., fast food, chips, candy, soda), I must be doing it too.	O Strongly Disagree	O Disagree Somewhat	O Agree Somewhat	O Strongly Agree
7. My parents encourage me to invite kids who are physically active over to my house.	O Strongly Disagree	O Disagree Somewhat	O Agree Somewhat	O Strongly Agree
8. My parents encourage me to eat healthy foods (like fruits and vegetables) with my friends.	O Strongly Disagree	O Disagree Somewhat	O Agree Somewhat	O Strongly Agree
9. My parents help me think of ways to be healthy around my friends.	O Strongly Disagree	O Disagree Somewhat	O Agree Somewhat	O Strongly Agree

F. Below is a list of things people might do or say to someone who is trying to exercise regularly. If you are not trying to exercise, then some of the questions may not apply to you, but please read and give an answer to every question.

Please rate each question twice. Under family, rate how often anyone living in your household has said or done what is described **during the last two months**. Under friends, rate how often your friends have said or done what is described **during the last two months**.

Please write one number from the following rating scale in each space:

Responses: 0 = None, 1= Rarely, 2 = A few times, 3 = Often, 4 = Very often

During the past two months, my family (or members of my household) or friends:	**FAMILY**	**FRIENDS**
1. Exercised with me.	☐	☐
2. Offered to exercise with me.	☐	☐
3. Gave me helpful reminders to exercise ("Are you going to exercise tonight?").	☐	☐
4. Gave me encouragement to stick with my exercise program.	☐	☐
5. Changed their schedule so we could exercise together.	☐	☐
6. Discussed exercise with me.	☐	☐
7. Gave me rewards for exercising (bought me something or gave me something I like).	☐	☐
8. Planned for exercise on recreational or fun outings.	☐	☐
9. Helped plan activities around my exercise.	☐	☐
10. Asked me for ideas on how **they** can get more exercise.	☐	☐
11.Talked about how much they like to exercise.	☐	☐

G. Below is a list of things people might do or say to someone who is trying to improve their eating habits. If you are not trying to make any of these dietary changes, then some of the questions may not apply to you, but please read and give an answer to every question.

Please rate each question twice. Under family, rate how often anyone living in your household has said or done what is described **during the last two months**. Under friends, rate how often your friends have said or done what is described **during the last two months**.

Please write one number from the following rating scale in each space:
Responses: 0 = None, 1= Rarely, 2 = A few times, 3 = Often, 4 = Very often

During the past two months, my family (or members of my household) or friends:	FAMILY	FRIENDS
1. Complimented me on my eating habits ("Keep it up," "We are proud of you").	☐	☐
2. Encouraged me to eat fruits and vegetables when I am tempted not to.	☐	☐
3. Discussed my eating habits with me (asked me how I'm doing with eating healthier foods.).	☐	☐
4. Reminded me to eat fruits and vegetables.	☐	☐
5. Offered me fruits and vegetables when I visited their home.	☐	☐
6. Asked me for ideas on how they could eat more fruits and vegetables.	☐	☐
7. Offered me healthy foods when I visited their home.	☐	☐

I. Please answer the next set of questions about your parents (or guardians) you live with. If you spend time in more than one home, answer the question about the parents (or guardians) who have the most say over your daily life.

1. My parents allow me to choose which healthy foods I eat.				
	O Strongly Disagree	O Disagree Somewhat	O Agree Somewhat	O Strongly Agree
2. My parents ask me what fruits and vegetables they should buy at the grocery store.				
	O Strongly Disagree	O Disagree Somewhat	O Agree Somewhat	O Strongly Agree
3. My parents encourage me to help in making decisions about what foods to cook for dinner.				
	O Strongly Disagree	O Disagree Somewhat	O Agree Somewhat	O Strongly Agree
4. My parents allow me to choose what types of exercise activities (e.g., sports, dance) I do.				
	O Strongly Disagree	O Disagree Somewhat	O Agree Somewhat	O Strongly Agree
5. My parents ask me for ideas on which exercise activities we do together.				
	O Strongly Disagree	O Disagree Somewhat	O Agree Somewhat	O Strongly Agree
6. My parents encourage me to help in making decisions about how long I am active.				
	O Strongly Disagree	O Disagree Somewhat	O Agree Somewhat	O Strongly Agree
7. My parents allow me to have a say in how long I should talk on the phone.				
	O Strongly Disagree	O Disagree Somewhat	O Agree Somewhat	O Strongly Agree
8. My parents ask me for input on rules about spending time on the computer.				
	O Strongly Disagree	O Disagree Somewhat	O Agree Somewhat	O Strongly Agree
9. My parents encourage me to help in making decisions about how long I should watch TV.				
	O Strongly Disagree	O Disagree Somewhat	O Agree Somewhat	O Strongly Agree

H. For the following questions, first indicate how often in the **past two months** you have talked to your parents about different health topics. If you discuss these topics, indicate how the conversation goes.

In the past two months, how often have you and your parent talked about _____, and how did the conversation go?

1. Eating fruits and vegetables	
O Never	O Do not discuss this topic
O Once or twice	O My parent does most of the talking
O A few times	O Usually talk about it in a way where we have to watch what we say
O Many times	O Usually talk about it openly and each say what we think
2. Being physically active	
O Never	O Do not discuss this topic
O Once or twice	O My parent does most of the talking
O A few times	O Usually talk about it in a way where we have to watch what we say
O Many times	O Usually talk about it openly and each say what we think
3. Decreasing how much junk food (e.g., fast food, chips, candy, soda) you eat	
O Never	O Do not discuss this topic
O Once or twice	O My parent does most of the talking
O A few times	O Usually talk about it in a way where we have to watch what we say
O Many times	O Usually talk about it openly and each say what we think
4. Decreasing how much TV you watch	
O Never	O Do not discuss this topic
O Once or twice	O My parent does most of the talking
O A few times	O Usually talk about it in a way where we have to watch what we say
O Many times	O Usually talk about it openly and each say what we think
5. Eating healthy foods with your friends	
O Never	O Do not discuss this topic
O Once or twice	O My parent does most of the talking
O A few times	O Usually talk about it in a way where we have to watch what we say
O Many times	O Usually talk about it openly and each say what we think
6. Being physically active with your friends	
O Never	O Do not discuss this topic
O Once or twice	O My parent does most of the talking
O A few times	O Usually talk about it in a way where we have to watch what we say
O Many times	O Usually talk about it openly and each say what we think
7. Watching less TV with your friends	
O Never	O Do not discuss this topic
O Once or twice	O My parent does most of the talking
O A few times	O Usually talk about it in a way where we have to watch what we say
O Many times	O Usually talk about it openly and each say what we think
8. Playing less video games with your friends	
O Never	O Do not discuss this topic
O Once or twice	O My parent does most of the talking
O A few times	O Usually talk about it in a way where we have to watch what we say
O Many times	O Usually talk about it openly and each say what we think

APPENDIX D: MEASURES OF ADOLESCENT PSYCHOSOCIAL VARIABLES

Self-efficacy for PA

B. Below is a list of things people might do while trying to change their exercise habits. Whether you are trying to change your exercise habits or not, please rate how confident you are that you could *really motivate* yourself to do things like this for **at least 6 months.**

1. How sure are you that you can stick to your exercise program when your family is demanding more time from you?	O A little sure	O Sure	O Very Sure
2. How sure are you that you can stick to your exercise program when you have household chores to do?	O A little sure	O Sure	O Very Sure
3. How sure are you that you can stick to your exercising when you have guests staying in your home?	O A little sure	O Sure	O Very Sure
4. How sure are you that you can stick to your exercising when you're feeling lazy?	O A little sure	O Sure	O Very Sure
5. How sure are you that you can stick to participating in activities that include exercise?	O A little sure	O Sure	O Very Sure
6. How sure are you that you can stick to exercising even when you have limited amounts of time?	O A little sure	O Sure	O Very Sure
7. How sure are you that you can stick to your exercise program even when your friends want to socialize?	O A little sure	O Sure	O Very Sure
8. How sure are you that you can stick to making exercise a top priority?	O A little sure	O Sure	O Very Sure
9. How sure are you that you can stick to your exercise program even when you have a lot of demands at school?	O A little sure	O Sure	O Very Sure

D. Below is a list of things people might do while trying to change their eating habits. Whether you are trying to change your eating habits or not, please rate how confident you are that you could *really motivate* yourself to do things like this **for at least 6 months.**

1. How sure are you that you can stick to eating fruits and vegetables when you feel depressed, bored, or tense?	O A little sure	O Sure	O Very sure
2. How sure are you that you can stick to fruits and vegetables when eating with family?	O A little sure	O Sure	O Very sure
3. How sure are you that you can stick to eating fruits and vegetables when the only snack close by is from a vending machine?	O A little sure	O Sure	O Very Sure
4. How sure are you that you can stick to eating fruits and vegetables when you are alone?	O A little sure	O Sure	O Very sure
5. How sure are you that you can stick to eating fruits and vegetables when you feel too lazy to make something healthy?	O A little sure	O Sure	O Very Sure
6. How sure are you that you can stick to eating fruits and vegetables when someone offers you junk food at a party?	O A little sure	O Sure	O Very sure
7. How sure are you that you can stick to eating fruits and vegetables when someone eats junk food right in front of you?	O A little sure	O Sure	O Very sure
8. How sure are you that you can stick to eating fruits and vegetables when you must eat in a hurry?	O A little sure	O Sure	O Very sure
9. How sure are you that you can stick to eating fruits and vegetables when there is junk food readily available at a party?	O A little sure	O Sure	O Very sure
10. How sure are you that you can stick to eating fruits and vegetables when eating with friends?	O A little sure	O Sure	O Very sure

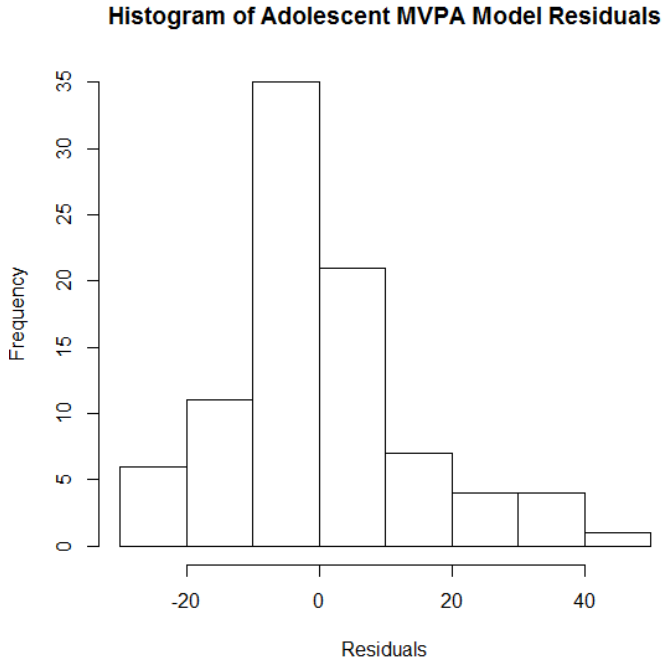
C. Please answer the following questions concerning your attitudes about exercising.

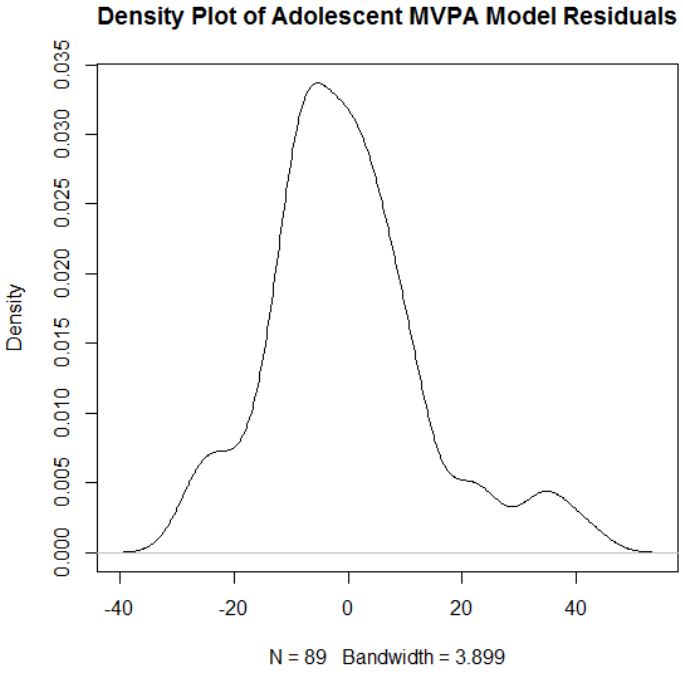
1. I am excited about being active on most days. ○ Not like me ○ A little like me ○ A lot like me
2. It is important to be active every day. ○ Not like me ○ A little like me ○ A lot like me
3. I get into being active on most days. ○ Not like me ○ A little like me ○ A lot like me
4. I make sure I get plenty of activity each day. ○ Not like me ○ A little like me ○ A lot like me
5. I plan how I can be active every day. ○ Not like me ○ A little like me ○ A lot like me
6. I get excited about being active everyday. ○ Not like me ○ A little like me ○ A lot like me
7. Being active is important to me. ○ Not like me ○ A little like me ○ A lot like me
8. I get into it when I am active every day. ○ Not like me ○ A little like me ○ A lot like me

E. Please answer the following questions concerning your attitudes about eating healthy.

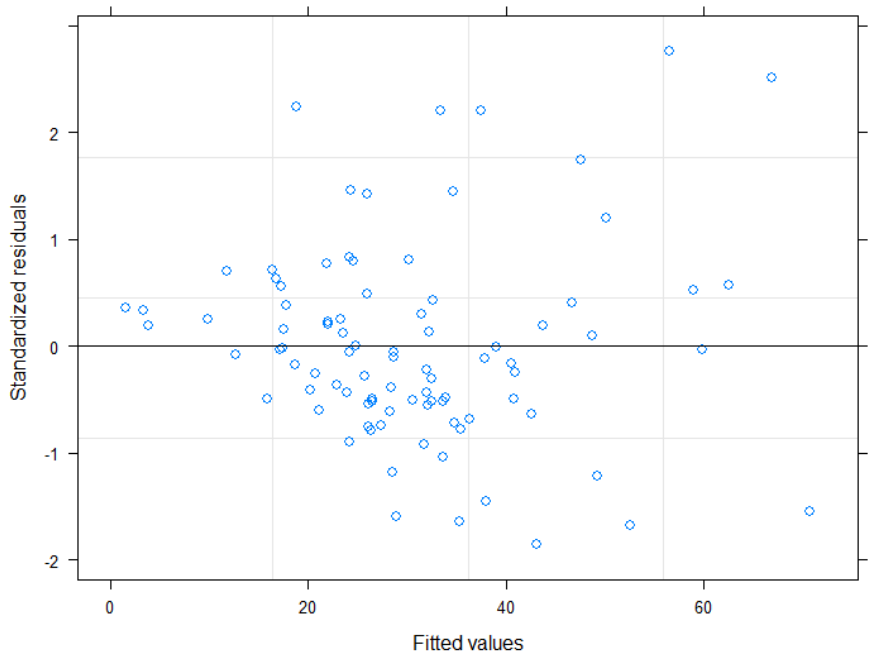
1. I am excited about eating healthy on most days.	○ Not like me	○ A little like me	○ A lot like me
2. It is important to eat healthy every day.	○ Not like me	○ A little like me	○ A lot like me
3. I get into eating healthy on most days.	○ Not like me	○ A little like me	○ A lot like me
4. I make sure I eat plenty of healthy foods each day.	○ Not like me	○ A little like me	○ A lot like me
5. I plan how I can eat healthy every day.	○ Not like me	○ A little like me	○ A lot like me
6. I get excited about eating healthy every day.	○ Not like me	○ A little like me	○ A lot like me
7. Eating healthy is important to me.	○ Not like me	○ A little like me	○ A lot like me
8. I get into it when I eat healthy every day.	○ Not like me	○ A little like me	○ A lot like me

APPENDIX E: SAMPLE GRAPHS OF MODEL ASSUMPTIONS





Standardized Residuals vs. Predicted Values for Adolescent MVPA Model



Standardized Residuals by Group for MVPA Model