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Impact of BIO Girls Program Participation on Health-related Quality of Life and Self-esteem

Anita Gust,¹ University of Minnesota Crookston, USA

Abstract: Low self-esteem is problematic for many adolescent girls in today's culture and society. Self-esteem can be improved, however, through various interventions and programs involving mentorship and/or physical activity. BIO Girls founders created a program involving mentorship, physical activity, and life lessons. The purpose of this study is to evaluate health-related quality of life (HRQoL) and self-esteem of BIO (Beautiful Inside and Out) Girls participants, in order to determine program effectiveness. BIO Girls is a curriculum-based mentorship and physical activity program for girls 7–12 years old. Utilizing a pre-test/post-test study design, researchers administered questionnaires (KINDL-R: Revised questionnaire to assess Health-Related Quality of Life in children and adolescents) in a pre-program session and post-program to each girl participant (n = 169) and a parent (n = 159) across eight site locations. Paired sample statistical analysis revealed significant improvements on girls' total survey score from pre- to post-program (t = -16.14, p < 0.001; physical well-being (t = -15.85, p < 0.001), emotional well-being (t = -18.64, p < 0.001), family life (t = -12.11, p < 0.001), and school life (t = -10.26, p < 0.001). Results of the parent surveys revealed significant improvements on total survey score (t = -28.83, p < 0.001), physical well-being (t = -28.59, p < 0.001), emotional well-being (t = -33.50, p < 0.001), self-esteem (t = -6.41, p < 0.001), family life (t = -11.99, p < 0.001), and school life (t = -20.50, p < 0.001). Repeated measures ANOVA revealed no main effects for age or site location on survey scores. Participation in a curriculum-based physical activity program resulted in positive improvements in quality of life and overall well-being.

Keywords: Physical Activity, Self-confidence, Adolescents, Empowerment Programs

Introduction

Low self-esteem is problematic for many adolescent girls in today's culture and society, with 62 percent of all girls feeling insecure, or not sure of themselves (DSEF 2008). Upon surveying a United States representative sample of 4,373 adolescent girls ages 8–17, seven out of ten girls believe they are not good enough, or do not measure up in some way, including their looks, performance in school, and relationships with friends and family members (DSEF 2008). Although self-esteem has various definitions in the literature, it is typically defined as confidence in one's own worth or abilities satisfaction or dissatisfaction with oneself (Hosogi et al. 2012). Self-esteem is influenced and developed by several factors, including an individual's environment, social influences (e.g., relationships with family and friends), cognitive factors (e.g., thoughts of self-denial or self-acceptance) (Hosogi et al. 2012), and psychological factors (e.g., sensation seeking and rebelliousness) (McClure et al. 2010). In a multivariate analysis conducted by McClure et al. (2010) on a large sample of adolescents (ages 12–16 years), several factors were related to low self-esteem, such as female gender, Hispanic race, overweight and obesity, and increased daily TV time (inversely related to physical activity). Girls were twice as likely to have low self-esteem compared to boys; those in the obese category were also twice as likely, and those in the overweight category were 1.3 times as likely to have low self-esteem as compared to normal-weight youth.

There is often a reciprocal relationship between self-esteem and having a negative self-image. Having a negative self-image can contribute to the development of low-self-esteem, and those, particularly adolescent girls, with low self-esteem have negative feelings about themselves and a negative self- and body image. The commissioned report by the Dove Self-

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Esteem Fund (DSEF) (2008) stated that 71 percent of girls with low self-esteem feel their appearance does not measure up, including not feeling pretty enough, thin enough, or stylish enough, compared to 29 percent of girls with high self-esteem. Regardless of which influences the other, low self-esteem and feelings of negative self-worth often results in subsequent emotional, behavioral, and social problems. Seventy-five percent of girls with low self-esteem, compared to 25 percent of girls with high self-esteem, reported engaging in negative behaviors such as disordered eating, cutting, bullying, drinking, or smoking. Low self-esteem and negative self-image in adolescents have been shown to be a risk factor for eating disorders (Beato-Fernández et al. 2004) while still in youth, and may lead future problems in adulthood, such as mental problems, physical problems, fewer economic prospects, and even criminal behavior (Trzesniewski et al. 2006). Using data from a large scale multimethod longitudinal study, Trzesniewski et al. (2006) evaluated life outcomes and found that adolescents with low self-esteem were more likely to develop major depression, anxiety disorder, and smoke; were more likely to have poor cardiorespiratory health, be overweight, and have poorer self-perceived health during adulthood than those who had high self-esteem. Additionally, adolescents with low self-esteem were more likely to leave school early, less likely to attend college, and more likely to be convicted of a crime in adulthood (Trzesniewski et al. 2006). Those with higher levels of self-esteem are less likely to engage in risky behaviors such as smoking, carrying cutters (e.g., knives), overspending, and risky sexual activity (Savi-Çakar and Tagay 2017). High self-esteem also appears to be a protective factor against negative health behaviors, such as eating disorders (Beato-Fernández et al. 2004; Langdon-Daly and Serpell 2017).

Interventions to Improve Self-esteem

Given the potential long-term consequences of low self-esteem, it is imperative analyses and interventions to improve self-esteem in adolescents be implemented. There are several factors that contribute to developing higher self-esteem, such as a stable home environment and good communication with parents (DSEF 2008), physical activity (Tremblay, Inman, and Willms 2000; Kirkcaldy, Shephard, and Siefen 2002; DeBate and Thompson, 2005), and/or sports participation (DeBate and Thompson 2005; McClure et al. 2010), a healthy BMI (McLure 2011), and being involved in programs that promote adolescent empowerment (Chinman and Linney 1998; Galeotti 2015; Iachini et al. 2017).

The physical and psychological benefits of physical activity (PA) have been well established among several populations, yet the majority of our nation's youth do not meet published physical activity recommendations. It is recommended that youth (ages 6–17) achieve sixty minutes of PA on a daily basis, with most of that sixty minutes being aerobic in nature (US Department of Human Services n.d.). However, results from the most recent United States Youth Risk Behavior Surveillance (YRBS) indicate that 73.9 percent of our nation's youth do not meet these guidelines, with the percent being higher for girls (82.5%) than boys (64.7%) (CDC 2017). Approximately 15 percent are not physically active (doing any kind of physical activity that increased their heart rate and made them breathe hard some of the time, during the seven days before the survey) at least one day per week, again, with the percent being higher for girls (19.5%) than boys (11.0%). In addition to the physical health benefits, physical activity may serve as a mediator for developing anxiety or depression by helping to improve self-esteem. Using data from two waves of a Norwegian community study (the HUNT study), Ranóyen et al. (2015) found that physical activity had a protective effect for developing anxiety or depression for those who had mothers who had anxiety/depression. Those who engaged in activities that fulfilled the needs of autonomy, competence, and relatedness improved self-esteem, and thus were less likely to develop anxiety/depression (Ranóyen et al. 2015).

Programs and interventions designed to improve physical activity, foster positive mentoring, and/or empower young females have improved self-esteem, yet have ambivalent

results. Huang et al. (2007) evaluated the effects of a year-long intervention targeting physical activity, sedentary, and diet behaviors among adolescents on self-reported body image and self-esteem. Researchers found girls who experienced weight reduction or weight maintenance during the intervention period reported improvements in body image satisfaction and self-esteem; however, no intervention effects were found on self-esteem or body satisfaction. DeBate and Thompson (2005) evaluated a wellness curriculum-based running program, “Girls on the Run,” designed to inspire girls (ages 8–12) and improve self-confidence, and found significant improvements over the twelve-week period in self-esteem, body dissatisfaction, eating attitudes, and behaviors. A similar ten-week empowerment model program, “Girls on the Go!,” designed to improve self-esteem, body image, and confidence, resulted in significant improved self-esteem and self-efficacy, as well as improved health behaviors (e.g., reduced dieting) (Tirlea, Truby, and Haines 2016).

Mentoring programs may also be effective for developing self-esteem and promoting healthy behaviors. In pre-/post-program design, youth participating in “Healthy Kids Mentoring Program” demonstrated significant improvements in levels of self-esteem and positive school, peer, and family connections. Additionally, participants of the program were less likely to be depressed or involved in any bullying compared to those who did not participate in the program (King et al. 2002). It has been suggested that the role and presence of the mentor in such programs is a stronger factor in improving self-esteem and social skills, rather than the curriculum itself (Karcher 2005). Franz (2010) reviewed several programs designed to improve self-esteem in adolescent girls and reported that preventative targeted programs can be helpful in increasing self-esteem and body image by focusing on improving the self-esteem and social network of individuals, rather than just providing knowledge. It was suggested the topics in curriculum-based programs should focus on the attitudes and behaviors of girls and the larger concepts that affect these, such as media, parent involvement, appreciation and encouragement, health and exercise, life skills, and stress management. More recently, programs and interventions intentionally designed to increase physical activity have been shown to improve self-esteem (Galeotii 2015; Iachini et al. 2016), as well as attitudes toward physical activity (Nugent and Faucett 2019).

In addition to programs involving physical activity and mentorship, faith-based interventions may improve self-esteem through the development of social connectedness. Having faith and/or being affiliated with a religious organization can also have certain physical and mental health benefits. Religious faith and spirituality may be associated with a decrease in symptoms associated with mental illnesses, such as anxiety and depression, and improved self-perceptions of well-being (Corrigan et al. 2003), reduced risky behaviors, such as eating disorders (Pivarunas 2016) and drinking alcohol (Pardini et al. 2000), decreased psychological distress, and increased coping skills and self-esteem (Pardini et al. 2000). In outpatient and community settings, faith-based interventions have been delivered via support group contexts for weight loss (Fitzgibbon et al. 2005; Kim et al. 2008), diabetes prevention (Boltri et al. 2008), and cardiovascular health (Yanek et al. 2001). Faith-based interventions, in this format, facilitate cohesiveness and improve connectedness and hope through experiencing similar issues with those of the same religious faith. This was particularly evident in females with an eating disorder (Pivarunas 2016). To date, however, faith-based interventions involving physical activity have not been evaluated for actual improvements in self-esteem.

Beautiful Inside and Out (BIO) Girls

In an attempt to engage young females in non-competitive physical activity and improve self-esteem, a program titled BIO (Beautiful Inside and Out) Girls was created for girls in second through sixth grades to build self-confidence and life skills based on three pillars: physical activity, small group mentorship, and faith-based lessons to develop life skills. This

empowerment model program is a twelve-week community-based running/physical activity program that includes mentorship and weekly lessons focusing on values, morals, and a personal belief system. Each week, program participants and mentors meet and engage in educational activities that strive to combat societal pressures, recognize their values, handle stress, and choose kindness (BIO Girls n.d.). Each mentor has a small group of three to four girls in which they engage in small-group activities and one-to-one discussions. Mentors also provide support and encouragement during the physical activity sessions. The physical activity portion of the program strives to encourage accountability and goal setting, as well as help with managing stress and anxiety (BIO Girls n.d.). Additionally, BIO Girls focuses on physical fitness as a part of a holistic approach to health and well-being. The goal at the end of the program is to complete a local community 5K race. Since the program's inception in 2013, there has not been any formalized evaluation of the program for its effectiveness. Therefore, the purpose of this study is to evaluate specific outcomes (e.g., health-related quality of life (HRQoL) and self-esteem) of BIO Girls programs in order to demonstrate program effectiveness.

Methods

Participants in this study were BIO Girls program participants ($n = 217$) and at least one parent of each program participant ($n = 217$) across eight site location in Minnesota and North Dakota in 2018. Using a non-experimental pre/post repeated measures design, study participants completed a questionnaire called the KINDL-R at weeks one and twelve of the BIO Girls program. The KINDL-R stands for (in German) *Revidierter Fragebogen für KINDer und Jugendliche zur Erfassung der gesundheitsbezogenen Lebensqualität*; translated to English "Revised Questionnaire to Assess Health-Related Quality of Life in Children and Adolescents." The KINDL-R is a validated, generic tool for measuring health-related quality of life in children and adolescents from the age of 3 to 17 years (Bullinger et al. 2008). Three versions of the questionnaire are available, based on age. The 7- to 13-year-old version, as well as the associated parent version, was used for this study. The survey comprises twenty-four questions covering six areas: physical well-being, emotional well-being, self-esteem, family, friends, and school. Using a five-point Likert scale, each question was answered as never, seldom, sometimes, often, or all the time.

All program participants and their parent received an informed consent form via email prior to the initial program meeting. The researcher distributed and collected pre- and post-program surveys, either by attending weeks one and twelve meetings, or via mail delivery, in which the BIO Girls site director distributed and collected the surveys, and mailed them back to the researcher. Each program participant and one parent completed the survey at weeks one and twelve of the BIO Girls program. It should be noted that the post-program survey, taken at week twelve, was completed prior to participating in their associated community 5K race.

The BIO Girls program served as the intervention. The intervention consisted of a twelve-week program where participants met for ninety minutes each week. Weekly meetings consisted of a large group session of approximately 15-20 minutes, a small group discussion and activity related to the weekly theme, and a physical activity session. Each week, a lesson from the curriculum developed by BIO Girls was presented in a large group format. Weekly lessons focused on issues pertinent to female adolescents, such as nutrition and healthy eating, body image, defining real beauty, identifying positive role models, defining true friendship, social media, and expressing emotion in a healthy way. Included in each large group session was a bible verse and brief prayer. Following the large group session, participants would break into pre-arranged small groups with their mentor to discuss the weekly topic and/or complete an associated activity. The small groups consisted of three to four participants and one mentor. The small groups remained consistent throughout the twelve-week program. Small-group

discussions and activities were intended to help the girls apply the weekly theme to their personal lives and/or to practice a life skill presented in the lesson. For example, in a weekly session where true friendship was the theme, girls practiced listening and asking relevant questions of their program counterparts, exemplifying respectable communication between friends. Following the weekly lesson and activity, program participants and mentors engaged in a physical activity session. The physical activity sessions were structured to progressively work toward completing a 5K race in their community. The first two weeks consisted of callisthenic style exercises and relays, with the remainder of the weeks involved a jog (e.g., 4-6 mph or 6-10 METs) or run (e.g., >6mph or >10 METs) of a particular distance, starting with 0.75 miles, adding 0.25 to 0.5 miles each week, and ending with a consecutive three miles during the last week of the program. The girls were encouraged to jog or run at a self-determined intensity level, and to actively recover (walk) at their own discretion, then return to a jog/run. Mentors participated alongside the participants, motivating and encouraging complete effort and goal attainment. Following the twelfth week, program participants engaged in a 5K race in a local community. All program participants were registered for the same local race and commenced the race together. Each participant completed the race at her own pace. In addition to weekly running as a group, program participants were given at-home workouts to complete on a weekly basis. The at-home workouts consisted of various walk/run interval sessions and callisthenic-type exercises. At-home workouts were progressive in nature, working toward the goal of jogging or running at a consistent intensity for three miles at the end of the twelve weeks. Each participant was encouraged to complete three sessions of her at-home workouts each week. To inspire participation in the at-home workouts, participants were encouraged to turn in weekly accountability slips, signed by a parent or guardian, in which they were then entered into a drawing for a weekly prize. The purpose of the physical activity and running sessions was to build confidence by achieving small goals as a stepping stone toward a local community 5K race.

Pre- and post-program questionnaires were scored using the scoring system accompanying the survey. The total number of points in all six areas represented the quality of life (QOL) score, whereas the total points in each subscale represented each subscale score. Negatively worded questions were reverse coded to reflect a higher score indicating a higher QOL and higher physical well-being, emotional well-being, self-esteem, family satisfaction, friends' satisfaction, and school satisfaction. Pre- and post-test scores were analyzed using IBM SPSS statistics software 2.5.

Results

A total of 434 pre-program surveys were returned, with 387 (193 girl, 194 parent) completed. Surveys with incomplete data were excluded from analysis. A total of 330 post-program surveys that matched pre-program participants via their assigned identification number, were returned, with 328 complete. Girl participant ($n = 169$) and parent ($n = 159$) pre- and post-survey scores across eight site locations were analyzed. Results were analyzed as a whole, by each site location, and divided by age groups (7–8 years, 9–10 years, and 11–12 years). Results of the girls' scores are presented in Table 1 and Figure 1. Paired sample statistical analysis revealed significant improvements on survey scores from pre- to post- program for girls' total survey score ($M = 3.12$, $SD = .46$, $M = 4.03$, $SD = .50$), $t(168) = -16.14$, $p < 0.001$; physical well-being ($M = 2.73$, $SD = .87$, $M = 4.02$, $SD = .63$), $t(168) = -15.85$, $p < 0.001$), emotional well-being ($M = 2.73$, $SD = .87$, $M = 4.27$, $SD = .59$), $t(168) = -18.64$, $p < 0.001$), family life ($M = 3.44$, $SD = .44$, $M = 4.20$, $SD = .67$), $t(168) = -12.11$, $p < 0.001$), and school life ($M = 3.13$, $SD = .60$, $M = 3.92$, $SD = .50$), $t(168) = -10.26$, $p < 0.001$

Table 1: Pre- and Post-Survey Scores of the Girl Participants

	Pre-Program N = 169		Post-program N = 169		t
	M	SD	M	SD	
Total score	3.22	.46	4.04	.50	16.14*
Physical well-being	2.73	.87	4.02	.63	15.85*
Emotional well-being	2.73	.87	4.27	.59	18.64*
Self-esteem	3.65	.60	3.71	.96	0.802
Family life	3.44	.44	4.20	.67	12.11*
Friends' life	4.62	.55	4.11	.64	-7.99*
School life	3.13	.60	3.92	.50	10.26*

Note. *P < .001

Source: Gust 2019

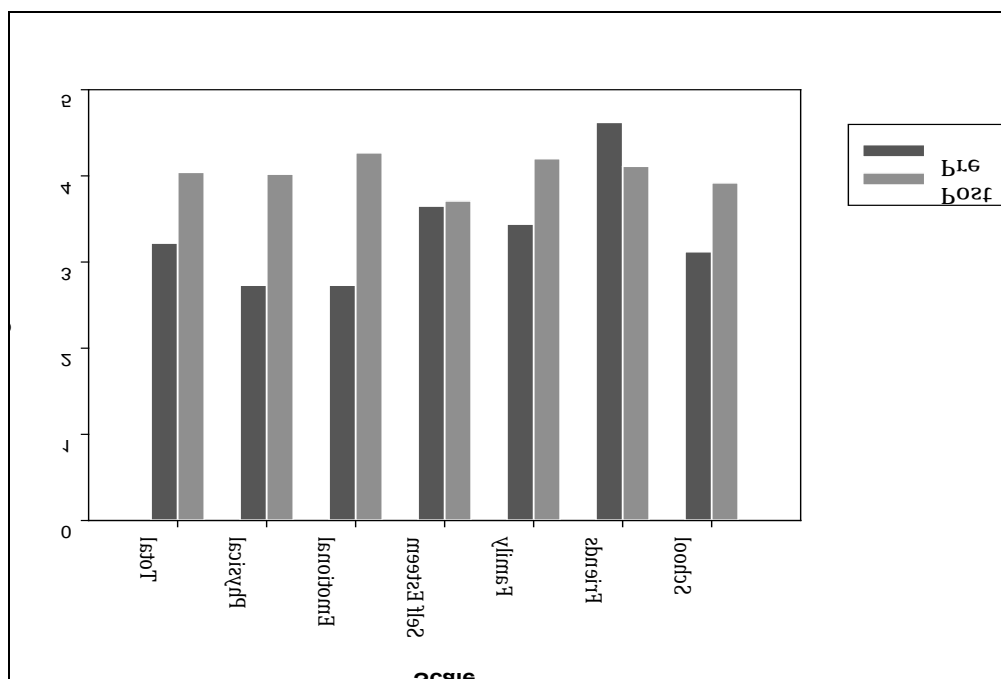


Figure 1: Girls' Pre- and Post-Survey Scores

Source: Gust, 2019

Results of the parent surveys are presented in Table 2 and Figure 2. Significant improvements on total survey score ($M = 3.05, SD = .22, M = 4.15, SD = .46, t(158) = -28.83, p < 0.001$), physical well-being ($M = 2.42, SD = .44, M = 4.16, SD = .58, t(158) = -28.59, p < 0.001$), emotional well-being ($M = 2.41, SD = .42, M = 4.40, SD = .53, t(158) = -33.50, p < 0.001$), self-esteem ($M = 3.64, SD = .52, M = 3.94, SD = .55, t(158) = -6.41, p < 0.001$), family life ($M = 3.34, SD = .29, M = 4.02, SD = .62, t(158) = -11.99, p < 0.001$), and school life ($M = 2.96, SD = .41, M = 4.24, SD = .70, t(158) = -20.50, p < 0.001$) were found. Significant decreases in friends' life scores ($M = 4.62, SD = .55, M = 4.11, SD = .64, t(168) = -7.99, p < 0.001$); ($M = 4.52, SD = .45, M = 4.36, SD = .62, t(158) = -6.73, p < 0.001$) were revealed in both girl and parent results respectively. Repeated measures ANOVA revealed no main effects for age or site location on survey total or sub-scale scores.

Table 2: Pre- and post-Survey Scores of Parent Participants

	Pre-Program N = 159		Post-program N = 159		t
	M	SD	M	SD	
Total score	3.05	.22	4.15	.46	28.83*
Physical well-being	2.42	.44	4.16	.58	28.59*
Emotional well-being	2.41	.42	4.40	.53	33.50*
Self-esteem	3.64	.52	3.94	.55	6.41*
Family life	3.34	.29	4.02	.62	11.99*
Friends' life	4.52	.45	4.16	.62	-6.73*
School life	2.96	.41	4.24	.70	20.50*

Note. *P < .001

Source: Gust 2019

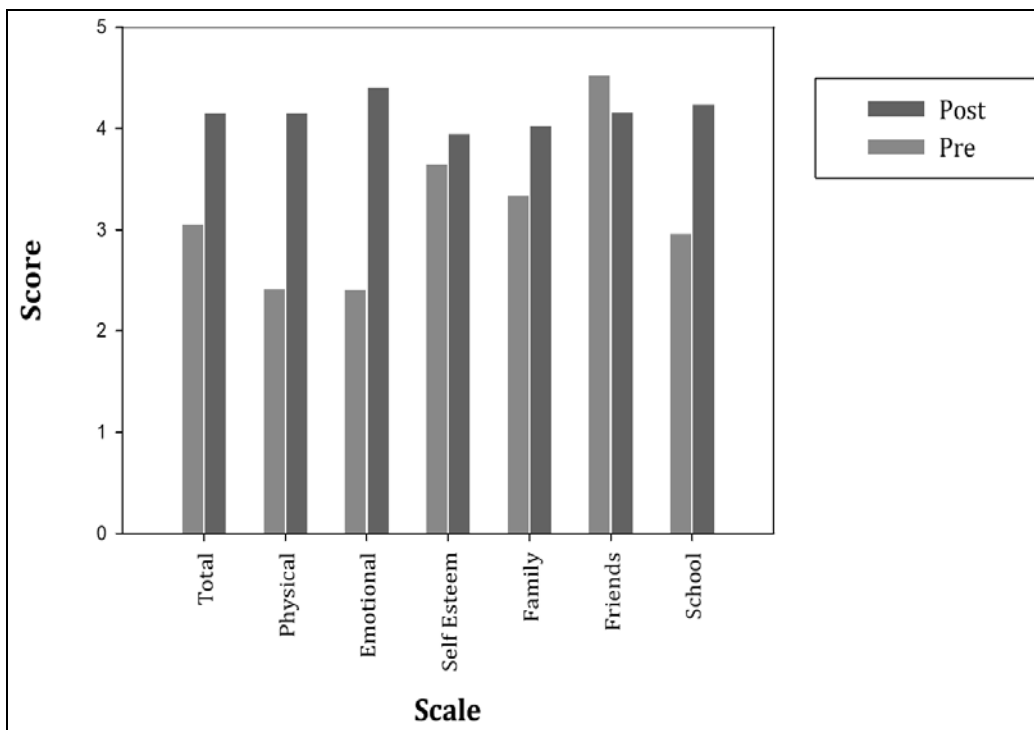


Figure 2. Parents' Pre- and Post-Survey Scores

Source: Gust 2019

Discussion

The mission of the BIO Girls program is to “improve the self-esteem of adolescent girls through empowerment of self and service to others” (BIO Girls n.d.). The program combines a life-skills curriculum, small group mentoring, and physical activity to help girls find a voice for their self-worth. The purpose of this study was to evaluate outcomes of the BIO Girls program, particularly self-esteem, to determine if the program was effective in its mission and goals. The results of this study demonstrated improvements in several of the areas measured, such as

physical well-being, emotional well-being, self-esteem, and home and school life. Results from the present study are similar to other studies involving comparable programs, such as “Girls on the Run” and “Girls on the Go!,” where participation demonstrated improvements in self-esteem (DeBate and Thompson 2005; Iachini et al. 2017; Tirlea, Truby, and Haines 2016); and Healthy Kids Mentoring Program (King et al. 2002) in which significant improvements in levels of self-esteem and positive school, peer, and family connections were found. The King et al. (2002) study found significant improvements in peer connections, which was partly in contrast to the results of the present study. Although improvements in school life were found, significant decreases in perception of friends were found in both the girls’ and parents’ results. The researcher speculates this may not be a negative result, and that the girls may be learning what constitutes true friendship, which is a topic within the BIO Girls curriculum. Improvements to self-esteem, although not significant in the girls’ results, were found in the present study, which is in contrast to the Huang et al. (2007) study, in which no changes were found in self-esteem in participants completing a healthy dietary and physical activity behavioral intervention. Further investigation as to how participants value their BIO Girls peers is warranted, as program peers can serve as a form of social support that can increase the likelihood of continued participation in physical activity (Laird, Fawcner, and Niven 2018), increase motivation to be physically active (Nugent and Faucette 2019), and improve self-esteem and emotional well-being (Savi-Çakar and Tagay 2017).

Although the connection between increased levels of physical activity and self-esteem is well established, physical activity is just one pillar of the BIO Girls program. The program utilizes a life skills curriculum intentionally designed to improve self-esteem, which can be helpful in actually increasing self-esteem (Franz 2010). In addition to life skills, the curriculum has a Christian faith component to it. The nature of the curriculum and the program may create a sense of social connectedness, allowing girls to share experiences and engage with those who may have similar issues and are of the same religious faith (Pivarunas 2016). Participating in positive, meaningful activities and learning useful and relevant life skills are two aspects of the adolescent empowerment cycle developed by Chinman and Linney (1998), which can be used to improve self-esteem and self-efficacy.

In addition to physical activity and the development of life skills, positive mentorship is the third pillar of the BIO Girls program. The improvements in school and family life found in the present study are similar to the Rhodes et al. (2000) study, in which purposeful positive mentoring in Big Brother, Big Sister programs led to improved parental relationships and aspects of school life, such as reduced unexcused absences and perceived scholastic competence. Improvements in self-worth were also found in the Rhodes et al. (2000) study, similar to the present study, which also demonstrated improvements in emotional well-being. Program mentors can also serve as a source of social support, which have been shown to have a positive influence on self-esteem (Savi-Çakar and Tagay 2017), as well as attitudes toward, and long-term engagement of, physical activity (Laird, Fawcner, and Niven 2018) and motivation to be physically active (Nugent and Faucette 2019).

Although body image was not measured in the present study, there is a strong correlation between physical activity, body image, and self-esteem. Appearance appraisal has been found to be one of the most important factors in predicting self-esteem (Kutob et al. 2010) and regular engagement in exercise was related in a more positive self-image as well as scores for psychological well-being (Kirkcaldy, Shephard, and Siefen 2002). A recent review of the literature conveyed strong correlations between negative body image and lower physical activity and sport participation, whereas greater participation in physical activity and sport was associated positive body image (Sabiston et al. 2019). Although a causal relationship cannot be determined, strong correlations and interactions between the variables exist, nonetheless. Therefore, programs incorporating physical activity may lead to improvements in body image, which may further enhance self-esteem.

A substantial purpose for improving self-esteem in young girls is to reduce the risk of developing anxiety and/or depression, and reduce negative health behaviors. Both physical activity and self-esteem have been found to be mediators for developing anxiety and depression (Ranøyen et al. 2015). Additionally, those with lower self-esteem are at higher risk for negative health behaviors, such as drinking, smoking, cutting, etc. (DSEF 2008), and health problems such as eating disorders (Beato-Fernández et al. 2004), whereas those with higher levels of self-esteem and emotional well-being have a lower risk for engaging in negative health behaviors (Beato-Fernández et al. 2004; Langdon-Daly and Serpell 2017). Other factors related to self-esteem include relationships with parents and success in school. Adolescents who had better perceived relationships with their parents, had stronger school performance, and participated in team sports demonstrated a lower risk for poor self-esteem (McClure et al. 2010). Results from the present study demonstrated improvements in family and school life following participation in the BIO Girls program, reiterating the benefits of programs designed to improve self-esteem.

Through programming and interventions involving physical activity, mentorship, and purposeful skill building intentionally designed to improve self-esteem, communities, researchers, school volunteers, etc., can positively influence adolescents self-esteem and other aspects of quality of life, thereby reducing the risk of anxiety, depression, and negative health behaviors of society's youth.

Limitations and Future Directions

Factors related to self-esteem are complicated, extensive, and interactive, yet the benefits of improved self-esteem are clear. How to effectively improve self-esteem remains equivocal, yet being physically active appears to have a strong role, as does positive mentoring. Although results of the present study suggest BIO Girls is effective in improving HRQoL and self-esteem, a significant limitation of this study is determining which of the components contributed to the improved scores—physical activity, mentorship, or the curriculum focusing on life-skills. Future research is needed to compare BIO Girls with similar programs that do not incorporate all three components. Other limitations of this study include a lack of a control group for non-participant comparisons, as well as study design by which direct parent and participant comparisons were not conducted.

Since this study was completed, BIO girls programs have expanded to include other types of physical activity, such as yoga, dance, and physical fitness. Therefore, future research in this area should include the effect of type of physical activity and the effect of each of the three program pillars independently. Additionally, future directions should include the effect of potential confounding variables, such as socioeconomic status, ethnicity, program location, effective program delivery and mentorship, program adherence, and program participation frequency. Lastly, long-term effects, (e.g., attitudes toward physical activity, self-esteem, health behaviors) of program participation should be examined with future research.

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