

Girls on the Run: A Quasi-Experimental Evaluation of a Developmentally Focused Youth Sport Program

Kelley K. Pettee Gabriel, Rita DiGiacchino DeBate, Robin R. High, and Elizabeth F. Racine

Background: Evidence supporting the effectiveness of a developmental-focused youth sport (DYS) program designed exclusively for elementary school aged girls is mounting. The purpose of this study was to evaluate the impact of on the *Girls on the Run* program on psychological and physical assets among 3rd- to 5th-grade girls. **Methods:** A longitudinal quasi-experimental study was conducted to evaluate intervention effects among 877 participants categorized into 1 of 3 groups (never, newly, and previously exposed). A 64-item self-report survey measured developmental assets at 3 time-points. Nested random effects ANOVA models were used to compare demographic factors and psychological and physical assets between exposure groups and to compare longitudinal differences in these assets. **Results:** After adjustment for multiple comparisons, previous program participants had significantly higher physical activity commitment ($P = .006$) and physical activity levels ($P = .047$) at preintervention than never exposed. From pre- to postintervention body image improved in newly exposed participants ($P = .03$). Physical activity increased from preintervention to follow-up among never and newly exposed participants (all $P < .05$). **Conclusions:** Although we were unable to fully confirm the study hypotheses, the results of the current study provide new evidence to support future long-term studies examining the effectiveness of an innovative DYS program for 3rd- to 5th-grade girls.

Keywords: child health, adolescent health, physical activity, health promotion

Participation in structured physical activity has the potential to enhance positive youth development^{1,2} through intentional programming that promotes positive physical,³⁻¹⁰ mental^{4,10-16} and academic^{4,10,17} outcomes.¹⁸ Over the past decade, literature examining the benefits of developmentally-focused youth sports (DYS) programs on physical, mental, and academic outcomes has emerged.¹⁹⁻²² DYS programs combine sport and life skills²¹ and use sport participation as a vehicle for increasing physical activity while providing youth with opportunities for psychological, emotional, social, and intellectual growth.^{19,20}

DYS program goals can be conceptualized in relation to 3 main types of developmental assets.²³ Developmental assets attained through DYS programs include a) physical assets (eg, sport-specific competencies, physically active lifestyles, physical fitness, physical health), b) psychological assets (eg, self-determined motivation

toward physical activity, positive values toward physical activity, positive identity, body image, and self-esteem), and c) social assets (eg, feelings of social acceptance, close friendships and friendship quality, sense of civic engagement, and contribution to community).²³

Despite the noted benefits, gender disparities exist for physical activity, with males being more active than females.²⁴ According to the 2007 Tucker Center Research Report: Developing Physical Active Girls,¹⁵ girls' participation rates across all venues of physical activity (ie, organized sports, outdoor recreation, youth clubs, physical education class) has decreased. It has been suggested that gender-based differences in physical activity may be attributable to differences in biological factors including motor skills, body composition, and socialization.²⁵ Girls are twice as likely to drop out of sports and tend to do so at an earlier age²⁶ when compared with boys. Age-related differences in physical activity levels have also been documented. In the National Heart, Lung, and Blood Institute Growth and Health Study, Kimm et al showed that physical activity levels among girls declined from ages 8-9 to 18-19 years, with the sharpest declines occurring at the onset of adolescence, with Black girls having lower physical activity levels than White girls.^{27,28} A 2002 study by Trost et al²⁸ examined objectively-measured physical activity levels in a population-based sample of 1st- to 12th-grade students, categorized into 4 grade levels (ie, grades 1-3, 4-6, 7-9, and 10-12). Among

Pettee Gabriel is with the Dept of Epidemiology, Human Genetics, and Environmental Sciences, University of Texas Health Science Center, Austin, TX. DiGiacchino DeBate is with the Dept of Community and Family Health, University of South Florida, Tampa, FL. High is with the Dept of Biostatistics, University of Nebraska Medical Center, Omaha, NE. Racine is with the Dept of Public Health Sciences, University of North Carolina at Charlotte.

girls, the largest group difference, relative to the previous grade level, in MVPA occurred between grades 1 to 3 and 4 to 6, which corresponds to late elementary school²⁸ Therefore, programs that specifically target elementary aged girls may be important to attenuate the decline in physical activity levels that have been documented in this age group.

Although a number of girl-focused DYS programs are available, the majority of programs are designed for girls in middle or high school,^{29–35} thus there is a need for empirical evaluations of single-gender DYS programs focused on elementary school-aged girls. One girl-focused DYS program, *Girls on the Run*, is designed to simultaneously teach life and sport skills to 3rd through 5th-grade girls as a vehicle to build physical, psychological, and social developmental assets.

To date, 3 studies have been conducted to evaluate the *Girls on the Run* program. All 3 studies used nonexperimental pre- to postintervention study designs, with each successive study building upon its predecessor in sample size and/or number of councils (ie, service delivery areas). The first study demonstrated statistically significant improvements in the following psychological assets: self-esteem, eating attitudes/behaviors, and body size satisfaction among *Girls on the Run* participants from pre- to postintervention (all $P < .05$).³⁶ The second study was expanded to include 6 *Girls on the Run* councils and revealed significant improvements from pre- to postintervention in psychological assets related to physical activity [ie, positive attitudes and commitment to physical activity (both $P < .01$)].³⁷ The third study included more councils that represented geographical regions across the U.S. This study revealed significant improvements in psychological assets (self-esteem, body size satisfaction), and physical assets (vigorous intensity physical activity) from pre- to postintervention (all $P < .01$).³⁸

Although preliminary studies revealed promising results regarding the psychological and physical assets examined in the previous *Girls on the Run* evaluation studies,^{36–39} the nature of the nonexperimental study designs that were used limit the interpretation of the findings. The current study builds upon previous study by the addition of a comparison group and additional time point (ie, 5-month follow-up). Accordingly, the purpose of the current study was to evaluate the effectiveness of the *Girls on the Run* DYS program to improve psychological and physical assets among elementary school girls. Two main hypotheses served as the basis for the current study and guided the evaluation design and analyses. Our first hypothesis was that 3rd- to 5th-grade girls exposed to *Girls on the Run* would have significantly improved changes in psychological (self-esteem, body size satisfaction, commitment to physical activity), and physical (physical activity) assets from pre- to postintervention as compared with 3rd- to 5th-grade girls who did not participate in the DYS program. The second hypothesis was that 3rd- to 5th-grade girls exposed to *Girls on the Run* would maintain improvements in psychological (self-esteem, body size satisfaction, commitment to

physical activity), and physical (physical activity) assets when compared with girls who did not participate in the program after 5 months of follow-up.

Methods

Study Design

The current study employed a 3-group (ie, never exposed, previously exposed, and newly exposed) quasi-experimental longitudinal study design to examine change in psychological (ie, self-esteem, body size satisfaction, commitment to physical activity) and physical assets (ie, physical activity) over time. Data were collected at 3 time-points, including 1) preintervention (September 2008), 2) postintervention (December 2008), and 3) follow-up, scheduled 5 months after the postintervention survey (April 2009).

Study Population

The 35 elementary schools in the Charlotte-Mecklenburg, NC public school system (CMS) that offered the *Girls on the Run* program during the 2008–2009 academic school year were invited to participate in this study. To increase participation, \$20 gift cards were provided to principals and classroom teachers as an incentive for agreeing to allow 3rd- to 5th-grade female students complete the evaluation survey at all 3 time-points during class time. Fifteen schools (43%) agreed to participate in the study. When comparing student composition characteristics between participating and nonparticipating schools ($n = 20$), differences were noted with participating schools having a higher average total enrollment (800 vs. 720 students per school), a greater percentage of students receiving free or reduced price lunch (32.6 vs. 29.9%), and a smaller percentage of non-Hispanic White students (59.6 vs. 61.2%).

Girls on the Run Intervention

Girls on the Run is a DYS program for 3rd- to 5th-grade girls that combines training for a 3.1 mile (5K) running event with positive youth development curricula.⁴⁰ In addition to this training, the *Girls on the Run* program consists of a 3-part curriculum based on developing physical, psychological, and social developmental assets. Within the 12-week curriculum, weeks 1 to 4 focus on, “All About Me: Getting to Know Who I Am and What I Stand For” (ie, Part 1), which focus on enhancing girls’ self-awareness and self-care—girls getting to know themselves; examining their values, likes and dislikes; and who they envision themselves to be. Part 2 of the curriculum (ie, weeks 5 to 8) focuses on, “Building my Team: Understanding the Importance of Cooperation” which incorporate lessons focused on stress team building, being supportive, learning to listen and cooperate, and developing a sense of community. Finally, Part 3, during weeks 9 to 12 focuses on the theme, “Community Begins

with Me: Learning about Community and Designing Our Own Community Project” with lessons that relate to the world at large that include making a contribution to the community and becoming aware of negative messages we often receive (media awareness, negative peer pressure). At the end of the 12-week program, *Girls on the Run* participants participate in a 5 km (5K) running event.

The program is facilitated by a trained and certified *Girls on the Run International* coach and assistant coach. Each 1.5 hour meeting is structured to include 1) a getting on board activity that serves as an introduction to the lesson; 2) stretching activities where the group processes the topic; and 3) the workout where the girls participate in multiple running activities involving a game or team goal to deliver the lesson. The program starts with short periods of running and develops as the coaches assess each girl’s ability and pace. The running component gradually builds to a “practice” 5k, to give the girls the confidence to participate in an actual 5K event; 4) cool down stretching and processing of the lesson; and 5) session closing where encouragement is provided by the coach for individual and group behavior.

Procedures

Study procedures were approved by the CMS Center for Research and Evaluation and the Institutional Review Board at the University of North Carolina at Charlotte. Two weeks before data collection, letters were sent home with students to all parents of 3rd- to 5th-grade girls attending the participating schools. The letter provided a brief description of the study and directed parents to contact study staff if they did not want their child to participate in the study.

To facilitate survey administration, the principal at each school was given the option of having either the research staff or teachers administer the surveys to the girls. Of the 15 schools participating in the study, 5 schools opted to have the research staff administer the instrument while the remaining 10 schools decided to have the classroom teacher administer the instrument. All survey administrators were provided with standardized detailed instructions for obtaining student assent and survey administration. In addition, answers to frequently asked questions were provided on the administrators’ version of the evaluation survey. For each child with parental permission to enroll in the study, administrators distributed the evaluation survey and read the informed assent statement to the students. Upon obtaining assent, the evaluation survey questions were read aloud by the survey administrator, one-by-one, as the participants completed the survey. The evaluation survey took approximately 20 to 30 minutes to complete at each time point.

Measures

A Likert-type 64-item self-report survey was used to assess demographic factors, psychological (ie, self-esteem, body size satisfaction, commitment to being

physically active) and physical assets (ie, physical activity level). The survey included a series of 4 reliable and valid instruments, including 1) Rosenberg’s Self-Esteem Scale,⁴¹ 2) the child/adolescent version of the Schematic Figural Scale [to measure body size (dis)satisfaction],⁴² 3) the Commitment to Physical Activity Scale,⁴³ and 4) the Physical Activity Questionnaire for Older Children (PAQ-C).⁴⁴

Rosenburg Self-Esteem Scale. The Rosenberg Self-Esteem Scale is the most widely used measure of self-esteem. The scale consists of 10 items that measure global self-esteem; higher sum scores represent higher self-esteem.^{41,45} The Rosenberg Self-Esteem Scale is reported as one of the most valid global measures of self-esteem^{46,47} in addition to measures of reliability ranging from Coefficient alphas (α) of .77 to .87.^{41,48} When administering the original survey, CMS considered the 3 negatively valenced items (eg, I feel I don’t have much to be proud of) as confusing for the 3rd-grade children. Thus, based on recommendations from CMS these 3 items were modified to read as positively valenced items (eg, I have much to be proud of). The reliability of the adapted Rosenberg Self-Esteem Scale elicited a Cronbach’s α of .722, which is in line with previous reliability studies.^{41,48}

Schematic Figural Scale. The child/adolescent version of the Schematic Figural Scale⁴² is a figural stimulus method used to assess overall body size (dis)satisfaction. The participant looked at 7 female child silhouettes (ranging from thin to large) and was asked to circle the silhouette which represented what they perceived their current size to be (perceived), followed with what they would like their current size to be (desired). A body size discrepancy score was calculated by subtracting desired body size from perceived body size. A discrepancy score of 0 represents satisfaction in body size (ie, no discrepancy between perceived and desired body shape). Reliability measures range from Coefficient α scores of .59 to .71.⁴⁹ In the current study the reliability of the Schematic Figural Scale was $\alpha = .605$, which is similar to the results from previous studies.

Commitment to Physical Activity. Commitment to be physically active was measured using the 12-item Likert type Commitment to Physical Activity Scale.⁴³ Among similarly aged girls, Cronbach α scores ranged from .820 to .835 and was shown to be significantly correlated with frequency (ie, times per week) of vigorous-intensity PA ($\rho = .29$; $P < .01$).³⁹ As with the Rosenberg Self-Esteem Scale, the Commitment to Physical Activity Scale contained 3 negatively valenced items which were adapted to positively valenced items based upon the recommendation by CMS to improve readability among participants. The reliability of the adapted scale was $\alpha = .820$.

Physical Activity. The Physical Activity Questionnaire for Older Children (PAQ-C) is a self-administered 7-day recall designed to assess habitual moderate- to vigorous-intensity physical activity during a specific season

(ie, fall, winter, spring) among older children aged 9 to 15 years.⁴⁴ The PAQ-C includes 10 items, 9 of which are used to compute the summary physical activity score. All questions are scored on a 5-point scale, with higher scores indicating higher levels of physical activity. The first question includes a checklist of 22 common leisure and sport activities and is scored as the average response score of the 22 activities. The remaining 8 questions ask participants about their physical activity levels over the previous 7 days during specific times and/or days during the 7-day recall time frame. These questions and the related checklist of activities were included to serve as a prompt to improve overall recall. The final score for the PAQ-C is computed as the average of the responses provided for all 9 questions (scores ranged from 1 = low physical activity participation to 5 = high physical activity participation over the past 7 days). The internal consistency of PAQ-C ranged from $\alpha = .79$ to $.89$.^{44,50} In the current study, the Cronbach α for the PAQ-C was $.898$.

Additional Variables. Age at last birthday was self-reported. The preintervention survey included questions regarding current grade level, previous participation in *Girls on the Run*, and reasons for previous participation in *Girls on the Run*. The postintervention survey included a question about participation in *Girls on the Run* during the fall of 2008. Race/ethnicity and participation in *Girls on the Run* during the spring of 2009 were included in the follow-up assessment.

Girls on the Run Exposure Groups

Based on responses given to questions included on the preintervention evaluation (September 2008), participants were classified into 1 of 3 *Girls on the Run* exposure groups: 1) did not participate in *Girls on the Run* before the preintervention evaluation or during the study period (never exposed), 2) participated in *Girls on the Run* for the first time in the fall of 2008 (newly exposed), and 3) participated in *Girls on the Run* in the past and during the fall of 2008 (previously exposed).

Statistical Methods

Univariate analyses were conducted on measured parameters including demographic factors and psychological and physical assets. The nesting structure of psychological and physical assets include multiple measurements (level 1) collected within students, students (level 2) nested within teacher, and teachers (level 3) nested within schools, and schools (level 4) was used for all statistical analyses.

Nested random effects analysis of variance (ANOVA) using PROC MIXED and PROC GLIMMIX in SAS were used to compare psychological and physical asset scores reported at preintervention between participants who completed evaluation surveys at all 3 time points ($n = 942$) versus those who did not ($n = 578$). Similarly, in participants who completed all 3 evaluation surveys,

nested random effects analysis of variance (ANOVA) was used to compare demographic factors and preintervention psychological and physical assets between *Girls on the Run* exposure groups. For categorical data, *Girls on the Run* exposure status and explanatory factors (ie, age group and race/ethnicity) were treated as response categories and respective counts were applied to a multinomial distribution.

To test hypothesis 1, change in psychological and physical assets were calculated as the difference between pre- and postintervention score. Repeated measures analysis of covariance (ANCOVA) models were used to evaluate change in psychological and physical asset from pre- to postintervention, stratified by *Girls on the Run* exposure status (never-, newly-, or previously exposed). For hypothesis 2, similar procedures were used to examine the change in psychological and physical asset from preintervention to follow-up, stratified by *Girls on the Run* exposure group. Data were examined for potential covariates including age, race/ethnicity (White vs. non-White), time (postintervention and follow-up), relevant preintervention psychological or physical asset score, and exposure status (never, newly, or previously) as well as interaction terms between variables. Results from final models were based on the nesting structure and adjusted for relevant covariates for each outcome. Holm's step down procedure was used for subgroup analysis to maintain the overall significance level at $P = .05$.⁵¹ All statistical analyses were generated using SAS/STAT software, Version 9.2 of the SAS System for Windows (Cary, NC).

Results

Participants

The overall study population included 2,119 3rd- to 5th-grade girls who attended 1 of the 15 participating CMS elementary schools. Among these participants, 335 were ineligible due to lack of: a) parental permission ($n = 4$); or b) participant assent ($n = 331$). Among the eligible population ($n = 1784$), 255 eligible participants (14.3%) were also removed from the study because of teacher refusal to administer the survey.

Among eligible participants ($n = 1529$), 62% ($n = 942$) completed the evaluation survey at all 3 time points. No statistically significant differences were reported at preintervention between those that completed the survey all 3 time-points versus those that did not with regard to self-esteem ($P = .11$), body size discrepancy ($P = .57$), commitment to physical activity ($P = .49$), or physical activity score ($P = .41$). A higher proportion of study participants completed all 3 surveys in schools where study staff administered the surveys (67% vs. 38%). Survey nonresponse did not differ in study participants by race/ethnicity ($P = .37$).

Of the 942 participants who completed the survey at all 3 time points, 65 were excluded from analysis due to:

a) missing data regarding previous participation in *Girls on the Run* ($n = 29$) or b) reported no participation in *Girls on the Run* until the spring of 2009 ($n = 36$). These participants were excluded so that comparison of exposure status between never exposed, previously exposed, and newly exposed in the fall could be achieved. The final study sample comprises 877 participants of which 67.3% participants ($n = 590$) were self-described as never participating in *Girls on the Run* (ie, never exposed), 14.9% participants ($n = 131$) who participated in *Girls on the Run* for the first time in the fall of 2008 (ie, newly exposed), and 17.8% of participants ($n = 156$) who previous to fall of 2008 participated in *Girls on the Run*.

Participant Characteristics at Preintervention

Demographic characteristics and psychological and physical assets reported at the preintervention survey are presented in Table 1. Among the final study sample ($n = 877$), the largest proportion of participants were aged 9 years or younger (44.3%) and non-White (54.7%). With regard to psychological and physical assets, average reported scores among all participants were as follows: self-esteem 22.5 ± 4.0 ; body size (dis)satisfaction $.46 \pm .92$; commitment to physical activity 25.0 ± 4.8 ; and physical activity 3.14 ± 0.65 . When stratified by exposure

Table 1 Demographic Factors and Preintervention Psychological and Physical Assets in all Study Participants and Then Stratified by *Girls on the Run* Exposure Group Status

Demographic factors	Full sample	<i>Girls on the Run</i> exposure group			P
	(n = 877)	Never (n = 590)	Newly (n = 131)	Previously (n = 156)	
	n (%)	n (%)	n (%)	n (%)	
Age					.09
≤9 years	387 (44.3)	260 (44.1)	69 (53.9)	58 (37.2)	
10 years	291 (33.3)	197 (33.4)	37 (28.9)	57 (36.5)	
≥11 years	196 (22.4)	133 (22.5)	22 (17.2)	41 (26.3)	
Race/ethnicity					.06
White/Caucasian	395 (45.3)	237 (40.3)	73 (57.0)	85 (54.5)	
Black/African-American	181 (20.8)	134 (22.8)	17 (13.3)	30 (19.2)	
Hispanic/Latino	110 (12.6)	84 (14.3)	16 (12.5)	10 (6.4)	
Asian/Native American	61 (7.0)	46 (7.8)	6 (4.7)	9 (5.8)	
Other	125 (14.3)	87 (14.8)	16 (12.5)	22 (14.1)	
Psychological and physical assets	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	P
Self-esteem ^a	22.5 ± 4.0	22.0 ± 4.0	22.8 ± 4.0	22.8 ± 4.0	.04
Body size discrepancy score ^b	.46 ± .92	.54 ± .92	.48 ± .92	.36 ± .92	.10
Physical activity commitment ^c	25.0 ± 4.8	24.3 ± 4.8	25.2 ± 4.8	25.6 ± 4.8	.006**
Physical activity ^d	3.14 ± .65	3.09 ± .65	3.08 ± .65	3.25 ± .65	.047*

Note. Nested random effects analysis of variance models with count data were used to compare demographic factors between *Girls on the Run* exposure status. Nested random effects analysis of variance models were also used to compare psychological and physical assets between exposure status.

^a Scores ranged from 0 to 30; higher scores indicated greater self-esteem. Score based on the mean of the following questions: I am OK with myself; I am a good person; I feel that there are a lot of good things about me; I can do things as well as most other people; I have much to be proud of; I feel useless at times; I have a lot to offer people; I wish I could have more respect for myself; I feel that I am a failure; I take a positive attitude toward myself.

^b Discrepancy score calculated by subtracting ideal body size from perceived body size.

^c Scores ranged from 0 to 36; higher scores indicated greater commitment to physical activity. Sum score based on the following questions: I look forward to physical activity, I wish there were better ways to get healthy than being physically active, physical activity is hard work, I like physical activity, physical activity is very important to me, life is better because I am physically active, physical activity feels good, I like thinking about doing physical activity, I would change my schedule to participate in physical activity, I have to force myself to be physically active, I like being physically active everyday, physical activity is the best thing about my day.

^d Scores ranged from 1 to 5; higher scores indicated higher physical activity participation. The score is comprised of responses to a checklist of 22 leisure and sport activities and 8 questions regarding their physical activity levels over the previous 7 days during specific times during the day or day of the week; it is scored as a mean of all of the activities using a 1–5 scale.

* $P < .05$; ** $P < .01$; never exposed group significantly different than previously exposed group after adjustment for multiple comparisons using Holm's step down correction.

group, no statistically significant differences were noted for demographic characteristics between *Girls on the Run* exposure groups with the exception of grade level ($P = .004$). Conversely, statistically significant differences were noted between exposure groups regarding self-esteem ($P = .04$), physical activity commitment ($P = .006$), and physical activity level ($P = .047$). After adjustment for multiple comparisons, those previously exposed to *Girls on the Run* had higher commitment to physical activity and physical activity scores as compared with participants who reported never participating in the program ($P < .01$ and $P < .05$, respectively).

Participant Characteristics at Preintervention, Postintervention, and Follow-up

Figure 1 provides a graphical representation of self-esteem, body size (dis)satisfaction, commitment to physical activity, and physical activity scores at pre- and postintervention and 5-month follow-up after adjustment for race/ethnicity (White vs. non-White). When compared with the never exposed to *Girls on the Run* group, previously exposed participants reported higher self-esteem at postintervention ($P = .02$) and follow-up ($P = .06$). Body size discrepancy scores did not significantly differ between exposure groups at either postintervention or follow-up. Participants newly exposed to the *Girls on the Run* program had significantly higher commitment to physical activity at follow-up when compared with participants never exposed to the program ($P = .04$). At postintervention, physical activity levels were higher among previously exposed participants when compared with the never and newly exposure groups ($P = .03$ and $.02$, respectively).

Hypothesis 1

Changes in pre- to postintervention self-esteem, body size (dis)satisfaction, commitment to physical activity, and physical activity, stratified by *Girls on the Run* exposure group are depicted in Table 2. After adjustment for multiple comparisons, statistically significant differences in body size (dis)satisfaction were observed among participants classified as newly exposed to *Girls on the Run* ($P = .03$), with discrepancy scores moving closer to 0 (ie, no discrepancy between perceived and desired body image). Further, change in body size (dis)satisfaction from pre- to postintervention approached statistical significance in never exposed girls ($P = .056$). No other statistically significant differences from pre- to postintervention were observed for the remaining psychological and physical assets.

Hypothesis 2

Table 2 also presents changes in psychological and physical assets from preintervention to follow-up. After adjustment for multiple comparisons, physical activity scores increased from preintervention to follow-up in

both the never and newly exposed to *Girls on the Run* groups ($P < .016$ and $.008$, respectively). Other than improvements in body size (dis)satisfaction among never exposed girls ($P = .04$), no statistically significant differences were noted between preintervention to follow-up for any psychological assets.

Discussion

The current study was designed to build upon the previous scientific evidence regarding the effectiveness of the *Girls on the Run* DYS program to foster positive physical and psychological assets in 3rd- to 5th-grade girls. This was the first investigation, in the series of studies evaluating the *Girls on the Run* program that used a comparison group and an additional time point to evaluate the long-term impact of the program over the complete academic school year.

At preintervention, commitment to physical activity and physical activity levels were higher among participants who were previously exposed to the *Girls on the Run* program when compared with girls who had never participated in the program. Overall commitment to be physically active is particularly important as it has been previously identified to be an important predictor of a physically active lifestyle.^{39,52-54} The parallel relationship that exists between this psychosocial factor and the actual behavior of physical activity was further confirmed in this study.

Despite the higher preintervention commitment to physical activity and physical activity scores among previous participants, hypothesis 1 was only partially confirmed with noted improvements in body size discrepancy among newly exposed girls from pre- to postintervention. The lack of a significant change in body size discrepancy score among previous participants of *Girls on the Run* program was likely due to overall satisfaction with body image at both pre- and postintervention; a possible sustained artifact of prior participation in the program. Although pre- to postintervention change in other psychological and physical assets were not statistically significant, results were intriguing. For example, from pre- to postintervention, self-esteem increased in newly and previously exposed participants and decreased in never exposed girls. This suggests that, although differences were not statistically significant, the 12-week program initiated change in a psychological asset that is perhaps developed over a longer period of time. Commitment to physical activity increased across all 3 exposure groups; however, it appears as if there were greater improvements in the newly exposed participants. Again, this result is promising given that commitment to physical activity is an important precursor to physical activity. With longer follow-up, perhaps these improvements in physical activity commitment could translate to increases in physical activity, which was shown in previous participants.

Similar to hypothesis 1, given the results of the current study, we are only able to partially confirm hypothesis 2. Despite the decrease from pre- to postintervention, physical activity score significantly increased

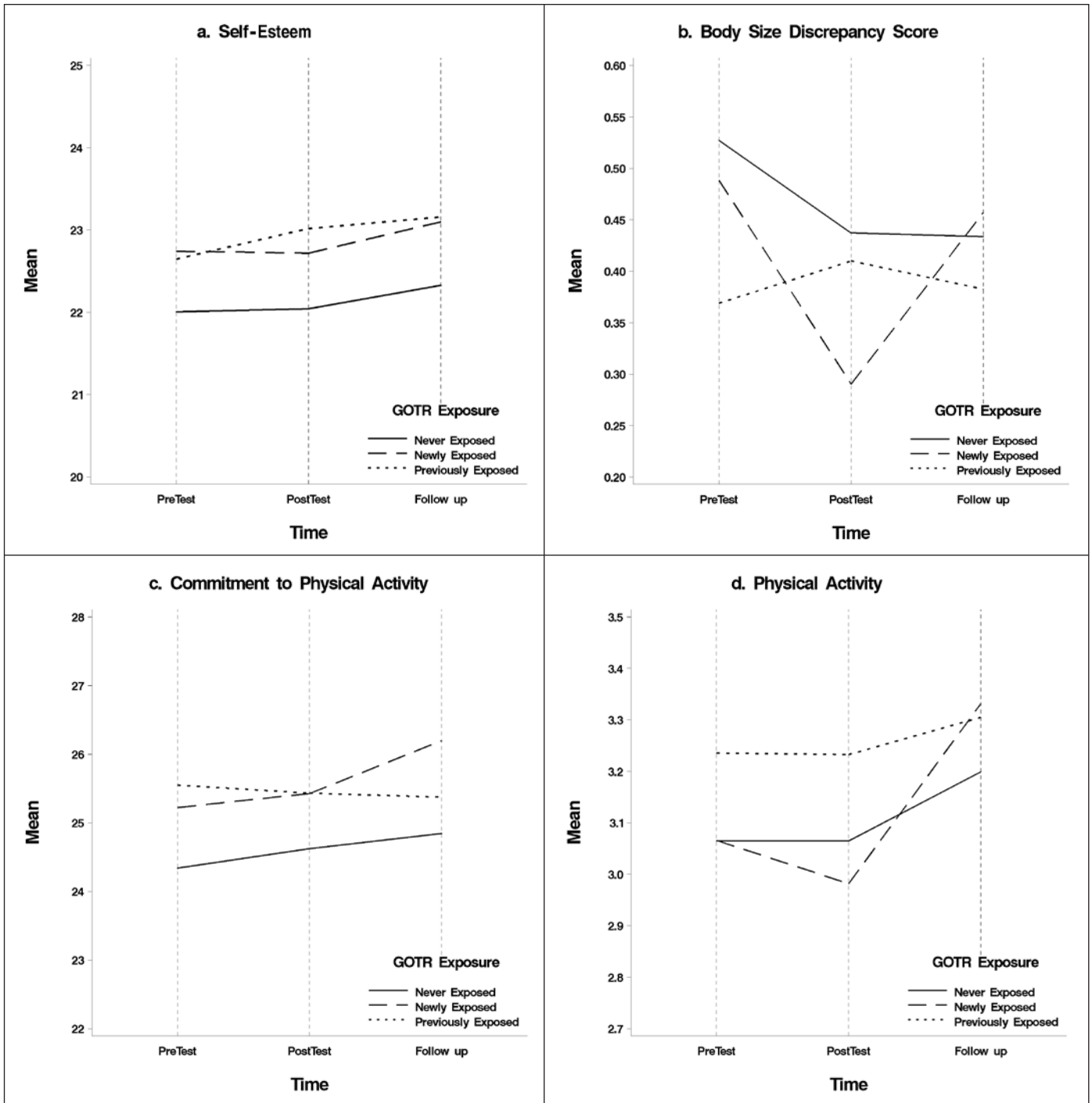


Figure 1 — Psychological and physical asset scores at pretest, posttest, and follow-up among study participants, stratified by *Girls on the Run* exposure status.

from preintervention to follow-up in the never and newly exposed groups. The observed patterns in physical activity over time may be due in part to issues of seasonality. Several previous studies have reported peak physical activity levels during warmer months, which decline

during the cooler months.⁵⁵⁻⁵⁷ This pattern is reflected in the current study in participants never and newly exposed to *Girls on the Run*, with reported levels decreasing from September to December (ie, pre- to postintervention) and rebounding from December to April (ie, preintervention

Table 2 Difference (Standard Error) in Psychological and Physical Assets by *Girls on the Run* Exposure Status

	n	Post- to preintervention			Follow-up to preintervention			Overall group x time <i>P</i> -value
		Difference	<i>P</i>	Adjusted <i>P</i>	Difference	<i>P</i>	Adjusted <i>P</i>	
Psychological assets								
Self-esteem ^a	755							.87
Never exposed		-.15(.26)	.56	.98	.13 (.26)	.62	.99	
Newly exposed		.04 (.43)	.94	1.0	.42 (.43)	.38	.84	
Previously exposed		.26 (.37)	.49	.96	.40 (.37)	.29	.78	
Body size discrepancy score ^b	824							.10
Never exposed		-.08 (.03)	.01	.056	-.08 (.03)	.007	.04	
Newly exposed		-.20 (.07)	.005	.03	-.03 (.07)	.64	1.0	
Previously exposed		-.02 (.06)	.70	1.0	-.05 (.06)	.40	.94	
Physical activity commitment ^c	686							.43
Never exposed		.09 (.28)	.76	1.0	.31 (.28)	.29	.79	
Newly exposed		.28 (.51)	.58	.99	1.05 (.51)	.04	.21	
Previously exposed		-.003 (.44)	.99	1.0	-.06 (.44)	.89	1.0	
Physical assets								
Physical activity ^d	546							.012
Never exposed		-.02 (.03)	.51	.98	.11 (.03)	.005	.016	
Newly exposed		-.11 (.07)	.12	.50	.24 (.07)	<.001	.008	
Previously exposed		.03 (.06)	.60	.99	.12 (.06)	.04	.20	

Note. Data are presented as absolute difference (standard error). Self-esteem^a and physical activity commitment^c models were adjusted for time, *Girls on the Run* exposure status, relevant preintervention psychological value, and exposure status by time terms. Physical activity^d model was adjusted for time, *Girls on the Run* exposure status, relevant preintervention physical asset value, exposure status by time, and preintervention score by time interaction terms. Body size discrepancy score^b model was adjusted for time, *Girls on the Run* exposure status, race/ethnicity, relevant preintervention psychological or physical asset value, exposure status by time, and preintervention score by time terms. Tests are significant at $P < .05$.

^a Scores ranged from 0 to 30; higher scores indicated greater self-esteem. Score based on the mean of the following questions: I am OK with myself; I am a good person; I feel that there are a lot of good things about me; I can do things as well as most other people; I have much to be proud of; I feel useless at times; I have a lot to offer people; I wish I could have more respect for myself; I feel that I am a failure; I take a positive attitude toward myself.

^b Discrepancy score calculated by subtracting ideal body size from perceived body size.

^c Scores ranged from 0 to 36; higher scores indicated greater commitment to physical activity. Sum score based on the following questions: I look forward to physical activity, I wish there were better ways to get healthy than being physically active, physical activity is hard work, I like physical activity, physical activity is very important to me, life is better because I am physically active, physical activity feels good, I like thinking about doing physical activity, I would change my schedule to participate in physical activity, I have to force myself to be physically active, I like being physically active everyday, physical activity is the best thing about my day.

^d Scores ranged from 1 to 5; higher scores indicated higher physical activity participation. The score is comprised of responses to a checklist of 22 leisure and sport activities and 8 questions regarding their physical activity levels over the previous 7 days during specific times during the day or day of the week; it is scored as a mean of all of the activities using a 1–5 scale.

to follow-up). In a previous study by Newman et al (2009),⁵⁸ individuals who participated in a healthy lifestyle program were less prone to seasonal fluctuations in physical activity levels when compared with the comparison group. This phenomenon may partially explain the lack of significant changes in physical activity levels over time among participants who were previously exposed to the *Girls on the Run* program. Further, the lack of statistical difference from preintervention to follow-up

in the previously exposed group may also be due to the consistently higher mean physical activity scores that were reported by participants in this group (ie, significant at postintervention).

Although the use of a quasi-experimental longitudinal study design improves the interpretation of the effectiveness of the *Girls on the Run* program to promote beneficial changes to physical and psychological assets in elementary school aged girls, several limitations should

be considered when interpreting the results of the current study. First, data were collected in 1 school system in Charlotte, NC. Therefore, this may limit the generalizability of the results to a more diverse population of 3rd through 5th-grade girls. In addition, schools participating in the study had the option of having a teacher or study staff member administer the evaluation surveys, which may have differentially affected the participant's perceived coercion; leading to increased social desirability bias. Since participants were not randomized into the exposure groups, self-selection bias may have also influenced the results. However, it is interesting to note that there were no significant differences in any preintervention psychological or physical asset scores between participants who were never or newly exposed to *Girls on the Run* program. All data collected in the study was obtained via self-report; therefore, the results might be limited by recall or social desirability bias. Study data were collected during months that represent 3 distinct seasons of the year (ie, September, December, and April); therefore, physical activity estimates obtained using a past 7-day recall time frame may be affected by issues of seasonality. In addition, as mentioned previously, the school district involved in the current study requested that 2 of the 4 outcome scales (ie, Rosenberg Self Esteem and Commitment to Physical Activity) be modified so that all items were positively valenced. However, even slight alterations to an existing measure may greatly impact the psychometric properties of the survey instrument; including the reliability and validity of the summary scores. Unfortunately, we are unable to determine whether the null study findings were a result of modifying these scales or due to inability of the program to change psychological or physical assets within a short period of time (ie, 12 weeks). However, in previous studies evaluating the *Girls on the Run* program showed significant improvements in both self esteem^{36,39} and commitment to physical activity.³⁷ This illustrates the need in school-based studies for researchers to establish a collaborative and persistent partnership with school leaders and educators throughout the study to optimize the outcomes for all groups involved. Finally, it is suggested that the timing of puberty may influence self-esteem and body image;⁵⁹ however, information regarding pubertal status was not collected in the current study.

The identification of effective programs that use structured physical activity to foster positive youth development are imperative to combat the gender and age-related declines in physical activity across the lifespan. Although we were unable to fully confirm hypothesis 1 and 2, the results of the current study supports the need for a subsequent longitudinal evaluation study of *Girls on the Run*, to better elucidate the elements of the program that encourage physical activity participation and positive asset development in girls as they transition from childhood to early adulthood.

Acknowledgments

The authors thank the 15 Charlotte Mecklenburg Schools for their cooperation during the implementation of this study.

This research was funded by Girls on the Run International (#540683).

References

- Gano-Overway L, Magyar T, Kin M, Newton M, Fry M, Guivernau M. Influence of caring youth sport contexts on efficacy-related beliefs and social behaviors. *Dev Psychol*. 2009;45(2):329–340.
- Zarrett N, Eccles J. The passage to adulthood: challenges of late adolescence. *New Dir Youth Dev*. 2006;111:13–28.
- Centers for Disease Control and Prevention. Physical activity and health. A report of the Surgeon General. In: US Department of Health and Human Services, ed. Atlanta, GA; 1996.
- Strong WB, Malina RM, Blimkie CR, et al. Evidence-based physical activity for school-aged youth. *J Pediatr*. 2005;146:732–737.
- Andersen LB, Harro M, Sardinha LB, et al. Physical activity and clustered cardiovascular risk in children: a cross-sectional study (The European Youth Heart Study). *Lancet*. 2006;368:299–304.
- Eisenmann JC, Katzmarzyk PT, Pe'russe L, Tremblay A, Despres JP, Bouchard C. Aerobic fitness, body mass index, and CVD risk factors among adolescents: the Quebec family study. *Int J Obes*. 2005;29:1077–1083.
- Torrance B, McGuire K, Lewanczuk R, McGavock M. Overweight, physical activity and high blood pressure in children: a review of the literature. *Vasc Health Risk Manag*. 2007;3(1):139–149.
- Janssen I. Physical activity guidelines for children and youth. *Appl Physiol Nutr Metab*. 2007;98:s109–s121.
- Baxter-Jones ADG, Kontulainen SA, Faulkner RA, Bailey DA. A longitudinal study of the relationship of physical activity to bone mineral accrual from adolescence to young adulthood. *Bone*. 2008;43(6):1101–1107.
- Sabo D, Veliz P. *Go out and play: youth sports in America*. East Meadow, NY: Women's Sports Foundation; 2008.
- Wiles NJ, Jones GT, Haase AM, Lawlor DA, MacFarlane GJ, Lewis G. Physical activity and emotional problems amongst youth. *Soc Psych & Psych Epidemiol*. 2008;43(10):765–772.
- Stein C, Fisher L, Berkey C, Colditz G. Adolescent physical activity and perceived competence: does change in activity level impact self-perception? *J Adolesc Health*. 2006;40(5):462–468.
- Marsh H, Kleitman S. School athletic participation: mostly gain with little pain. *J Sport Exer Psychol*. 2003;25:205–228.
- Sabo D, Miller K, Melnick M, Heywood L. *Her life depends on it: physical activity, and the health and well-being of American girls*. East Meadow, NY: Women's Sports Foundation; 2004.
- Tucker Center for Research on Girls & Women in Sport. *Developing physically active girls: an evidence-based multidisciplinary approach*. University of Minnesota, College of Education and Human Development; 2007.
- Hillman CH, Castelli DM, Buck SM. Aerobic fitness and cognitive function in healthy preadolescent children. *Med Sci Sports Exerc*. 2005;37:1967–1974.
- Susan A, Carlson JEF, Lee SM, Maynard LM, Brown DR, Kohl HW. Physical education and academic achievement in elementary school: data from the Early Childhood Longitudinal Study. *American Journal of Public Health*. 2008;98(4):721–727.

18. National Research Council and Institute of Medicine. *Community programs to promote youth development*. Washington, DC: National Academy Press; 2002.
19. Fraser-Thomas J, Cote J, Deakin J. Youth sport programs: an avenue to foster positive youth development. *Phys Educ Sport Pedagogy*. 2005;10(1):19–40.
20. Perkins DF, Noam GG. Chapter 5: characteristics of sport-based youth development programs. *New Dir Youth Dev*. 2007;115:75–84.
21. Petitpas A, Cornelius A, Raalte JV, Jones T. A framework for planning youth sport programs that foster psychosocial development. *T Sport Psychol*. 2005;19:63–80.
22. Berlin RA, Dworkin A, Eames N, Menconi A, Perkins DF. Chapter 6: examples of sport-based youth development programs. *New Dir Youth Dev*. 2007;115:85–106.
23. Weiss M, Wiese-Bjornstal D. Promoting positive youth development through physical activity. *President's Council on Physical Fitness and Sports. Research Digest*. 2009;10(3):1–8.
24. Sallis J. Epidemiology of physical activity and fitness in children and adolescents. *Crit Rev Food Sci Nutr*. 1993;33:403–408.
25. Sallis J, Simons-Morton B, Stone E, et al. Determinants of physical activity and interventions in youth. *Med Sci Sports Exerc*. 1992;12(Suppl16):S248–S257.
26. <http://fitness.gov/betterhealth/ppar.pdf>. Accessed June 17, 2010.
27. Kimm S, Glynn N, Kriska A, et al. Decline in physical activity in black girls and white girls during adolescence. *N Engl J Med*. 2002;347(10):709–715.
28. Trost S, Pate R, Sallis J, et al. Age and gender differences in objectively measured physical activity in youth. *Med Sci Sports Exerc*. 2002;34(2):350–355.
29. Girls' Wilderness Program. 2009 Course Offerings. <http://www.girlswilderness.org/courses/>. Accessed April 6, 2009.
30. G-Row Boston. Programs. <http://www.growboston.org/programs.htm>. Accessed April 6, 2009.
31. PowerPlay. About PowerPlay. www.powerplaynyc.org. Accessed April 6, 2009.
32. Row New York. Mission and history. www.rownewyork.org. Accessed April 6, 2009.
33. Sport for Change. Urban Soccer Girls Program. <http://sportforchange.changemakers.net/node/18859>. Accessed April 6, 2009.
34. Sport for Change. Beautiful no matter what: using ultimate frisbee to teach life skills. <http://sportforchange.changemakers.net/node/14326>, April 6.
35. Sportsmen's Tennis Club. Youth enrichment. www.sportsmenstennisclub.org. Accessed April 6, 2009.
36. DeBate RD, Thompson SH. Girls on the Run: improvements in self-esteem, body size satisfaction and eating attitudes/behaviors. *Eat Weight Disord*. 2005;10:25–32.
37. DeBate RD, Zhang Y, Thompson SH. Changes in commitment to PA among 8-to11-year-old girls participating in a curriculum-based running program. *Am J Health Educ*. 2007;38(5):277–284.
38. DeBate RD, Gabriel KP, Zwald M, Huberty J, Zhang Y. Changes in psychosocial factors and physical activity frequency among 3rd to 8th grade girls who participated in a developmentally focused youth sport program: a preliminary study. *Journal of School Health*. 2009:Submitted, 7/31/08.
39. DeBate RD, Huberty J, Pettee K. Psychometric properties of the commitment to physical activity scale. *Am J Health Behav*. 2009;33(4):425–434.
40. Girls on the Run International. The Girls on the Run Program. <http://www.girlsontherun.org/theprogram.html>. Accessed June 9, 2008.
41. Rosenberg M. *Society and the adolescent self-image*. Princeton, NJ: Princeton; 1965.
42. Collins ME. Body figure perceptions and preferences among preadolescent children. *Int J Eat Disord*. 1991;10:199–208.
43. Neilson AB, Corbin CB. *Physical activity commitment*. Vol 93. Scottsdale, AZ: North American Society of Psychology of Sport and Physical Activity; 1986.
44. Crocker PR, Bailey DA, Faulkner RA, Kowalski KC, McGrath R. Measuring general levels of physical activity: preliminary evidence for the Physical Activity Questionnaire for Older Children. *Med Sci Sports Exerc*. 1997;29(10):1344–1349.
45. Alfonzo VC. Measures of quality of life, subjective well-being, and satisfaction with life. In: Allison DB, ed. *Handbook of assessment methods for eating behaviors and weight related problems: measures, theory and research*. Thousand Oaks: Sage Publications; 1995:23–79.
46. Byrne BM. Investigating measure of self-concept. *Meas Eval Guid*. 1983;16:115–126.
47. Blascovich J, Tomaka J. Measures of Self-esteem. In: Robinson JP, Shaver PR, Wrightsman LW, eds. *Measures of personality and social psychological attitudes*. New York: Academic Press; 1991.
48. Wylie RC. *Rosenburg self-esteem scale (RSE). Measure of self-concept*. Lincoln: University of Nebraska Press; 1989:24–35.
49. Thompson JK. Assessment of Body Image. In: Db A, ed. *Handbook of assessment methods for eating behaviors and weight related problems: measures, theory and research*. Thousand Oaks, CA: Sage Publications; 1995.
50. Janz KF, Lutuchy EM, Wenthe P, Levy SM. Measuring activity in children and adolescents using self-report: PAQ-C and PAQ-A. *Med Sci Sports Exerc*. 2008;40(4):767–772.
51. Holm S. A simple sequentially rejective Bonferroni test procedure. *Scand J Stat*. 1979;5:55–70.
52. Corbin C, Nielson A, Borsdorf L, Laurie D. Commitment to physical activity. *Int J Sport Psychol*. 1987;18:215–222.
53. Martin K, Hausenblas H. Psychological commitment to exercise and eating disorder symptomology among female aerobic instructors. *T Sport Psychol*. 1998;12:180–190.
54. Burke P, Reitzes D. An identify theory approach to commitment. *Soc Psychol Q*. 1991;54(3):239–251.
55. Matthews C, Freedson P, Hebert J, et al. Seasonal variation in household, occupational, and leisure time physical activity: longitudinal analyses from the seasonal variation of blood cholesterol study. *Am J Epidemiol*. 2001;153(2):172–183.
56. Tudor-Locke C, Bassett D, Swartz A, et al. A preliminary study of one year of pedometer self-monitoring. *Ann Behav Med*. 2004;28(3):158–162.
57. Uitenbroek D. Seasonal variation in leisure time physical activity. *Med Sci Sports Exerc*. 1993;25(6):755–760.
58. Newman M, Pettee K, Storti K, Richardson C, Kuller L, Kriska A. Yearly variation and physical activity levels in postmenopausal women. *Med Sci Sports Exerc*. 2009;41(2):322–327.
59. Cash T, Strachan M. Body images, eating disorders, and beyond. In: Lemberg R, ed. *Eating disorders: a reference sourcebook*. Phoenix: The Oryx Press; 1999.