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A Preliminary Test of a Student-Centered Intervention on Increasing Physical Activity in Underserved Adolescents

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Abstract

Background—Previous studies have shown that choice and self-initiated behavior change are important for increasing intrinsic motivation and physical activity (PA), however, little of this research has focused on underserved adolescents.

Purpose—This study examined the effects of a 4-week student-centered intervention on increasing PA in underserved adolescents.

Methods—Twenty-eight students in the intervention school were matched (on race, percentage on free or reduced-price lunch program, gender, and age) with 20 students from another school who served as the comparison group (30 girls, 18 boys; ages 10–12 years; 83% African American; 83% on free or reduced-price lunch). The student-centered intervention was consistent with self-determination (motivation) theory and social cognitive theory in that it emphasized increasing intrinsic motivation and behavioral skills for PA. Intervention adolescents took ownership in selecting a variety of PA activities in which to participate, and they generated coping strategies for making effective PA behavior changes.

Results—Intervention participants showed greater increases in accelerometer estimates of time spent in moderate PA, moderate-to-vigorous PA, and vigorous PA from baseline to Week 4 of the intervention than the comparison group. Intervention participants also showed greater increases in PA motivation and positive self-concept for PA than comparison adolescents.

Conclusions—This study provides preliminary evidence that increasing adolescent involvement and choice of activities may be important in developing future PA interventions for underserved adolescents.

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Introduction

Previous studies have demonstrated that underserved adolescents including minorities and those of low socioeconomic status (SES) are less physically active than adolescents who are nonminorities or of higher SES. Taylor and Sallis (1) reported that only 50% of youth were meeting the Surgeon General's guidelines of engaging in vigorous physical activity (PA) 3 or more days per week for at least 20 min per day and that minority adolescents were less physically active than Whites. Under-served adolescents are also more likely to engage in sedentary behaviors such as television watching than adolescents who are nonminorities or of higher SES (2).

The literature on school-based PA interventions has demonstrated only modest effects on increasing PA in adolescents (3–5). The Planet Health project (3) evaluated a school-based social cognitive theory (SCT) and behavioral choice intervention in sixth and seventh graders on increasing moderate-to-vigorous (MV) PA. There were no significant changes in PA due to the intervention, and only television viewing predicted changes in obesity prevalence. The Minnesota Heart Health Program was a quasi-experimental design in which sixth graders participated in either an SCT intervention or no intervention (4) that was designed to increase PA outside of school physical education classes. After 7 years, girls were more likely to show an increase in PA than boys. In a recent review it was concluded that school-based interventions have demonstrated modest changes in PA primarily in the context of physical education classes (5).

The student-centered PA intervention in this study was based on two theoretical models: SCT and self-determination theory (SDT). Bandura's SCT (6) conceptualizes multiple influences and assumes that individual-cognitive factors, environmental events, and behavior are interacting and reciprocal determinants of each other. SDT (7) proposes that behavior changes that are motivated by intrinsic factors such as novel, enjoyable, self-driven, and satisfying experiences will sustain behavior more so than those behavior changes produced by extrinsic factors (external reward or coercion). One element of the student-centered intervention in this study that is consistent with SDT and expands on past SCT interventions is the focus on allowing students to have choice of physical activities that are offered as part of the program. Previous studies have documented the importance of choice and self-initiated behavior change on increasing intrinsic motivation for engaging in PA (8–10).

A second novel element of the student-centered intervention is the focus on having students develop their own positive coping strategies for making effective lifestyle changes in PA during a videotaped session known as *strategic self-presentation* (11,12). The literature on strategic self-presentation is based on research in the areas of role playing and commitment (13,14), cognitive dissonance theory (15,16), and self-perception theory (17). The theory proposes that one's public display shapes one's private self (18). In a previous study by Wilson et al. (12) students who participated in strategic self-presentation showed greater increases in healthy eating than students who did not participate in strategic self-presentation. Furthermore, the changes in dietary behavior were highly correlated with a positive increase in motivation and self-concept for eating healthy.

In summary, school-based behavioral interventions in children and adolescents have resulted in only modest changes in PA levels (5,19). To increase the effectiveness of PA interventions, more interventions are needed that specifically effect change in the theoretically hypothesized mediators. The purpose of our study was to examine the effects of an innovative student-centered intervention on increasing PA levels and theoretically related psychosocial factors specific to PA (motivation, self-concept, and self-efficacy).

Methods

Participants

The study protocol was approved by the University of South Carolina institutional review board. All student participants and their parents provided informed consent prior to participating in the study. Using a quasi-experimental design, we recruited, with the assistance of school staff, students enrolled in Grade 6(11–14 years) from two middle schools in a rural south-eastern community. At one school 28 children volunteered to enroll in the student-centered after-school PA program. Another middle school in this community (matched on race, gender distribution, age, and proportion on free or reduced-price lunch) was selected as a comparison group (n = 20) to determine the PA levels of adolescents who were not currently engaging in an after-school PA program.

Procedure

Participants provided background and demographic information (see Table 1). Height and weight measurements were obtained by a trained assistant. Students at both the intervention and the comparison schools participated in a 4-week program. The goal for the student-centered intervention was to increase MVPA to 60 min per day based on the guidelines for PA standards in adolescents (20). Adolescents in the student-centered program took ownership in developing the program, selected a variety of physical activities to participate in that were fun and interesting, and participated in generating their own positive coping strategies for making effective PA behavior changes. The participants in the comparison school received 4 weeks (of equivalent hours to the intervention group) of general health education during regular school hours that did not emphasize PA. Measures were obtained at baseline and during Week 4 of the intervention for all participants.

Student-Centered Intervention

The student-centered intervention was implemented on Mondays, Tuesdays, and Thursdays for 2 hr after school. Three trained staff provided oversight for the program, and two staff who were specifically trained in physical education and injury prevention provided structure for the PA elements of the program. The program had three main components: a homework-snack component (30 min), a PA component that included activities that the students selected each week of moderate and vigorous intensity (60 min), and an SCT and motivational component during which trained graduate students taught participants behavioral skills and motivational strategies to increase their PA with friends and at home (30 min).

The intervention was consistent with SDT and SCT in that it emphasized increasing intrinsic motivation and behavioral skills for PA. Strategies to teach specific SCT behavioral skills included self-monitoring, goal setting, and developing strategies for engaging in PA with friends and family. The student-centered intervention included two elements consistent with SDT: (a) allowing the students to develop positive coping strategies for making lifestyle changes in overall PA using a strategic self-presentation (videotaped interview) and (b) allowing the students to participate in program development by selecting a variety of the physical activities offered weekly, developing a program name and motto, and developing ideas for promoting PA to friends and peers. Each week the students generated a list of physical activities that they wanted to engage in for the following week and the entire group voted on the top two choices. The activities that were selected included basketball, football, hip-hop dance, step dance, Double Dutch jump rope, and dodgeball.

Strategic Self-Presentation Videotape Session

Participants in the student-centered intervention participated in a strategic self-presentation videotape—a methodology that has been previously described in detail (11). Briefly, this motivational approach facilitates high levels of personal involvement through strategic self-presentation that enhances motivation and self-concept for PA by encouraging adolescents to develop their own strategies for improving PA habits. Participants were informed that their task was to advise other students on how to handle problem situations in a videotaped interview portraying their own positive coping strategies. To induce self-presentation processes, we asked students to focus on the positive things they did to reach their daily PA goal and to focus on how they managed to overcome challenges in changing their PA habits. To induce commitment to their public behavior, we used the following procedure: Students (a) were videotaped during an interview session, (b) viewed the videotapes during their next session, and (c) were given the opportunity to revise their videotapes until they approved of the quality of their presentation.

Process Evaluation Program Components

The investigators identified certain “essential elements” that would characterize the student-centered PA program that were developed into a Process Evaluation Checklist. Attendance was recorded and the checklist was completed once per week during the study period by an independent evaluator.

Measurement of Physical Activity (Accelerometers)

Objective assessments of PA behavior were obtained for time spent in moderate (M) PA, MVPA, and vigorous (V) PA. PA behavior was measured over 5 consecutive days (Monday through Friday) using activity monitors (MTI, Shalimar, Florida). Pate (21) as well as his colleagues (22,23) have demonstrated adequate interinstrument reliability and validity of this activity monitor in children ages 10 to 14 years. Monitors were attached to adjustable belts and worn over the right hip. After collection, stored activity counts were downloaded and saved to an IBM-compatible computer. Minute-by-minute activity counts were uploaded to a Visual Basic data reduction and reduced to time spent in MPA (3–5.9 metabolic equivalents [METS]), MVPA (≥ 3 METS), and VPA (≥ 6 METS).

Psychosocial Variables

Motivation for PA—A 10-item questionnaire was used to assess PA motivation that has been shown to have adequate reliability and validity in minority adolescents (12). Examples of these items include “I am very involved in making sure that I get plenty of exercise each day” and “I am the kind of person who gets excited about exercising everyday.”

Self-concept for PA—A 10-item scale was used to assess self-concept for PA that has been shown to have adequate reliability and validity in minority adolescents (12). Examples of PA-related self-concept items include “I take pride in exercising regularly” and “Exercising regularly is a very important part of my everyday life.”

PA self-efficacy—PA self-efficacy was measured with the Self-Efficacy for Exercise Behavior Scale (24). Participants reported how confident they felt that they could make PA changes consistently for at least 6 months. The 30-item scale includes three factors: preventing relapse, target behaviors, and behavioral skills rated on a scale ranging from 1 (*very unsure I can*) to 6 (*very sure I can*). The reliability and validity of this scale has also been demonstrated in minority adolescents (12).

Enjoyment for PA—Participants completed an enjoyment scale (25) for a range of physical activities at the end of each week. The scale ranged from 1 to 7, with high scores representing more enjoyment. This scale has been validated in adolescent populations (24).

Results

Demographic and Baseline Characteristics

Demographic and baseline characteristics of the sample are presented in Table 1. There were no significant group differences across baseline measures.

Scale Reliabilities

The reliability coefficients were .90 for the PA motivation scale, .90 for the PA self-concept scale, and .89 for PA self-efficacy and ranged from .87 to .94 for enjoyment across the 4 weeks of the program.

Process Evaluation

Attendance—Twenty-eight students (64% girls, 36% boys) were enrolled in the intervention program. The retention rate was 86%, with 4 students dropping out of the program. Nineteen out of 24 participants (79%) missed none or only 1 day of the program. Four students (17%) missed 2 or 3 days. Only 1 student missed more than 3 days.

Intervention adherence—The Process Evaluation Checklist indicated the program followed the established essential elements. On all 4 days that the process observation data were recorded, students were engaged in PA for at least 50 min (the one exception was the 15 min that a group watched a video on Double Dutch jump roping). Students had at least two different choices of physical activities, and all activities included MVPA every week of the program. Students were engaged in behavioral skills and motivational strategy activities for at least 25 min on 3 of 4 days. Students were engaged in homework–snack time for 30 min all 4 days. On the basis of this data, the goal of including the three essential components in the program was reached.

Physical Activity (Accelerometer) Outcomes

Table 2 presents the accelerometer data (unadjusted means) for the intervention versus comparison participants. The accelerometer values in Table 2 are consistent with other published studies (26). Repeated measures analyses (controlling for sex and body mass index) demonstrated a significant School × Time interaction for MPA, MVPA, and VPA ($p < .02$ for all). Participants in the student-centered intervention showed a greater increase in time spent in MPA than those in the comparison group (adjusted means and standard errors were 99.36 ± 5.88 vs. 72.63 ± 5.88), MVPA (adjusted means and standard errors were 113.94 ± 6.27 vs. 78.78 ± 6.27), and VPA (adjusted means and standard errors were 11.33 ± 1.07 vs. 5.31 ± 1.07).

Further analyses were conducted comparing accelerometer estimates of program versus nonprogram days. There were no significant differences in PA levels for MPA (means and standard deviations were 101.47 ± 29.59 vs. 93.52 ± 36.30) or MVPA (means and standard deviations were 118.30 ± 34.52 vs. 101.65 ± 39.79) for program versus nonprogram days. However, VPA (means and standard deviations were 16.34 ± 14.42 vs. 8.13 ± 5.49, $p < .02$) was greater during program as compared to nonprogram days.

Psychosocial Outcomes

Table 3 shows the theoretical psychosocial variables for participants in the student-centered program versus comparison program (unadjusted). A repeated measures analysis (controlling

for sex and body mass index) demonstrated a significant School × Time interaction for PA motivation and self-concept ($p < .01$ and $p < .056$, respectively). Adolescents in the student-centered program showed a greater increase in measures of PA motivation (adjusted means and standard errors were 4.57 ± 0.16 vs. 3.82 ± 0.17) and positive self-concept (adjusted means and standard errors were 4.45 ± 0.14 vs. 4.04 ± 0.15) than adolescents in the comparison program. Enjoyment for physical activities ranged from 6.42 ± 1.06 to 6.89 ± 0.20 for the intervention group over the 4-week program.

Discussion

This study examined the effects of an innovative student-centered intervention on increasing PA and psychosocial factors of motivation, self-concept, and self-efficacy for PA. Overall, the results of this study provide preliminary support demonstrating the feasibility of the student-centered after-school intervention for increasing time spent in MPA, MVPA, and VPA. Comparisons of program and nonprogram days also revealed that only VPA was significantly greater during program as compared to nonprogram days. In addition, compared to the control group, the intervention group showed significant increases in PA motivation and positive self-concept for PA.

This study provides partial support for the importance of allowing adolescents to have choice in developing and selecting PA preferences as part of an intervention program, although the study design did not allow us to isolate this effect. The student-centered intervention differs from other self-management programs in that not only did participants have a choice weekly in what activities were offered but they also took ownership in developing a program name and motto and in promoting the program to friends. In addition, the strategic self-presentation methodology is also hypothesized to operate through creating a positive shift in self-concept and by increasing public commitment. These constructs are not typically essential to other self-management approaches. Student attendance was quite high, and very few participants dropped out of the intervention program. Both moderate and vigorous intensity PA increased in the intervention students but not in the comparison students as a result of this innovative program. These results are consistent with other studies that have shown that increasing choice can lead to greater participation in PA programs among adults (9). No increase in PA was seen in the comparison group, and there was a trend toward decreasing PA in this group. This trend may have been related to the fact that it rained at posttest, and although measures were obtained on both groups during the same week, only the intervention group may have had access to indoor PA facilities after school. The results from our study and other previous studies suggest that perceived choice and self-initiated behaviors may be instrumental in increasing intrinsic motivation for PA.

Students in the intervention group showed greater increases in motivation and self-concept for PA relative to the comparison group. Thus, this study demonstrates that the intervention successfully influenced theoretically based psychosocial measures for increasing PA. These results are consistent with previous studies that have evaluated motivational influences on health behaviors in adolescents (12) and with previous work by Ferrer-Caja and Weiss (8) that examined the relationships among intrinsic motivation, effort, and persistence in the physical education context in high school students. The findings from the study presented here and previous studies suggest that increasing intrinsic motivation may lead to greater behavioral changes in adolescents.

It is noteworthy in this study that changes in self-efficacy were not significantly impacted by the intervention program. Other studies have shown self-efficacy for PA to be an important determinant of PA behavior (12,27–29). The Child and Adolescent Trial on Cardiovascular Health is one of the largest clinical trials to examine the effects of an SCT approach on

improving diet and increasing physical activity in children (27–29). Intermittent effects for self-efficacy were observed for increasing physical activity. Trost et al. (30) examined determinants of PA in sixth-grade African American youth and reported that relative to adolescent boys who were inactive, boys who exhibited three or more 20-min bouts of MVPA a week had higher levels of self-efficacy. Relative to inactive adolescents girls, active girls reported significantly higher levels of PA self-efficacy and were significantly less likely to watch television or play video games. The findings from this study suggest that this brief student-centered intervention was more effective in increasing motivation and positive self-concept for PA than in increasing self-efficacy about behavioral skills. However, further research is needed over a longer duration of time to determine the full impact of the intervention on psychosocial factors. This study provides preliminary support suggesting that future interventions might benefit from designing components that directly target increasing motivation and positive self-concept among adolescents. Because adolescence is a time of increasing autonomy, it is important to acknowledge the need for independence and self-initiated behavior change. The student-centered intervention presented here is an innovative approach that is developmentally relevant for adolescents because it allows them to choose their own methods for making health behavior changes.

There are several limitations with our study. First, the study was a quasi-experimental design and included only a small number of participants. Another limitation is that because of the multicomponent approach, it is difficult to know which components of intervention were effective. Further research is needed to better determine the efficacy of the student-centered intervention in increasing PA in a larger sample of participants in a randomized clinical trial. In this study the comparison group did not participate in any after-school program, although they did participate in a general health education program during classroom hours. Future research is needed to include comparison groups that have opportunities for after-school programs that may be more typical in nature than no after-school program as was the design in this study. A longer intervention would also require extensive training and process evaluation to ensure that essential elements of SCT and SDT would be implemented in a consistent fashion.

This study provides preliminary evidence for the feasibility of increasing PA through a student-centered program that focused on increasing intrinsic motivation and behavioral skills in underserved adolescents. Future research is needed to more clearly delineate which elements of the program are most effective in changing PA and psychosocial factors for increasing PA. This program may ultimately have important implications for promoting and sustaining long-term health behavior changes in youth who may be at an increased risk for developing obesity and related health consequences.

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TABLE 1

Demographic and Baseline Characteristics

Characteristic	Student-Centered Program	Comparison Program
Sample size	28	20
Sex (% females)	61%	85%
Race (% African American)	85%	80%
Free/Reduced-price lunch (% yes)	89%	75%
After-school program (% yes)	11%	19%
Height (cm)	152 ± 6	151 ± 9
Weight (kg)	49 ± 11	46 ± 15
Body mass index (kg/m^2)	21 ± 4	21 ± 5
Age (years)	11 ± 0.6	11 ± 0.7

Note. All *ps* = *ns*.

TABLE 2

Unadjusted Average Minutes of Physical Activity (PA) Based on Accelerometer Assessment for 5 Days

	Baseline	Postintervention
Student-centered program		
Average MPA min/day	81.05 ± 34.41	98.22 ± 27.22
Average MVPA min/day	89.10 ± 40.31	111.50 ± 29.69
Average VPA min/day	6.66 ± 4.99	10.5 ± 15.74
Comparison program		
Average MPA min/day	89.95 ± 33.24	73.77 ± 27.19
Average MVPA min/day	104.25 ± 41.35	81.22 ± 30.45
Average VPA min/day	11.33 ± 8.34	6.13 ± 5.40

Note. There was a School × Time interaction, with participants in the student-centered program showing a greater increase in moderate (M) PA, moderate-vigorous (MV) PA, and vigorous (V) PA from baseline to intervention than comparison adolescents ($p < .01$).

TABLE 3

Unadjusted Means for Psychosocial Measures at Baseline and at the End of the 4-Week Intervention

	Baseline	Postintervention
Student-centered program		
PA motivation	3.88 ± 1.34	4.54 ± 1.07
Self-concept PA	4.03 ± 1.17	4.39 ± 1.05
PA self-efficacy	4.10 ± 1.21	4.43 ± 1.48
Self-efficacy behavioral skills	4.35 ± 1.07	4.65 ± 1.09
Comparison program		
PA motivation	3.95 ± 1.04	3.85 ± 1.28
Self-concept PA	4.20 ± 1.26	4.12 ± 1.36
PA self-efficacy	3.71 ± 1.30	3.64 ± 1.37
Self-efficacy behavioral skills	4.64 ± 1.09	3.90 ± 1.42

Note. There was a School × Time interaction, with participants in the student-centered program showing a greater increase in motivation ($p < .01$) and self-concept ($p < .05$) than comparison adolescents. PA = physical activity.