

## Adolescent Physical Activity Participation and Motivational Determinants Across Gender, Age, and Race

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**Background:** Physical activity (PA) declines as adolescents get older, and the motivational determinants of PA warrant further investigation. The purposes of this study were to investigate the amount of physical and sedentary activity that adolescents participated in across age, gender, and race, and to investigate adolescents' attraction to PA and their perceived barriers and benefits across age, gender, and race. **Methods:** High school students ( $N = 1163$ ) aged between 13 and 16 years completed questionnaires on minutes and intensity of physical and sedentary activity, interests in physical activity, and perceived benefits and barriers to participating in PA. **Results:** A series of multivariate analyses of variance were conducted and followed up with discriminant function analysis. PA participation decreased in older females. In addition, fun of physical exertion was a primary attraction to PA for males more than females. Body image as an expected outcome of participating in PA contributed most to gender differences. **Conclusion:** There is a need to determine why PA drops-off as females get older. Findings underscore the importance of structuring activities differently to sustain interest in male and female adolescents, and highlights motives of having a healthy body image, and making PA fun to enhance participation.

**Keywords:** sedentary, adolescence, attraction, barriers

The positive role that regular physical activity (PA) has on both psychological and physiological well-being has been well documented in the empirical literature.<sup>1,2</sup> In particular, psychological and emotional benefits have been reported to decrease anxiety and depression, increase self-efficacy and self-esteem, as well as improve quality of life.<sup>3</sup> Despite the benefits of physical activity participation and the health risk factors associated with a sedentary lifestyle,<sup>4-6</sup> the statistics over the past decade demonstrate that many adolescents are not exercising regularly, and in fact, decrease their participation as they get older.<sup>7</sup> Accordingly, recommendations and physical activity guidelines have been put forward from a variety of professional organizations (eg, Healthy People 2000, 2010) to increase levels of physical activity.<sup>8</sup> Nonetheless, it is frequently reported that children and adolescents of all age groups do not participate in sufficient levels of PA to meet recommended guidelines.<sup>7</sup> In particular, research has demonstrated that in the adolescent population, the amount of physical activity (and subsequent energy expenditure) declines significantly as age increases.<sup>7,9</sup>

For example, Kemper<sup>10</sup> found that the amount of physical activity and subsequent energy expenditure declines from ages 10 to 21 with the most dramatic decreases occurring from 13 to 17 years of age. In addition, some research has shown that participation in regular physical activity declines more in females than in males.<sup>11</sup> One explanation put forward as to why there appears to be a decreasing trend in PA as adolescents get older is the lack of understanding of their motives for participation as well as perceived barriers preventing participation. To further knowledge in this area, an increasing amount of attention is being given to identifying the motivational determinants of physical activity in adolescents as well as barriers that are perceived to limit participation. Determinants have been described as a function of either the individual's attitude toward a behavior or attitudes of significant others such as parents and peers.<sup>12</sup> Early research in this area<sup>13,14</sup> has highlighted that for the adolescent population, social, psychological, and environmental determinants appear to be the most promising modifiable variables to investigate.

While age has been reported as a key determinant of the downward trend of activity, a particular focus has also been placed on gender and ethnic groups.<sup>15,16</sup> Specifically, findings reporting on gender differences demonstrate some consistency with adolescent boys being more active than their female counterparts<sup>7</sup> and this trend is amplified

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from childhood to adolescence. However, while studies such as Trost et al<sup>16</sup> and Mabry et al<sup>15</sup> have considered physical activity attitudes of African American adolescents, they only used girls. This negates an opportunity to compare the frequently reported contrast between genders. Similar studies applying cross-sectional analyses on adolescent girls<sup>17</sup> have found differing determinants of physical activity between White and African American adolescents. Such results have signaled positive physical activity attitudes and paternal support to be significantly different between these ethnic groups. Specifically, Mabry et al<sup>15</sup> reported that African American girls were more accepting of their body image whereas their White counterparts found a thin body somatotype and a positive self-image more desirable. However, even across a range of ethnic groups, Morgan et al<sup>18</sup> reported that girls were at a disadvantage to boys because they had lower physical self-perceptions, enjoyed PA less, and perceived fewer opportunities to partake in PA. It is these variables that must be understood to provide equitable interventions and opportunities and to promote PA effectively to adolescents of both genders and different ages.

It is clear that identifying young peoples' attitudes and motives (and barriers) toward activity is a critical ingredient for developing effective curricula that are consistent with these attitudes and interests.<sup>12</sup> Recent evidence has suggested that adolescents' attitudes toward physical activity differ significantly across many psychosocial factors and that a greater understanding of values, attitudes and barriers is required to develop effective interventions.<sup>16</sup> More specifically, there is a lack of information on perceived motives (and barriers) toward PA when considering subpopulations (eg, male and female adolescents; black and white adolescents) at different ages categorizing the adolescent years. Therefore, the purposes of the present investigation were to: (a) investigate the amount of physical and sedentary activity that adolescents participated in across age, gender, and race, and (b) to investigate adolescents' attraction to PA and their perceived barriers and benefits across age, gender, and race.

## Methods

### Participants

Participants were 1163 adolescents (703 females and 460 males) between 13 and 16 years from Midwest public and private high schools in the United States. Participants were recruited from a total of 12 schools in which the mean enrollment per school was 900 students with 112 being African Americans and 988 Caucasian. This sample had a similar racial distribution to the US population (ie, 10–20% African American). The participants were grouped into 13 to 14 years ( $n = 479$ ) and 15 to 16 years ( $n = 610$ ) of age. All participants were volunteers and signed a written consent form following initial contact and written permission from parents and the school physi-

cal education teacher. Data collected from students who had not been able to participate in physical activity due to illness/injury were excluded from the analysis.

### Assessment of Physical and Sedentary Activity

Following the data collection of participants' demographic information (ie, age, grade in school, gender, ethnicity), the Self-Administered Physical Activity Checklist (SAPAC) was used to obtain measures of physical activity levels. Sallis and his colleagues<sup>19</sup> provided validity (ie, .57 correlation with heart rate index using 1-day recall) for self-report measures of physical activity for children and youth of both genders as well as ethnic groups. This self-report measure provides a list of 21 physical activities (with space to add additional activities) as well as an additional section for reporting TV/video viewing and video/computer games. To complete the questionnaire, participants report the minutes they spent in each activity during 3 time periods from the previous day. These time periods were "before," "during," and "after" school. Participants were also asked if the activity caused them to "breathe hard" or "feel tired" none, some, or all of the time to provide a measure of intensity. To calculate the energy cost of physical activities [expressed as METs (MET = the ratio of exercise metabolic rate) ranging from 3.0–10.0] that the participants recorded, the activities and the intensity of activities were classified using a standard compendium of physical activities, which was designed by Ainsworth and her colleagues.<sup>20,21</sup> This coding scheme enabled each activity to be classified by rate of energy expenditure and the specific type of activity. For example, basketball has a MET value of 7.0 and is therefore considered a vigorous/hard activity (6.0+). To correct the MET value so that it was in accordance with the intensity that the individual played with, the MET value is multiplied by 1.25 (out of breath most of the time), 0.75 (out of breath none of the time), or 1.0 (out of breath some of the time). Finally, MET values were multiplied by the minutes of physical activity to obtain an overall estimate of energy expenditure for physical activity (ie, MET-minutes). It is estimated that energy expenditure ranging between 600 and 1000 MET-minutes is sufficient to obtain health benefits from exercise. However, the nearer the energy expenditure is to 1000 MET-minutes, the more effective the health benefits will likely be.<sup>22</sup>

### Assessment of the Motivational Determinants and Barriers to Physical Activity

The 25-item Children's Attraction to Physical Activity (CAPA) scale assessed interest in physical activity. The CAPA scale<sup>23</sup> is based on the concept that youths' motivation to participate in physical activity is dependent on their affective reactions to various dimensions of involvement. Five distinct dimensions of physical activity

experiences that children find personally attractive or unattractive have been identified. These include (a) liking of vigorous exercise (ie, children's feelings about engaging in vigorous exercise), (b) liking of games and sport (ie, the fun experienced through playing games and sports), (c) importance of physical activity (ie, children's cognitions about the importance of exercise to physical health), (d) peer acceptance in game and sports (ie, children's popularity with their peers during participation in games and sports), and (e) fun of physical exertion (ie, children's like or dislike of exertional aspects of physical activity such as getting sweaty or out of breath).<sup>23</sup> The CAPA items are presented in a structured-alternative format. In particular, participants respond to each item using a 4-choice response format in which they are asked to first decide which statement is true for them, followed by choosing the box that indicates whether this statement is "really true" for them or just "sort of true" for them. Each subscale score ranges between 5 (not attracted to physical activity) and 20 (attracted to physical activity). A sufficient level of internal reliability has been reported in the range of .62 to .78.<sup>24</sup> In addition, since the sample used in the current study were aged between 13 and 16 years, internal reliability coefficients were computed with the present sample. Coefficients ranged between .66 and .74 on the 5 CAPA subscales.

The participants' perceptions of barriers and benefits for participation in physical activity were assessed by the Expected Outcomes and Barriers for Physical Activity Scale.<sup>25</sup> This scale has 26 items (12 items for expected outcomes and 14 items for barriers), with each item being scored on a 5-point likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). Items pertaining to expected outcomes/benefits from participating in regular physical activity are separated into the 3 subscales of psychological (5 items with a score ranging from 5–25), body image (4 items with a score ranging from 4–20), and health (3 items with a score ranging from 3–15). The 3 subscales pertaining to perceived barriers to regular physical activity participation are lack of time (4 items with a score ranging from 4–20), effort (6 items with a score ranging from 6–30) and limiting health (4 items with a score ranging from 4–20). Therefore, for each subscale a lower score determines disagreement (ie, it is not an expected outcome of PA or a barrier limiting participation in PA), while a higher score determines agreement (ie, it is an expected outcome of PA or a barrier limiting participation in PA) on the respective subscales. Steinhart and Dishman<sup>25</sup> reported internal consistency coefficients ranging from .47 to .78, and test-retest stability correlations ranging from .66 to .85.

## Procedures

Following institutional ethics approval, initial permission was obtained to conduct the study by the school principal. In total, 14 school principals were contacted and 12 agreed to participate (86% consent rate). Following this, contact was made with the head physical education

teacher in each school who then assisted with obtaining written consent forms from parents. Participants were assured confidentiality and anonymity in their responses. Data collection took place during a regularly scheduled physical education class. All data were collected in person by the primary investigator which enabled clear instructions to be provided to the participants. This also enabled the participants to ask any questions that they had regarding the study and questionnaires that were administered. Standardized instructions for each questionnaire were provided to the participants before starting each questionnaire. To help ensure participants understanding of the intent of each specific inventory, the primary investigator waited until each participant had completed the first questionnaire before providing new instructions for the next questionnaire. All questionnaires were completed within 35 minutes.

## Data Analysis

The first research question examined whether the amount of adolescent physical and sedentary activity varied as a function of their age, gender and race. A  $2 \times 2 \times 2$  (age  $\times$  gender  $\times$  race) multivariate analysis of variance (MANOVA) was conducted. The dependent variables for this analysis were the 3 scores from minutes of moderate-to-vigorous physical activity, minutes of sedentary activity, and energy expenditure (as measured by the SAPAC). The independent variables were age (13–14 years, 15–16 years), gender (male, female), and race (White, African American). Significant multivariate effects were followed up by examining the discriminant function loadings. The second purpose was to investigate whether adolescents' attraction to physical activity and their perceived expected outcomes and barriers toward physical activity participation varied as a function of age, gender, and race. Two separate  $2 \times 2 \times 2$  (age  $\times$  gender  $\times$  race) MANOVAs were conducted. The independent variables were age (13–14 years, 14–15 years), gender (male, female), and race (white, African American). In the first MANOVA, the dependent variables were the 5 subscales scores from the CAPA (liking of vigorous exercise, liking of games and sport, importance of physical activity, peer acceptance in game and sports, fun of physical exertion). In the second MANOVA, the dependent variables were the 6 subscales scores from the Expected Outcomes and Barriers to Physical Activity Participation Scale (psychological outcome, body image outcome, health benefit outcome, time barrier, effort barrier, obstacle barrier). Significant multivariate effects were followed up by examining the discriminant function loadings.

## Results

### Amount of Physical and Sedentary Activity

Results revealed that both the gender main effect, Wilks's lambda = .96,  $F(3, 618) = 7.55$ ,  $P < .001$ , and the race

main effect, Wilks's lambda = .93,  $F(3, 618) = 14.95$ ,  $P < .001$ , were significant. The descriptive statistics for each group are presented in Table 1. For the gender main effect, using a minimal loading of .30, examination of the canonical discriminant function loadings<sup>26</sup> indicated that minutes of sedentary activity and energy expenditure contributed most to group differences (see Table 2). Specifically, examination of the group means indicated that males participated in more minutes of sedentary activity than females. For energy expenditure, males scored higher than females indicating that when male adolescents were participating in physical activity, their participation was at a higher intensity than that of

females' participation. In regard to the significant race main effect, the discriminant function loadings indicated that minutes of sedentary activity contributed most to the group differences (see Table 2). Examination of the group means (see Table 1) indicated that African American adolescents participated in more minutes of sedentary activity than White adolescents.

In addition to the main effects for gender and race, results also revealed a significant age  $\times$  gender interaction, Wilks's lambda .96,  $F(3, 618) = 6.55$ ,  $P < .001$ , and gender  $\times$  race interaction, Wilks's lambda .98,  $F(3, 618) = 2.78$ ,  $P < .05$  for minutes of moderate-to-vigorous physical activity. The group means are presented in Tables

**Table 1 Descriptive Statistics by Age, Gender, and Race for the Self-Administered Physical Activity Checklist, Children's Attraction to Physical Activity Scale, and Expected Outcomes and Barriers for Physical Activity Scale**

	Age				Gender				Race			
	13–14 years		15–16 years		Male		Female		White		African American	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Self-Administered Physical Activity Checklist												
Minutes of sedentary activity	173.6	141.04	161.8	139.87	200.0	145.29	141.6	128.88	155.0	125.60	254.0	185.60
Minutes of moderate-to-vigorous activity	114.9	101.28	100.93	93.6	122.0	106.9	96.6	88.11	103.3	90.90	142.5	132.07
MET-minutes	919.03	808.35	838.72	888.21	1043.9	1053.77	769.8	697.80	854.0	850.88	1077.43	958.62
Children's Attraction to Physical Activity Scale												
Vigorous physical activity	12.8	2.33	12.9	2.3	13.0	2.37	12.8	2.27	13.0	2.28	12.4	2.47
Liking of games and sports	12.9	1.53	13.1	1.56	13.1	1.6	13.9	1.51	13.1	1.50	12.8	1.84
Importance of physical activity	15.9	2.79	15.8	2.88	18.8	2.92	15.8	2.76	15.9	2.78	15.4	3.01
Peer acceptance in games/sports	14.9	3.33	15.1	3.05	14.8	3.14	15.1	3.22	15.0	3.19	15.1	3.23
Fun of physical exertion	14.1	3.33	14.4	3.35	14.7	3.18	14.1	3.39	14.4	3.34	13.6	3.17
Expected Outcomes and Barriers for Physical Activity Scale												
Psychological benefits	18.4	3.15	18.4	3.18	18.2	3.55	18.6	2.85	18.4	3.12	18.4	3.55
Body image benefit	15.7	3.11	15.8	3.36	14.8	3.4	16.3	3.06	15.8	3.24	15.0	3.42
Health benefit	12.6	1.92	12.8	1.88	12.5	2.14	12.9	1.73	12.8	1.89	12.4	2.23
Time barrier	11.2	3.45	12.04	3.3	11.2	3.5	12.0	3.27	11.9	3.34	10.1	3.41
Effort barrier	15.3	4.93	16.1	4.74	15.1	5.25	16.2	4.54	15.9	4.81	14.0	4.64
Obstacle barrier	9.4	2.77	9.47	2.78	9.1	2.97	9.5	2.66	9.4	2.73	9.0	3.21

**Table 2 Discriminant Function Loadings for Gender and Race Main Effect**

	Discriminant function loadings	
	Gender main effect	Race main effect
Self-Administered Physical Activity Checklist		
Minutes of sedentary activity	0.74	0.94
Minutes of moderate-to-vigorous activity	0.55	0.36
MET-minutes	0.65	0.18
Children's Attraction to Physical Activity Scale		
Vigorous physical activity	0.35	0.52
Liking of games and sports	0.15	0.58
Importance of physical activity	-0.42	0.34
Peer acceptance in games/sports	-0.20	-0.22
Fun of physical exertion	0.67	0.58
Expected Outcomes and Barriers for Physical Activity Scale		
Psychological benefits	0.16	-0.01
Body image benefit	0.85	0.36
Health benefit	0.45	0.30
Time barrier	0.46	0.88
Effort barrier	0.42	0.58
Obstacle barrier	0.34	0.29

*Note.* A minimal loading of .30 was considered significant.

**Table 3 Descriptive Statistics for Male Adolescents by Age and Race**

Questionnaire subscales	White males				African American males			
	13-14 yrs		15-16 yrs		13-14 yrs		15-16 yrs	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Self-Administered Physical Activity Checklist								
Minutes of sedentary activity	189.09	122.83	199.86	151.34	229.52	153.93	313.66	189.24
Minutes of moderate-to-vigorous activity	107.23	97.14	124.45	93.80	174.95	99.23	191.25	244.81
MET-minutes	947.13	864.53	1075.31	1165.45	1252.10	727.03	1272.64	1661.00
Children's Attraction to Physical Activity Scale								
Vigorous physical activity	13.22	2.36	13.13	2.30	12.61	2.54	12.38	2.76
Liking of games and sports	13.14	1.54	13.28	1.52	12.51	1.54	13.00	2.35
Importance of physical activity	16.04	2.82	15.93	2.99	14.92	3.37	15.35	3.21
Peer acceptance in games/sports	14.93	3.20	14.74	3.18	14.53	2.99	16.22	3.07
Fun of physical exertion	14.82	2.86	14.74	3.43	13.20	3.16	14.77	2.39
Expected Outcomes and Barriers for Physical Activity Scale								
Psychological benefits	18.28	3.54	18.16	3.53	17.96	4.09	18.88	4.24
Body image benefit	15.04	3.10	15.05	3.42	14.54	3.58	13.64	4.22
Health benefit	12.46	2.11	12.62	2.04	12.56	2.20	12.15	3.02
Time barrier	11.07	3.55	11.71	3.42	9.65	3.26	10.05	4.32
Effort barrier	14.75	4.96	15.65	5.29	13.48	4.90	13.10	5.13
Obstacle barrier	9.12	2.59	9.36	3.04	9.13	3.81	8.26	3.44

3 and 4. Regarding the age  $\times$  gender interaction, the greatest difference between males and females occurred in the older age group of the adolescents (ie, 15–16 year-old age group). Specifically, older males increased their participation in minutes of moderate-to-vigorous physical activity while older females decreased their participation. Thus, physical activity leaders need to determine why physical activity drops-off as females get older and possibly structure activities different to sustain their interest. For the gender  $\times$  race interaction in minutes of moderate-to-vigorous activity, African American males reported participating in more minutes of moderate-to-vigorous physical activity than White males (see Table 3), while there was little difference between African American females and white females (see Table 4). Results also revealed that the age  $\times$  gender interaction was significant for both minutes of sedentary activity scores ( $P < .01$ ) and energy expenditure scores ( $P < .01$ ). The greatest differences between males and females occurred in the 15 to 16 year-old age group. Specifically, the 15 to 16 year-old males (see Table 3) increased their minutes of sedentary activity as well as energy expenditure while females in the 15 to 16 year-old age group (see Table 4) decreased their minutes of sedentary activity and energy expenditure. Thus, when older males do participate in physical activity they do

so at a higher intensity, while older females participate in physical activity with decreased intensity.

### Attraction to Physical Activity

Both the gender main effect, Wilks's lambda = .98,  $F(5, 988) = 4.04$ ,  $P < .001$  and the race main effect, Wilks's lambda = .98,  $F(5, 988) = 3.99$ ,  $P < .001$ , were significant. The descriptive statistics are presented in Table 1. For gender, the discriminant function loadings (see Table 2), using a minimal value of .30,<sup>26</sup> indicated that participating in physical activity for fun of physical exertion contributed most to gender differences. Examination of the group mean scores indicated that male adolescents report having more fun than female adolescents participating in activities where they can exert the physical characteristics of PA such as getting out of breath (see Table 1). Thus physical activity leaders may need to pay special attention to making sport and exercise more fun for females, which would likely enhance participation and intensity levels. Regarding the significant race main effect, examination of the discriminant function loadings revealed that the liking of games and sports and fun of physical exertion subscales contributed most to race differences (see Table 2), with White adolescents scoring higher than African American adolescents (Table 1).

**Table 4 Descriptive Statistics for Female Adolescents by Age and Race**

Questionnaire subscales	White females				African American females			
	13–14 yrs		15–16 yrs		13–14 yrs		15–16 yrs	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Self-Administered Physical Activity Checklist								
Minutes of sedentary activity	145.31	123.02	121.56	103.03	264.75	243.99	257.17	131.60
Minutes of moderate-to-vigorous activity	108.34	99.79	87.49	78.41	146.31	105.06	52.14	36.93
MET-minutes	835.80	761.14	706.36	625.85	1195.71	880.29	485.31	335.86
Children's Attraction to Physical Activity Scale								
Vigorous physical activity	12.79	2.18	12.94	2.30	11.80	2.69	12.05	1.86
Liking of games and sports	12.98	1.44	13.12	1.51	13.07	1.97	13.05	1.58
Importance of physical activity	16.06	2.67	15.90	2.75	15.57	2.78	15.61	2.85
Peer acceptance in games/sports	15.16	3.49	15.24	2.96	14.44	3.25	15.50	3.82
Fun of physical exertion	13.99	3.58	14.40	3.37	12.80	3.10	12.77	2.79
Expected Outcomes and Barriers for Physical Activity Scale								
Psychological benefits	18.59	2.83	18.66	2.83	19.06	2.58	17.33	3.75
Body image benefit	16.43	2.78	16.37	3.23	15.20	2.82	17.00	2.30
Health benefit	12.95	1.64	13.11	1.73	12.13	2.50	12.88	1.32
Time barrier	11.68	3.34	12.49	3.08	10.80	3.35	9.44	2.99
Effort barrier	16.00	4.81	16.57	4.29	15.23	4.68	14.27	3.81
Obstacle barrier	9.76	2.65	9.54	2.59	9.60	3.06	9.23	2.68

## Expected Outcomes and Barriers to Physical Activity Participation

Both the gender main effect, Wilks's lambda = .97,  $F(6, 991) = 4.35$ ,  $P < .001$  and the race main effect, Wilks's lambda = .97,  $F(6, 991) = 4.89$ ,  $P < .001$ , were significant. The descriptive statistics are presented in Table 1. For the gender main effect, examination of the discriminant function loadings revealed that the subscales of body image outcome and lack of time contributed most to gender differences (see Table 2) with group means indicating that females scored higher than males. Thus, females participated in regular physical activity for perceived body image improvements more than males, and also reported a lack of time as the dominant barrier to participating in regular physical activity more than males. For the race main effect, the time barrier and effort barrier subscales contributed most to group differences (see Table 2) with group means revealing that White adolescents reported lack of time and too much effort as barriers limiting PA participation more than African American adolescents. Results also revealed a significant age  $\times$  gender interaction, Wilks's lambda = .98,  $F(6, 991) = 2.24$ ,  $P < .05$  on the body image subscale as an expected outcome of participating in regular physical activity. The descriptive statistics are presented in Tables 3 and 4. These results indicated that the largest difference between males and females occurred in the older age group. Specifically, in the 15- to 16-year-old age group, body image scores for females increased while the scores for males decreased, indicating that older females participate in regular physical activity for perceived body image improvements while body image becomes less important as an outcome of physical activity for older males.

## Discussion

The purposes of the present investigation were to (a) investigate the amount of physical and sedentary activity that adolescents participated in across age, gender, and race, and (b) investigate adolescents' attraction to physical activity and their perceived barriers and benefits of physical activity participation across age, gender, and race. There are some key results to report from this study. First, results indicate that females, and in particular, older females, participate in less physical activity than males and expend less energy. Second, males and females are attracted to physical activity for different reasons. Specifically, males are attracted to the exertional characteristics (eg, getting out of breath or sweaty) while females report being more attracted to physical activity for the popularity gained with their peers during participation, and for improved body image. In addition, results demonstrate that a perceived lack of time is a major barrier toward physical activity participation in adolescents, particularly for White adolescents.

The findings of this study regarding males and females and their PA participation tend to support existing literature. Research has demonstrated that with the

adolescent population, the amount of physical activity declines as age increases,<sup>7,9</sup> and this decline tends to occur more so in females than in males.<sup>8,11</sup> Indeed, in the current study, both the amount of PA and energy expended decreased in older females. Thus, it is possible that older female adolescents are more at risk than males when considering participating at a sufficient level of PA to receive appropriate health gains. It is clear therefore, that evaluating gender with regards to PA levels across adolescence is important, as this may have implications for the development of PA interventions. Along these lines, taking into account the reasons why adolescent girls might be attracted to certain physical activities and/or sports might help to promote participation. In support of this, Vilhjalmsson and Kristjansdottir<sup>27</sup> found that adolescent girls who are attracted to playing a particular sport demonstrate levels of physical activity that are equal to adolescent boys. Results of the present study also indicated that while males were shown to participate in more minutes of sedentary activities (eg, TV/video viewing, computer and video game playing) than females, when they did participate in PA they expended more energy (ie, higher MET-minutes). This finding supports previous literature<sup>18</sup> suggesting that when adolescent males do participate in PA they do so at more vigorous levels than adolescent females. Similar results were also found when examining race differences. That is, African American adolescents reported participating in more sedentary activity than White adolescents, but also reported participating in more minutes of moderate-to-vigorous physical activity. Taken together, these findings offer support to the notion that sedentary activity behavior in youth may not always equate to a lack of PA participation.<sup>28</sup> Nonetheless, there have been mixed findings regarding sedentary activity and the extent to which it displaces the opportunities to participate in all levels of PA. For example, Sallis et al<sup>7</sup> found that adolescents participating in sedentary activities spent less time participating in physical activity. In contrast to this finding, Marshall et al<sup>2</sup> reported there to be ample opportunity for both traditionally sedentary pastimes such as television viewing as well as PA.

In a sense, results demonstrate the need to equally consider the importance of the intensity of the activity as well as the amount of sedentary and physical activity participation. Researchers continue to debate appropriate guidelines for PA (ie, amount and intensity) in adolescents.<sup>29</sup> It is suggested that adolescents should participate daily in 60 minutes of moderate-to-vigorous activity (ie,  $>6$  METS) to obtain sufficient health benefits.<sup>30</sup> In general, with regards to energy expenditure, it is estimated that 600 to 1000 MET-minutes (ie, MET value multiplied by minutes of PA) should be targeted to achieve the health benefits of exercise.<sup>22</sup> However, it is also important to note that the health benefits from expending 1000 MET-minutes during PA would be greater than those of 600 MET-minutes. Therefore, in practice, results of this study do indicate that females aged 15 to 16 years are meeting the lower-end of MET-minutes recommended for exercise health benefits. However, taking into account existing

research demonstrating that participation in PA declines in adolescents as age continues to increase, particularly in females, it is plausible that the decrease in PA would continue, and drop below the recommended amount and intensity of PA.

In an attempt to understand patterns of PA, research examining adolescents' expected outcomes and benefits from participating in regular PA has increased. When studying females, research indicates that one of the more common correlates of physical activity is self-presentation, and females participating for improved body image.<sup>15</sup> In accordance with previous research, results of the current study indicate that older females participate in regular physical activity for the expected outcome of improving body image more than younger females. Thus, it appears that as girls get older, they become more self-aware of their body shape and their appearance. It is also important to note that research has reported that weight control can become a motive for physical activity as girls get older in adolescents,<sup>31</sup> and also underscores the danger of females developing patterns of disordered eating to control weight.<sup>29,32</sup> Taken together, these findings highlight the importance of PA intervention programs emphasizing not only the health benefits of PA participation, but also how regular PA can help body image (eg, having a healthy body that is firm and toned). This is especially important for the female adolescent population and can increase their motivation to stay active and physically fit. Future research should focus on strategies of tying physical activity to improved body image without the need for disordered eating or other clinical inappropriate behaviors.

In an attempt to target the adolescent population and increase physical activity, researchers and practitioners have been concerned with the youth population and their attractions to PA participation.<sup>7,33</sup> Overall, research findings indicate that there is a wide array of attractions to PA including enjoyment and fun, feelings of well-being,<sup>31</sup> liking of playing games and sport, games that are physically challenging,<sup>12</sup> and for the importance of health benefits.<sup>23</sup> Results of the current study indicated that the fun experienced through liking games and sports as well as for fun of exerting the physical characteristics of PA were important variables in determining the interests of White adolescents. Therefore, practitioners should consider creative ways that fitness activities can be incorporated into games and sports which might, in turn, enhance the enjoyment levels when playing games and sports. In addition, results indicated that males were more attracted to PA for fun of physical exertion than females. Although the mean differences were not especially large, this trend is consistent with previous research indicating males' higher interest and enjoyment of the physical exertion supplied by physical activity. Thus, promoting physical activities to female adolescents that involve the exertional aspects of exercise such as "getting sweaty" appears not to be the most effective way to increase their participation. Indeed, observation of mean scores suggests that females are more attracted to physical activity for the popularity

gained with their peers during participation than males. This finding highlights the important roles that peer groups and 'best friends' might play when designing activities for female adolescents. Overall, it appears that continuing to understand the different attractions to PA participation between genders and ethnic/racial groups might make an important contribution to future physical education curriculum development in schools as well as physical activity interests outside of school.

In addition to understanding the motivational determinants of PA, results also highlight the importance of considering the barriers that are perceived to limit participation. It is possible that White adolescents and female adolescents participated in less moderate-to-vigorous PA due to a perceived lack of time which was reported as limiting regular PA participation. Therefore, it appears that the time barrier as a correlate of physical activity required to be active is consistently reported across adolescent populations.<sup>1,7</sup> One way to reduce the time barrier might be to increase physical education programs which would provide more opportunities to participate in PA during the school day. Indeed, there is also some evidence to suggest that structuring recess breaks to incorporate PA has a positive impact on school children and their physical activity levels.<sup>34</sup> Thus, schools can have significant roles to play in promoting PA. Along these lines, different schools can offer varying opportunities to participate in PA, and these variations could be linked to sociodemographic factors (eg, environment and socioeconomic status). It is important to note that in the current study information on socioeconomic status (SES) was not obtained. However, data collection took place at 12 different schools which spread across both rural and inner-city areas. Thus, it is possible that SES might have influenced the amount of physical and sedentary participation reported in this study. Future research should continue to explore the role of socioeconomic status and school physical activity participation (eg, extracurricular activities available, facilities, physical education program).

Finally, when considering these findings associated with the amounts of physical and sedentary activity participated in as well as PA intensity, it is important to note that the Self-Administered Physical Activity Checklist is completed based on participants' activities from the previous day. Thus, it is possible that the amount of physical activity reported<sup>35</sup> by some of the participants is not an accurate reflection of their regular PA participation over a period of time. This highlights the need for future research to adopt a longitudinal approach to studying adolescents' patterns of PA participation. In addition, the concern in using self-report questionnaires to measure physical activity has been reported. Specifically, although self-report questionnaires tend to be the most common form of physical activity measurement, questions have been raised as to the extent to which this type of measurement can accurately quantify physical activity. It is possible that the use of qualitative techniques using interviews as well as actual measurement of physical activity using pedometers and other movement

measurement devices could provide even more accurate and complete data.<sup>35</sup>

In conclusion, the findings of the current study demonstrate the importance of investigating age, gender and race differences when considering physical activity participation. Specifically, it is clear that differences exist between females as age increases relative to expected outcomes of participating in physical activity. Along these lines, the fact that the amount of physical activity participation decreased in the older aged female group emphasizes the need for future researchers to continue to develop and refine measures of PA that can increase our understanding of possible ways to help this subpopulation adhere to a level of PA that provides sufficient cardiovascular health benefits. Results of this study have begun to shed some light on how structuring activities specific to interests and attractions might increase and sustain PA participation in male and female adolescents. Specifically, PA leaders should consider emphasizing the health benefits (eg, promoting a healthy body image) of PA in addition to the social aspects (peer relationships) for female adolescents. For males, it appears that activities need to be intense enough for them to exert the physical characteristics of PA beyond fitness activities alone. Results also highlighted that fun of physical exertion appears to be a primary interest for White adolescents to participate in PA more than African Americans as well as for males more than females. Further research is warranted to examine 'what' and 'why' adolescents of varying age, gender, and ethnicities are interested in participating in PA. This could have important implications for the physical education curriculum as well as extra curricula activities offered by high schools.

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