

## RESEARCH ARTICLE

# Role of Individual and School Factors in Physical Activity Patterns of Secondary-Level Spanish Students

FRANCISCO RUIZ JUAN, PhD<sup>a</sup>  
ENRIQUE GARCÍA BENGOCHEA, PhD<sup>b</sup>  
MARÍA ELENA GARCÍA MONTES, PhD<sup>c</sup>  
PAULA LOUISE BUSH, MSc<sup>d</sup>

## ABSTRACT

**BACKGROUND:** While the importance of individual and school factors as correlates of overall youth physical activity has been demonstrated by previous research, less is known about the relationship of these factors with specific patterns of physical activity during adolescence. Thus, the purpose of this study was to examine the association of selected individual and school factors with patterns of physical activity based on a sum index of physical activity in a population-based sample of Spanish adolescents.

**METHODS:** One thousand and eighty-four students aged 12 to 17 years completed a self-report survey once during school hours. In addition to participation in physical activity outside of school hours, the following variables were included in the analysis: gender, age, weight status, physical self-perceptions, evaluation of the school physical education experience, and type of school (public vs private). Multinomial logistic regression was used to model the associations among the variables and to calculate odd ratios (ORs) and 95% confidence intervals (CIs) for each pattern of physical activity.

**RESULTS:** The physical self-perceptions variable was the most consistent individual correlate of physical activity across participation patterns (ORs ranging from 4.29 to 1.88, CIs ranging from 2.16-8.54 to 1.10-3.21). Regarding the school variables included in this study, both were linked with participation in physical activity, but evaluation of the physical education experience showed the most consistent associations across activity patterns (ORs 2.49-2.17, CIs 1.49-4.15 to 1.25-3.74).

**CONCLUSION:** Physical education programs may benefit adolescents with different physical activity participation preferences regardless of important individual characteristics and broader school factors.

**Keywords:** child and adolescent health; physical fitness and sports; instructional programs.

**Citation:** Ruiz Juan F, Garcia Bengoechea E, Garcia Montes ME, Bush PL. Role of individual and school factors in physical activity patterns of secondary-level spanish students. *J Sch Health*. 2010; 80: 88-95.

Received September 24, 2008

Accepted July 16, 2009

<sup>a</sup>Associate Professor, (fruijz@umes), Faculty of Sport Sciences, University of Murcia, C/Argentina s/n, 30720 San Javier (Murcia), Spain.

<sup>b</sup>Assistant Professor, (enrique.garcia@mcgill.ca), Department of Kinesiology and Physical Education, McGill University, Montreal, Quebec, H2W 1S4, Canada.

<sup>c</sup>Associate professor, (garciamo@umes), Faculty of Sport Sciences, University of Murcia, C/Argentina s/n, 30720 San Javier (Murcia), Spain.

<sup>d</sup>Doctoral Candidate, (paula.bush@mail.mcgill.ca), Department of Kinesiology and Physical Education, McGill University, Montreal, Quebec, H2W 1S4, Canada.

Address correspondence to: Enrique García Bengoechea, Assistant Professor, (enrique.garcia@mcgill.ca), Department of Kinesiology and Physical Education, McGill University, Montreal, Quebec, H2W 1S4, Canada.

Youth physical inactivity has become an important public health concern in countries around the world.<sup>1</sup> Adolescence, in particular, represents a period in which sharp declines in overall physical activity levels are likely to occur.<sup>2,3</sup> Therefore, understanding the factors that influence physical activity participation for this age group may help design effective interventions and modify environments to reverse this trend. Cross-sectional studies examining factors associated with youth physical activity can assist in identifying potential mediators of participation that can be targeted in interventions.<sup>4,5</sup>

Past research has exposed several individual, social, and environmental correlates of youth physical activity.<sup>6-8</sup> Consistent with an ecological approach emphasizing multiple levels and settings of influence and person and environment connections,<sup>9</sup> this study examined the association of selected individual and school factors with patterns of physical activity participation in a population-based sample of Spanish adolescents. The individual factors examined were gender, age, weight status, and physical self-perceptions. As has been established in systematic reviews,<sup>5,10</sup> gender is a consistent correlate of physical activity during adolescence. Specifically, studies using both self-report and objective measures of physical activity have shown that boys are more physically active than girls.<sup>2,3</sup> According to the reviews cited above, the evidence for the other individual variables included in this study remains inconclusive. This suggests the relationship of these variables with youth physical activity is complex. For example, there is limited research indicating that the relationship between adolescent physical activity and weight status varies by type of activity (eg, sports participation, strength training, and physical education enrollment).<sup>11</sup> The complexity of this relationship is further illustrated by a study that found smaller than expected differences in physical activity levels of clusters of adolescent girls with different motivation and self-perception profiles.<sup>12</sup> Likewise, although several studies have revealed a decline in physical activity levels across the adolescent years,<sup>2,3</sup> findings from other studies<sup>13,14</sup> indicate that the evidence regarding age as a correlate of adolescent physical activity remains inconclusive. Therefore, it is clear that more research is needed to clarify the potential role of weight status, physical self-perceptions, and age as correlates of physical activity during adolescence.

Schools are an evident and appropriate setting for targeting young people's health and behavior in ways that are sustainable, flexible, and cost-effective.<sup>15,16</sup> Participation in school-based physical education, in particular, has demonstrated positive links with overall levels of physical activity during adolescence.<sup>17-19</sup> In addition to this, intervention studies indicate that school-based physical education is an important determinant of physical activity in youth.<sup>20,21</sup> As

empirical studies suggest, promoting student choice and self-determination, fostering students' perceived competency, and designing enjoyable class experiences may be effective ways of encouraging leisure-time physical activity participation through school physical education.<sup>22-24</sup> More research is needed, however, to further tease out the specific features of the physical education class that are associated with extracurricular physical activity participation in adolescence. In addition, research regarding the role of broader school factors—such as type of school—on adolescent physical activity is limited. These factors are important to consider because they may provide insight into prevailing values, beliefs, and conditions, which, in turn, may help explain behavioral processes originating in the school.<sup>25</sup> For example, in a recent study,<sup>26</sup> adolescents enrolled in public schools reported higher physical activity energy expenditure than those attending private schools, particularly during weekends. Consequently, the school-related variables included in this study were, respectively, students' evaluation of their physical education class experience and type of school (public vs private).

Youth physical activity is a complex behavior influenced by many factors.<sup>5</sup> In fact, van der Horst et al<sup>10</sup> pointed out that 1 limitation of their recent review on correlates of physical activity in youth was that "the main outcome was overall physical activity, without making a distinction between, for instance, moderate or vigorous physical activity, or between physical activity at home and at school." (p1247) Therefore, they concluded that possible differences in correlates stemming from the various specific behaviors could not be established. There is indeed limited work examining correlates associated with the various specific behaviors typically subsumed in the literature under the more general umbrella of "physical activity." In light of this and the previous considerations, this study sought to investigate the association of selected individual and school factors with patterns of physical activity based on a sum index of physical activity (PAI) in a population-based sample of Spanish adolescents.

## METHODS

### Data Sources

Data from a school-based survey on sport and lifestyle habits conducted during the academic year 2001-2002 during regular school hours in secondary schools in the southern Spanish province of Almería were analyzed. A 4-stage stratified sampling design taking into account type of school, population size, number, grade, and gender of students was used to ensure the sample was representative of the population of interest (ie, all students registered in public and private secondary schools in the province of Almería during the school year 2001-2002).

## Participants

Participants were 1084 Spanish secondary school students aged 12 to 17 years at the time of data collection (February-May 2002). Among the 1084 participants, 511 were female and 174 were registered in private schools. This sample is considered accurate within  $\pm 3$ , 19 times out of 20.

## Measures

*Weight status* was determined based on body mass index (BMI) scores, which were derived from the adolescents self-reported weight and height using the formula  $BMI = (\text{weight in kg})/(\text{height in m}^2)$ . Participants were identified as having *normal weight*, being *underweight*, *overweight*, or *obese* according to the age- and sex-specific BMI cutoffs defined by the World Health Organization.<sup>27</sup>

*Physical self-perceptions* were assessed by 7 questions, rated on an alternate 5-point Likert scale format regarding participants' perceptions of athletic competence, physical appearance, and activity levels (activity vs sedentariness). The scale showed adequate reliability in terms of internal consistency (Cronbach's alpha = 0.81). Furthermore, responses to all questions loaded on 1 single factor in a principal component analysis. Each question required participants to compare themselves on the target dimension with peers of the same age and sex. Specifically, the statements to which participants responded were "I am not talented at sports ... I am talented at sports"; "I do not have good flexibility ... I have good flexibility"; "I am slow and not very agile ... I am fast and very agile"; "I am weak physically ... I am strong physically"; "I am not coordinated ... I am coordinated"; "I am not satisfied with my physical aspect ... I am satisfied with my physical aspect"; "I am sedentary ... I am active." Higher scores corresponded with more positive self-perceptions. For the purposes of the analyses, categorical scoring levels (medium-high, low) for this variable were created based on previous work that used similar variables and scoring strategies.<sup>28</sup>

*Evaluation of the physical education experience* was assessed by the participants' ratings on the following statements scored on a 4-point Likert scale ranging

from "totally agree" to "totally disagree": "Physical education classes were enjoyable"; "Physical education classes did a good job of introducing me to leisure-time physical activities and sports"; "Time in physical education classes was well used"; "Physical education teachers got me interested in leisure-time physical activities and sports"; and "Physical education classes were given the importance they deserved in school." These questions have been used in previous research with Spanish adolescents.<sup>29</sup> Higher scores indicated a more positive evaluation of the physical education class experience. The scale displayed acceptable reliability in terms of internal consistency (Cronbach's alpha = 0.71). In addition, responses to all questions loaded on 1 single factor in a principal component analysis. For analytical purposes, categorical scoring levels were created based on previous literature that used similar variables and scoring strategies.<sup>28</sup>

*Physical activity participation patterns* were first calculated by computing 5 self-reported questions into a sum PAI. These questions concerned the frequency and intensity of leisure-time physical activity, and participation in organized sports and sports competitions (Table 1). Before summation, the scores from the questions were recoded so that the weight of each question was similar. This resulted in a minimum PAI value of 5 and a maximum of 15. Reliability estimates for the physical activity questions (Cronbach's alpha = 0.85) were similar to those reported in previous research using a similar index<sup>30,31</sup> and indicated strong associations among the variables. Furthermore, all items loaded on 1 single factor in a principal component analysis and were therefore retained in the index. To better represent the activity patterns of the participants, the latter were subsequently classified into 1 of the following categories based on their PAI scores: vigorously active, moderately active, lightly active, insufficiently active, and sedentary. These categories are consistent with previous research that has used this measure with adolescents.<sup>31,32</sup>

Questions regarding physical self-perceptions, the physical education experience, and physical activity participation were translated and adapted from

Table 1. Physical Activity Questions

Question	Scale Response Alternatives
Outside of school hours, how often do you participate in sport activities?	4-point scale ranging from "Never" to "Almost everyday"
Outside of school hours, how often do you participate in recreational outdoor activities such as walking, biking, swimming, and running?	4-point scale ranging from "Never" to "Almost everyday"
Outside of school hours, how many times do you participate in sports (for at least 20 minutes)?	7-point scale ranging from "Never" to "Everyday"
Outside of school hours, how many hours per week do you do sports in a way that makes you sweat and breathe hard?	6-point scale ranging from "None" to "7 hours or more"
Do you take part in sport competitions (eg, track and field, soccer games)?	5-point scale ranging from "No, I have never participated" to "Yes, I participate at a national or international level"

previous research with adolescents from different European countries.<sup>33,34</sup> Once translated and adapted into Spanish, questions were content validated by a panel of experts in the domains of youth health and physical activity and survey methodology. Finally, the questions were pilot tested up to 3 times with adolescents not included in the final sample in an iterative process. Feedback was sought and modifications were subsequently made to ensure questions were relevant to and understood by the target population.

### Statistical Analyses

Initially, an ordinal regression was conducted to examine the relationships among the study variables. However, the data did not meet the assumption of parallel slopes, indicating that there were different factors associated with each activity pattern. Therefore, a multinomial logistic regression was subsequently used to model the associations among the variables of interest and to calculate odd ratios (ORs) and 95% confidence intervals (CIs) at each pattern of physical activity using the “sedentary” group as the comparison group.

## RESULTS

Descriptive statistics presented in Table 2 revealed that lightly active and moderately active were the more common participation patterns among the youths in this study (31.1% and 29.2%, respectively), followed by vigorously active (19.3%), insufficiently active (12.1%), and sedentary (8.3%). The BMI of the majority of participants (74.1%) was considered as normal. In addition, most participants (81.4%) reported physical self-perceptions in the medium to high range. The percentage of participants who reported a positive evaluation of their school physical education experience was slightly higher than the percentage of those whose evaluation was negative (51.7% vs 48.3%).

Table 3 presents the results of the main analyses. The odds of being classified as vigorously active were higher for boys (OR = 9.69, CI = 5.34-17.57), younger adolescents (OR = 2.39, CI = 1.39-4.08), adolescents reporting more positive physical self-perceptions (OR = 4.29, CI = 2.16-8.54), and positive evaluation of their physical education experience (OR = 2.17, CI = 1.25-3.74). Conversely, the odds of being considered vigorously active were lower for those attending public schools (OR = 0.33, CI = 0.14-0.81).

The odds of being considered moderately active were higher for boys (OR = 3.86, CI = 2.72-6.58), younger adolescents (OR = 1.94, CI = 1.18-3.19), those reporting more positive physical self-perceptions (OR = 3.01, CI = 1.69-5.36) and positive evaluation

**Table 2. Prevalence of Participants' Characteristics (n = 1084)**

Physical activity pattern	
Vigorously active	19.3%
Moderately active	29.2%
Lightly active	31.1%
Insufficiently active	12.1%
Sedentary	8.3%
Gender	
Male	52.9%
Female	47.1%
Age	
12-14	58.8%
15-17	41.2%
Weight status	
Underweight	10.1%
Normal	74.1%
Overweight	5.9%
Obese	10.0%
Physical self-perceptions	
Medium-high	81.4%
Low	18.6%
Evaluation of physical education experience	
Positive	51.7%
Negative	48.3%
Type of school	
Public	83.9%
Private	16.1%

of their physical education experience (OR = 2.49, CI = 1.49-4.15). Underweight adolescents, for their part, had lower odds of belonging to this group (OR = 0.26, CI = 0.09-0.81).

Adolescents reporting more positive physical self-perceptions (OR = 1.88, CI = 1.10-3.21) and evaluation of their physical education experience (OR = 2.48, CI = 1.51-4.08) had higher odds of being part of the lightly active group. On the other hand, underweight adolescents (OR = 0.31, CI = 0.10-0.96) had lower odds of being included in this category.

Last, the odds of being considered insufficiently active were 71% lower ( $p < .01$ ) in adolescents attending public schools compared to those attending private schools.

## DISCUSSION

Identifying correlates of youth physical activity has important public health implications, since this information can be used in efforts aimed at increasing the number of young people who meet health-related physical activity recommendations.<sup>5</sup> In line with the tenets of an ecological framework highlighting influences from multiple levels and settings,<sup>9</sup> results from this study exposed various factors associated with youth physical activity that originate at the individual and school levels. Likewise, the results demonstrate the significance of examining correlates of various patterns of physical activity based on factors such as frequency and intensity, and the type of activity.

**Table 3. Multinomial Logistic Regression Model Examining Physical Activity Patterns as a Function of Individual and School Factors**

	Vigorously Active OR (95% CI)	Moderately Active OR (95% CI)	Lightly Active OR (95% CI)	Insufficiently Active OR (95% CI)
Gender				
Female	1.00	1.00	1.00	1.00
Male	9.69 (5.34-17.57)***	3.87 (2.27-6.59)***	1.24 (0.74-2.10)	0.79 (0.42-1.46)
Age				
15-17	1.00	1.00	1.00	1.00
12-14	2.39 (1.39-4.09)**	1.94 (1.18-3.19)**	1.39 (0.86-2.25)	1.22 (0.70-2.12)
Weight Status				
Obese	1.00	1.00	1.00	1.00
Overweight	0.47 (0.11-1.97)	0.30 (0.08-1.12)	0.76 (0.21-2.74)	0.48 (0.90-2.51)
Normal	1.22 (0.43-3.47)	0.54 (0.21-1.40)	0.77 (0.29-2.04)	1.13 (0.36-3.55)
Underweight	0.57 (0.17-1.91)	0.27 (0.09-0.81)*	0.32 (0.10-0.97)*	0.27 (0.66-1.14)
Physical self-perceptions				
Low	1.00	1.00	1.00	1.00
Medium-high	4.30 (2.16-8.55)***	3.01 (1.69-5.37)***	1.88 (1.11-3.22)*	1.36 (0.74-2.48)
Evaluation of physical education experience				
Negative	1.00	1.00	1.00	1.00
Positive	2.17 (1.26-3.75)**	2.49 (1.50-4.15)***	2.49 (1.51-4.08)***	1.22 (0.69-2.18)
Type of school				
Private	1.00	1.00	1.00	1.00
Public	0.34 (0.14-0.81)*	0.44 (0.19-1.03)	0.48 (0.21-1.10)	0.29 (0.12-0.68)**

Note: Comparison group is "sedentary." \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$ .

Consistent with and also extending the previous literature,<sup>2,3,26</sup> boys were more active than girls, but only in terms of vigorous and moderate physical activity. The 2 genders did not differ significantly in their odds of being classified as lightly active or as insufficiently active. In line with recent findings from Peiró-Velert et al,<sup>26</sup> this suggests that adolescent girls may have a preference for less vigorous forms of activity than boys. To increase participation and retention, program planners can take these observed gender differences into account to design programs that cater to the specific activity preferences of girls and boys. On the other hand, given the health benefits of moderate and vigorous physical activity during adolescence,<sup>1</sup> it could be argued that more efforts to promote these patterns of activity among girls may be necessary as less intense patterns of activity may not be as effective in improving physical fitness and achieving favorable changes in body composition.<sup>35</sup>

The same considerations apply to the age differences observed in this study. The results suggest that the decline in physical activity levels through adolescence documented in the literature<sup>2,3</sup> may be mainly due to decreasing levels of vigorous and moderate physical activity. Fortunately, involvement rates in less intense types of activity may not drop, as evidenced by the fact that younger and older adolescents did not differ significantly in their odds of participating in light or in insufficient physical activity. Although this may be problematic from the perspective of achieving high fitness levels and more favorable body composition, it is important to remember that a growing body of research suggests that not only is some physical activity

better than none, but also that even low amounts of physical activity reduce the risk of premature death.<sup>35</sup> In other words, this research clearly demonstrates that it is avoidance of physical inactivity which is crucial.<sup>1,35</sup>

Compared to gender and age, weight status was more influential at lower intensity levels of activity among participants in this study. Specifically, the odds of belonging to the moderately active and lightly active categories were lower among underweight adolescents than among obese adolescents. Further, the lower odds of belonging to the moderately active group among overweight adolescences compared to obese adolescents approached statistical significance. These results are difficult to interpret in light of the conflicting results reported in the literature regarding the role of weight status in physical activity during adolescence.<sup>11,36,37</sup> Taken together, the results support the notion that the relationship between weight-related variables and youth physical activity is complex.<sup>5,38</sup> From a methodological point of view, given the common analytic practice of including underweight individuals in the normal-weight category, these results illustrate that it is important to pay attention to the specific role of underweight status in studies investigating the links between weight status and physical activity participation during adolescence.

Among all the individual factors examined in this study, the physical self-perceptions variable was the most consistent correlate of adolescent physical activity across participation patterns. More positive self-perceptions stemming from favorable comparisons with peers were positively associated with vigorous,

moderate, and light physical activity, respectively, in our sample. This finding stands in line with some of the results reported in the literature that show an association between physical self-perceptions and youth physical activity,<sup>39,40</sup> but is in contrast with other findings in which the association was not evident.<sup>8,12</sup> Similar to weight status, this discrepancy in the literature may be indicative of a complex relationship between physical self-perceptions and youth physical activity. Alternatively, it may reflect the variety of measurement approaches used and/or a somewhat loose definition of “physical self-perceptions” across studies.

Our study, for example, used a composite measure of physical self-perceptions consisting of the participants’ ratings on a series of questions dealing with perceptions of athletic competence, physical appearance, and activity levels (activity vs sedentariness). Even though it makes intuitive sense to believe there is a good match between perceptions of how active or sedentary one is and self-reported physical activity levels, research with adolescents shows this is not necessarily the case. To illustrate this, in a study with adolescents,<sup>41</sup> a large portion of students who reported participating 1 hour or less per week in physical activities still considered themselves as being “active” or “very active.” The composite measure of physical self-perceptions used in this study displayed appropriate internal consistency, which demonstrates the interrelatedness of the dimensions involved. As seen in Table 3, the strength of the association decreased at each level of PAI, suggesting that, in a manner consistent with gender and age, the role of physical self-perceptions in our sample was more important at higher levels of physical activity involvement. From a physical activity promotion perspective, this finding is encouraging as it could imply that it is possible to get young people with less favorable physical self-perceptions to become active, at least at certain levels.

At the school level, the two variables included in this study were associated with participation in physical activity. In line with and extending previous research,<sup>8,24</sup> a more favorable evaluation of the school physical education experience was positively linked with participation in vigorous, moderate, and light physical activities. Furthermore, contrary to the individual factors of gender, age, and physical self-perceptions, the strength of this association was similar across physical activity participation patterns (Table 3). This suggests that physical education programs may be equally beneficial to adolescents with different preferences in terms of physical activity, independent of important individual and broader school factors.

As this study exemplifies, to effectively encourage physical activity outside of school hours, high school physical education programs could benefit from a focus on promoting enjoyable experiences that introduce

students to—and get them interested in—leisure-time physical activities. Likewise, a context in which physical education is given the importance it deserves in school and classes where time is used efficiently may help to encourage students’ leisure-time physical activity.

Type of school (public vs private) was associated with physical activity at the higher and lower ends of the participation spectrum. This illustrates the importance of including broader macrosystemic factors in studies investigating correlates of youth physical activity. Specifically, the odds of engaging in vigorous physical activity were lower in students attending public schools, compared to those enrolled in private schools, and the same tendency was observed across all physical activity categories. This suggests that private school students were more active than public school students. These results stand in apparent contrast with findings from a recent study<sup>26</sup> showing that adolescents enrolled in public schools have higher physical activity energy expenditure than those attending private schools, particularly during weekends. However, in a manner consistent with our results, findings from Peiró-Velert et al<sup>26</sup> also indicated that the percentage of adolescents considered inactive was higher among public school students.

More research is needed to ascertain the specific circumstances within each type of school setting that are linked with physical activity participation during adolescence. For example, differences may exist between school settings in terms of supply of, and access to, extracurricular physical activity programs. In addition, each of these school settings may possess its own youth/peer culture that dictates social norms having an impact on physical activity participation patterns. It is also possible that socioeconomic factors may confound the effect of type of school, as it is typically the case in Spain, since attendance to private or public school tends to be determined by the economic possibilities and educational background of parents.

### Limitations

This study used self-reported data. As such, the findings may have been influenced to some extent by acquiescence and social desirability biases. In order to prevent or minimize biases, the participants were guaranteed the anonymity of their responses. Likewise, to prevent interpretation problems, frustration, and distraction, items were worded as straightforwardly and simply as possible and were pilot tested and refined in an iterative process. In addition to the possibility of response biases and interpretation problems, the cross-sectional design does not allow us to make conclusions in terms of cause and effect. Lack of more data regarding the validity of the PAI scores (eg, correlations with objective measures of physical activity

and/or energy expenditure) is another limitation of this study.

Despite these inherent limitations, this study has several strengths. First, a large, representative sample of adolescents drawn from the southern Spanish province of Almería was used. Second, the physical activity measure used and the analyses performed allowed for the investigation of differences in correlates associated with various participation patterns based on factors such as frequency and intensity of activity. In particular, this study explored correlates of insufficient physical activity and, as van der Horst et al<sup>10</sup> noted, few studies have addressed this issue in youth. Third, based on established criteria, the analyses performed in this study discriminated between underweight and normal-weight youths, which yielded additional information regarding subgroups that may be at risk for physical inactivity. Finally, a comprehensive measure was used to assess the participants' experience of the physical education class. This measure encompasses a number of dimensions that could be targeted in curriculum-based and school-wide interventions to promote physical activity among adolescents, particularly if confirmed in prospective studies.

### Conclusions

This study identified several individual and school factors independently associated with physical activity participation patterns during adolescence. Physical self-perceptions and students' evaluation of the school physical education experience were the individual and school factors, respectively, that were more consistently correlated in this sample with the spectrum of physical activity participation patterns more likely to result in health benefits (ie, vigorous, moderate, light). Importantly, physical self-perceptions and, particularly, school physical education programs represent *modifiable* correlates that can be potentially targeted in multimodal interventions to promote physical activity through the adolescent years. As mentioned earlier, encouraging student choice and self-determination, promoting students' perceived competency, and planning enjoyable class experiences may be effective ways of encouraging leisure-time physical activity participation through school physical education.<sup>22-24</sup>

As this study demonstrates, adolescents have preferential patterns or styles of participation in physical activity. At the secondary-school level, suggestions to address the problem of heterogeneity in terms of physical activity preferences include designing and implementing programs where students choose classes, where classes are based on progressions in skill (eg, Badminton I, Badminton 2), and which are based on an adult model of participation (health/fitness club) versus the more compliance-oriented, regularly scheduled model common to most schools.<sup>42</sup> Ultimately,

to be in a better position to cater to these preferences—and encourage the development of others when necessary—it is important that researchers and practitioners strive to understand the factors associated specifically with each of these preferences.

### Human Subjects Approval Statement

Prior to the beginning of the study, approval from appropriate university and school boards and informed consent from participants and at least 1 of their parents were obtained.

### REFERENCES

1. World Health Organization. Global strategy on diet, physical activity and health: World Health Organization. 2004. Available at: [http://www.who.int/dietphysicalactivity/strategy/eb11344/strategy\\_english\\_web.pdf](http://www.who.int/dietphysicalactivity/strategy/eb11344/strategy_english_web.pdf). Accessed September 4, 2008.
2. Troiano RP, Berrigan D, Dodd KW, Masse LC, Tilert T, McDowell M. Physical activity in the United States measured by accelerometer. *Med Sci Sports Exerc*. 2008;40(6):181-188.
3. Trost SG, Pate RR, Sallis JF, et al. Age and gender differences in objectively measured physical activity in youth. *Med Sci Sports Exerc*. 2002;34(2):350-355.
4. Bauman AE, Sallis JF, Dzewaltowski DA, Owen N. Toward a better understanding of the influences on physical activity—the role of determinants, correlates, causal variables, mediators, moderators, and confounders. *Am J Prev Med*. 2002;23(2):5-14.
5. Sallis JF, Prochaska JJ, Taylor WC. A review of correlates of physical activity of children and adolescents. *Med Sci Sports Exerc*. 2000;32(5):963-975.
6. Heitzler CD, Martin SL, Duke J, Huhman M. Correlates of physical activity in a national sample of children aged 9-13 years. *Prev Med*. 2006;42(4):254-260.
7. Kahn JA, Huang B, Gillman MW, et al. Patterns and determinants of physical activity in US adolescents. *J Adolesc Health*. 2008;42(4):369-377.
8. Sallis JF, Prochaska JJ, Taylor WC, Hill JO, Geraci JC. Correlates of physical activity in a national sample of girls and boys in grades 4 through 12. *Health Psychol*. 1999;18(4):410-415.
9. Spence JC, Lee RE. Toward a comprehensive model of physical activity. *Psychol Sport Exerc*. 2003;4(1):7-24.
10. van der Horst K, Paw M, Twisk JWR, van Mechelen W. A brief review on correlates of physical activity and sedentariness in youth. *Med Sci Sports Exerc*. 2007;39(8):1241-1250.
11. Levin S, Lowry R, Brown DR, Dietz WH. Physical activity and body mass index among US adolescents—youth risk behavior survey, 1999. *Arch Pediatr Adolesc Med*. 2003;157(8):816-820.
12. Biddle SJH, Wang CKJ. Motivation and self-perception profiles and links with physical activity in adolescent girls. *J Adolesc*. 2003;26(6):687-701.
13. Jeya C, Henry K, Lightowler HJ, Al-Hourani HM. Physical activity and levels of inactivity in adolescent females ages 11-16 years in the United Arab Emirates. *Am J Hum Biol*. 2004;16:346-353.
14. Prochaska JJ, Rodgers MW, Sallis JF. Association of parent and peer support with adolescent physical activity. *Res Q Exerc Sport*. 2002;73(2):206-210.
15. Farrell L, Chau J. Building solutions for preventing childhood obesity. Module 6: Interventions to increase physical activity in adolescents. Sydney: NSW Centre for Overweight and Obesity; 2008. Available at: [http://www.coo.health.usyd.edu.au/pdf/2008\\_overview\\_module.pdf](http://www.coo.health.usyd.edu.au/pdf/2008_overview_module.pdf). Accessed September 5, 2008.

16. World Health Organization. *Improving Health Through Schools: National and International Strategies*. Geneva: World Health Organization; 1998. Available at: [http://www.who.int/school\\_youth\\_health/media/en/94.pdf](http://www.who.int/school_youth_health/media/en/94.pdf). Accessed September 4, 2008.
17. Gordon-Larsen P, McMurray RG, Popkin BM. Determinants of adolescent physical activity and inactivity patterns. *Pediatrics*. 2000;105(6):63-70.
18. Myers L, Strikmiller PK, Webber LS, Berenson GS. Physical and sedentary activity in school children grades 5-8: The Bogalusa Heart Study. *Med Sci Sports Exerc*. 1996;28(7):852-859.
19. Pate RR, Ward DS, O'Neill JR, Dowda M. Enrollment in physical education is associated with overall physical activity in adolescent girls. *Res Q Exercise Sport*. 2007;78:265-270.
20. Kahn EBLT, Ramsey LT, Brownson RC, et al. The effectiveness of interventions to increase physical activity. A systematic review. *Am J Prev Med*. 2002;22(4 Suppl):73-107.
21. Salmon J, Booth ML, Phongsavan P, Murphy N, Timperio A. Promoting physical activity participation among children and adolescents. *Epidemiologic Rev*. 2007;29:144-159.
22. Hagger MS, Chatzisarantis NLD, Culverhouse T, Biddle SJH. The processes by which perceived autonomy support in physical education promotes leisure-time physical activity intentions and behavior: A trans-contextual model. *J Educ Psychol*. 2003;95(4):784-795.
23. Standage M, Duda JL, Ntoumanis N. A model of contextual motivation in physical education: Using constructs from self-determination and achievement goal theories to predict physical activity intentions. *J Educ Psychol*. 2003;95(1):97-110.
24. Wallhead TL, Buckworth J. The role of physical education in the promotion of youth physical activity. *Quest*. 2004;56(3):285-301.
25. Bronfenbrenner U. Environments in developmental perspective: theoretical and operational models. In: Friedmann SL, Wachs, TD, eds. *Measuring Environment Across the Life Span*. Washington, DC: APA; 1999:3-28.
26. Peiró Velert C, Devis Devis J, Beltran Carrillo VJ, Fox KR. Variability of Spanish adolescents' physical activity patterns by seasonality, day of the week and demographic factors. *Eur Sport Sci*. 2008;8(3):163-171.
27. De Onis M, Onyango AW, Borghi E, Siyam A, Nishida C, Siekman J. Development of a WHO growth reference for school-aged children and adolescents. *Bull World Health Organ*. 2007;85:660-667.
28. Canadian Institute for Health Information. *Improving the Health of Young Canadians*. Ottawa; 2005. Available at: [http://secure.cihi.ca/cihiweb/products/IHYC05\\_webRepENG.pdf](http://secure.cihi.ca/cihiweb/products/IHYC05_webRepENG.pdf). Accessed September 4, 2008.
29. Ruiz Juan F, Gómez López M, García Montes ME, Piéron M. Relations between the physical activity and the personal school experience in senior high school students. In: *AIESEP 2005 World Congress Active Lifestyles: The Impact of Education and Sport*. Lisbon, Portugal: Universidade Técnica de Lisboa; 2005.
30. Telama R, Yang XL, Viikari J, Valimaki I, Wanne O, Raitakari O. Physical activity from childhood to adulthood - a 21-year tracking study. *Am J Prev Med*. 2005;28(3):267-273.
31. Piéron M, Ruiz Juan F, García Montes ME, Díaz Suárez A. Análise da prática de atividades físico-esportivas em alunos de ESO e ESPO das províncias de Almería, Granada e Murcia por um índice composto de participação. *Fit Perf J*. 2008;7(1):52-58.
32. Piéron M, Telama R, Almond L, Carreiro da Costa F. Lifestyle of young Europeans: comparative study. In: Walkuski J, Wright S, Tan Kwang San S, eds. *AIESEP Singapore 1997: Proceedings of World Conference on Teaching, Coaching and Fitness Needs in Physical Education and the Sport Sciences*. Singapore: School of Physical Education, National Institute of Education, Nanyang Technological University; 1997:403-415.
33. Piéron M, Ledent M, Almond L, Airstone M, Newberry I. 1996. Comparative analysis of youth lifestyle in selected European countries. University of Liège & University of Loughborough. Research sponsored by the International Council of Sport Science and Physical Education.
34. Piéron M, Telama R, Almond L, Ledent M, Carreiro Da Costa F. Involvement of children in sports and physical activities. Comparative analysis of youth lifestyle in selected European countries. In: Chin KN, Jwo H, eds. *AIESEP Taiwan 2001 International Conference Proceedings: The Exchange and Development of Sport Culture in East and West*. Taipei: National Taiwan Normal University; 2001:84-88.
35. US Department of Health and Human Services. 2008. Physical activity guidelines for Americans. Available at: <http://www.health.gov/paguidelines/guidelines/chapter2.aspx>. Accessed February 19, 2009.
36. Taylor WC, Sallis JF, Dowda M, Freedson PS, Eason K, Pate RR. Activity patterns and correlates among youth: differences by weight status. *Pediatr Exerc Sci*. 2002;14(4):418-431.
37. Trost SG, Kerr LM, Ward DS, Pate RR. Physical activity and determinants of physical activity in obese and non-obese children. *Int J Obes*. 2001;25(6):822-829.
38. Bar-Or O, Baranowski T. Physical activity, adiposity and obesity among adolescents. *Pediatr Exerc Sci*. 1994;6:348-360.
39. Neumark-Sztainer D, Story M, Hannan PJ, Tharp T, Rex J. Factors associated with changes in physical activity - a cohort study of inactive adolescent girls. *Arch Pediatr Adolesc Med*. 2003;157(8):803-810.
40. Sabiston CM, Crocker PRE. Exploring self-perceptions and social influences as correlates of adolescent leisure-time physical activity. *J Sport Exerc Psych*. 2008;30(1):3-22.
41. García Montes ME, Ruiz Juan F, Gómez López M, Piéron M. Relationships between physical activity and self-perception in senior high school students. In: *AIESEP 2005 World Congress Active Lifestyles: The Impact of Education and Sport*. Lisbon, Portugal: Universidade Técnica de Lisboa; 2005.
42. Siedentop D. *Introduction to Physical Education, Fitness, and Sport*. 6th ed. Boston, MA: McGraw-Hill; 2006.