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Physical activity correlates in middle school adolescents: Perceived benefits and barriers and their determinants

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Abstract

The purpose of this study was to examine the determinants of benefits and barriers and their relationship with physical activity (PA) among predominantly Latino middle school students. Data were collected in a cross-sectional survey of 4,773 in the seventh-grade students recruited from a large, urban school district in Los Angeles. Hierarchical logistic regression models were used to

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assess determinants of benefits and barriers as well as their association with self-reported PA. Differences in benefits and barriers were observed by gender, ethnicity, and body size. Barriers were negatively correlated with all three PA outcomes while benefits were positively associated with exercising at least 60 minutes daily. A deeper understanding of benefits and barriers can facilitate the development of interventions and collaborative efforts among physical education teachers, school nurses and administrators to implement a whole-of-school approach that encourages students' participation in PA in- and outside of the classroom.

Despite the health advantages of regular physical activity (PA) (Biddle & Asare, 2011; Janssen & LeBlanc, 2010), few adolescents meet daily PA recommendations. In 2012, only 24.8% of youth in the United States aged 12–15 met Department of Health and Human Services recommendations of at least 60 minutes of moderate to vigorous activity each day (Fakhouri, Hughes, Song, Fulton, & Ogden, 2014). Further, demographic disparities exist in levels of PA engagement among youth. Prior research has found that Latino, female, and low socioeconomic status adolescents are less physically active than males, White, and more affluent youth (Sterdt, Liersch, & Walter, 2014). Given the overall low rates of PA coupled with persistent disparities in PA, a better understanding of the psychosocial correlates of PA in diverse populations may facilitate our understanding of differences in activity patterns among these groups.

The correlates of PA are multidimensional, with psychological, sociocultural, environmental, and behavioral factors influencing PA participation (Sterdt et al., 2014). Recent evidence supports addressing individual factors alongside ecological determinants (e.g. the availability of parks and green space in communities) to promote PA (Bauman et al., 2012). As such a deeper understanding of individual-level correlates of PA like perceived benefits and barriers may contribute to the design of multilevel interventions and curricula aimed at promoting PA among school-aged youth. Moreover, individual level correlates of PA - such as intention, beliefs, and attitudes as well as perceived benefits and barriers are of specific interest to school nurses, physical education teachers, and administrators because these factors may be more amenable to change.

Although perceived benefits and barriers have been consistently linked to PA in adults (Trost, Owen, Bauman, Sallis, & Brown, 2002), their connection to PA in youth is less clear. Research has identified perceived barriers as the most consistent negative psychological correlate of PA in children aged 3 to 12 (Robbins, Pender, & Kazanis, 2003). For adolescents, however, evidence regarding the association between perceived benefits and barriers and PA is inconsistent (Sterdt et al., 2014). One study of White, Black, and Latino adolescent girls found that perceived barriers significantly predicted PA behavior among whites, but not for Latina or Black participants (Kelly et al., 2010).

Frequently cited perceived barriers to PA in youth include time constraints, social factors (e.g. lack of parental support), motivation levels, perceived competence, and limited access (Martins, Marques, Sarmento, & Carreiro da Costa, 2015). A qualitative study of middle school students and their parents cited poor quality and insufficient quantity of physical education, limited parental support, and excessive media use as primary barriers to PA (Goh et al., 2009). Frequently cited perceived benefits of PA among youth include fun, social

benefits (e.g. engaging with friends), psychologic enhancements, and sports performance (Martins et al., 2015).

The amount and types of perceived benefits and barriers may differ by gender, weight status, activity level, race, and ethnicity (Butt, Weinberg, Breckon, & Claytor, 2011; Martins et al., 2015; Robbins, Sikorskii, Hamel, Wu, & Wilbur, 2009). The literature suggests that girls and overweight adolescents perceive greater barriers than boys and non-overweight youth regardless of barrier type (Deforche, De Bourdeaudhuij, & Tanghe, 2006; Zabinski, Saelens, Stein, Hayden-Wade, & Wilfley, 2003). However, few studies have examined how perceived benefits and barriers to PA may affect PA participation among Latino adolescents, with most studies focusing on differences between Black and White students (Butt et al., 2011; Robbins et al., 2003, 2009).

Among a sample of predominantly Latino students attending middle school in a large, urban, geographically-dispersed school district, this study examines: (1) the predictors of high perceived benefits and barriers; and (2) the relationship between perceived benefits and barriers to PA and level of engagement in daily exercise, muscle-strengthening exercises, and sports team participation.

Methods

Data for this investigation are from a cross-sectional survey conducted as a part of a larger study entitled *Project SHAPE*. *Project SHAPE* was a community-engaged physical education intervention aimed at increasing moderate to vigorous PA among middle school students in Los Angeles Unified School District. The University of California Institutional Review Board and the school district approved this study.

Participants

A cross-sectional baseline survey was administered to 4,773 seventh-grade students recruited from 16 middle schools in a large, geographically dispersed school district in Los Angeles, California. Study schools were identified by their willingness to participate in a larger physical education study and their level of enrollment in the free and reduced-price school meal program (an average of 74% of students across the 16 schools participated in the free and reduced-price meal program). Seventh-grade students enrolled in physical education classes from all study schools were offered the opportunity to participate in the survey. There were 6,201 seventh-grade students at all 16 study sites and 5,529 students enrolled in participating teachers' classes (89.2%). Of those enrolled in participating physical education classes, 4,773 students completed the survey (86.3%). The mean age of students was 12.6 years and 68.5% identified as Latino.

Data Collection and Consenting Procedures

In the fall of 2014, members of the research team administered the survey during seventh-grade physical education classes. Prior to data collection, the research team distributed study information sheets to students informing parents of the survey and allowing parents to opt out. The research team also informed students prior to data collection that participation in the survey was voluntary, could be stopped at any time, and had no influence on academic

grades. Students provided verbal assent to participate in the survey. The research team as well as physical education teachers remained in the room to answer student questions during survey administration. Additional details on the survey protocol can be found in Gill et al., 2017.

Instrument and Measures

The survey instrument encompassed multiple domains including PA knowledge, attitudes, and behaviors, nutrition knowledge, attitudes and behaviors and the school food environment. Developed by the research team following a comprehensive review of the literature and existing measures, the survey instrument used items adapted from existing instruments that were appropriate for the participants and that could be completed in the available time. Prior to data collection the instrument was pre-tested with a group of sixth grade students (n=6) and modified clarity, reading level, and survey length, as school schedules constrained student time. A second pre-test of the revised instrument was conducted with another group of seventh grade students (n= 8) resulting in minor modifications of the survey instrument.

Perceived Benefits and Barriers.—Perceived barriers to PA were measured using a 20-item scale adapted from the Amherst Health and Activity Study (Sallis, 1996). Students reported how often each barrier statement (e.g., homework, lack of time, lack of skill, lack of equipment, not liking to sweat) kept them from being physically active, using a 5-point scale from never to often (0–4). These responses were summed to create a scale score (0–80) and dichotomized to account for the non-normality of the distribution. The two categories were selected to retain sufficient sample size while maintaining interpretability: low perceived barriers (0–20) for students who tended to report never or rarely and high perceived barriers (20–80) for students who tended to report a few times, often, or very often.

Perceived benefits of PA were measured using a 9-item scale adapted from the Amherst Health and Activity Study (Sallis, 1996). Students reported their level of agreement with benefit statements (e.g., I will feel less depressed or bored, I will improve my heart and lung fitness, my body will look better) identified as positive outcomes from regular PA, using a 5-point disagree-agree (0–4) scale. These responses were summed to create a scale score (0–36) and dichotomized to account for the non-normality of the distribution. The two categories were selected to retain sufficient sample size while maintaining interpretability: low perceived benefits (0–26) for students who tended to report strongly disagree, somewhat disagree, or neutral and high perceived benefits (27–36) for students who tended to report somewhat agree and strongly agree. Previous research has demonstrated reliability of the scale with a Cronbach's alpha statistic of 0.88 and test-retest score of 0.90 for barriers as well as a Cronbach's alpha statistic of 0.92 and test-retest score of 0.65 for benefits (Taylor et al., 2002). From our data we found a Cronbach's alpha statistics were 0.90 and 0.91 for the barriers and benefits scales, respectively, suggesting strong internal consistency.

Physical Activity.—PA was measured using three items adapted from the Youth Risk Behavior Survey (Centers for Disease Control and Prevention, 2015): "During the past 7 days, on how many days were you physically active for 60 minutes or more per day

(including all activities in and out of school)?"; "During the past 12 months, on how many sports teams did you play (count any teams run by your school or in your community like AYSO, little league baseball)?; "On how many of the past 7 days did you do exercises to strengthen or tone your muscles, such as push-ups, sit-ups, or weight lifting?" The three PA outcomes were dichotomized to indicate meeting national PA recommendations for middle school-aged youth (exercising 60 minutes or more daily and completing muscle strengthening exercises at least 3 days per week; US Department of Health and Human Services, 2008) or to reflect higher PA participation (playing on at least one sports team). The Centers for Disease Control has conducted two test-retest reliability studies of the Youth Behavior Risk Survey. Both studies showed kappa statistics greater than 0.55 for the PA items (Brener et al., 2002; Brener, Collins, Kann, Warren, & Williams, 1995). The validity of self-reported measures of PA can vary depending on the other types of measures used as a comparison (Brener, Billy, & Grady, 2003). In two comprehensive reviews summarizing the literature evaluating the validity of self-report measures developed for children and adolescents found that correlation values ranged from 0.03 to 0.88 (Kohl, Fulton, & Caspersen, 2000; Sallis & Saelens, 2000). A high degree of correspondence between self-report sport team participation and school team rosters has been found (Aaron et al., 1995).

Intentions and Beliefs.—Using an item from the 2013 Middle School Youth Risk Behavior Survey, intention to change weight was measured with one item: "Which of the following are you trying to do about your weight?" (Centers for Disease Control and Prevention). Students could respond "lose weight", "gain weight", "stay the same weight", or "I am not trying to do anything about my weight". Responses were dichotomized into students who were attempting to lose weight and those who were not. Students were also asked about their perceived amount of PA achieved each day with the following item: "Would you say you get too much, too little or just the right amount of physical activity each day?". For the analysis, responses were dichotomized into students who reported "too much" or "just right" and those who reported "too little". This item came from an instrument developed for prior research project in Los Angeles Unified School District (Prelip, Slusser, Lange, Vecchiarielli, & Neumann, 2010).

Social Support.—Measures of social support for PA were obtained using the family and friend participation subscales of the Sallis Support for Exercise Scales (Sallis, Grossman, Pinski, Patterson, & Nader, 1987). Each subscale included 10-items that asked about family and friend encouragement, involvement, and facilitation for PA in the last three months. Students reported how often each social support item occurred in the last three months, using a 5-point scale from never to very often (0–4). Responses were summed to create two scale scores (0–40), one for family and one for friends, and dichotomized into high support (21–40) for students who tended to report "often" or "very often" and low support (0–20) for students who tended to report "never", "rarely", or "a few times". First developed in 1987, this scale has demonstrated evidence of criterion-related and construct validity (Sallis et al., 1987). Since then it has been adapted to different contexts, translated into different languages, and adapted for use with adults (Noroozi, Ghofranipour, Heydarnia, Nabipour, & Shokravi, 2010; Kiernan et al., 2012; Warner, Ziegelmann, Schüz, Wurm, & Schwarzer, 2011; Wilcox et al., 2010). Previous studies have demonstrated reliability of the scale

(Prochaska, Rodgers, & Sallis, 2002; Sallis et al., 1987) and internal consistency for these continuous scales in this study was α=0.90 for family and 0.91 for friend support, indicating high reliability.

Anthropometrics.—The students' physical education teachers provided weight and height obtained from FITNESSGRAM (The Cooper Institute, 2013) testing conducted approximately three months after survey data collection. Body mass index (BMI) was calculated from students' height and weight. FITNESSGRAM is a commonly-used fitness assessment that utilizes evidence-based standards to measure fitness level (The Cooper Institute, 2014). Gender and age-specific BMI percentiles were calculated using the Centers for Disease Control and Prevention (CDC) Growth Charts for ages 2 to <20 years of age (Kuczmarski et al., 2000). Following CDC guidelines, underweight was defined as a percentile <5, healthy weight as a percentile ≥5 and <85, overweight as a percentile ≥85 and <95, and obese as a percentile >95 (Division of Nutrition, Physical Activity, and Obesity, National Center for Chronic Disease Prevention and Health Promotion, 2015).

Demographics.—Students reported gender, age, ethnicity (Latino or non-Latino) and main language spoken at home (English, Spanish, English and Spanish, or other).

Statistical Methods

Descriptive statistics were calculated for all variables. Hierarchical logistic regression models were used to assess differences in demographic variables by the dichotomized barriers and benefits of PA, while accounting for school-level clustering. Similarly, these models were also used to determine differences in all variables between students with FITNESSGRAM data and students without.

Multivariate hierarchical logistic regression models were then used to describe the associations between the two dichotomized scales of interest, barriers and benefits to PA, and gender, ethnicity, language spoken at home, intent to lose weight, and weight status. The models included a random intercept for school. Interactions between gender and ethnicity, gender and weight status, weight status and ethnicity, and weight status and intent to lose weight were tested individually. These were selected a priori, based on the expectation that they might be present. As no interactions were significant, the final model presented excludes any interactions.

Similarly, multivariable hierarchical logistic regression models were used to determine the association between the three PA outcomes and the two dichotomized scales, benefits and barriers, controlling for gender, ethnicity, language spoken at home, intent to lose weight, weight status, perceived amount of PA, family support, and friend support, with a random intercept for school. Interactions between benefits and barriers and the rest of the covariates were tested individually. Again, these were selected a priori, based on the expectation that they might be present, and no interactions were found to be significant. Therefore, the final model presented excludes any interactions.

Since the analysis included only observations with complete barriers and benefits scales, as a sensitivity analysis, all multivariate hierarchical logistic regression model analyses were

repeated using multiple imputation. In particular, we used a method of multiple imputation with chained equations designed for multiple incomplete multi-item scales (Plumpton, Morris, Hughes, & White, 2016). Twenty-five imputed datasets were used. All analyses were conducted using Stata version 14.1.

Results

Table 1 presents descriptive statistics of the sample that had FITNESSGRAM data. Of the 4,773 students, 3,859 (80.9%) had FITNESSGRAM data providing height and weight. Those with and without FITNESSGRAM differed by gender, intention to lose weight, and sports team participation rate. Girls had higher odds of having FITNESSGRAM data compared to males, as did students with intent to lose weight (compared to those with no intent to lose weight). Students who reported playing on at least one sports team had lower odds of having FITNESSGRAM data than students who did not play on any sports teams.

Differences in the three outcomes by level of perceived benefits and barriers are also presented in Table 1, where statistical significance was assessed using a Bonferroni corrected α-level. Of those who reported complete scales for barriers (75.3%), 45.7% were categorized as perceiving high barriers to PA. Similarly, among those who reported complete scales for benefits (88.2%), two-thirds were categorized as perceiving high benefits to PA. Students who perceived high barriers were less likely to report participation in all three PA outcomes. Conversely, students with high benefits were more likely to report participation in all three PA outcomes. Significant differences in perceived benefits and barriers were observed by gender and students trying to lose weight, in perceived barriers by weight status and perceived amount of daily PA, and in perceived benefits by family and friend social support. There were no significant differences by ethnicity or language spoken at home.

Table 2 presents results of the multivariate hierarchical logistic regression models for the outcomes of high barriers and high benefits to PA. All else equal, the odds of girls perceiving high barriers were 1.61 times the odds of males. Additionally, the odds of girls perceiving high benefits were 0.74 times the odds of males. Similarly, students who were overweight or obese had higher odds of perceiving higher barriers compared to students with a healthy weight. Students who reported trying to lose weight had higher odds of perceiving both high barriers and high benefits than students who were not. The odds of Latino students perceiving high barriers were 0.78 times the odds of non-Latinos; however, no differences were observed for language spoken at home. No differences in perceived benefits were detected for ethnicity (Latino), language spoken at home, or weight status. Observations were significant with each other at the school level. Similar trends were observed in the sensitivity analysis, except for a change from non-significance to significance in weight status (Appendix, Table 1) and a change from significance to non-significance trying to lose weight (Appendix, Table 2).

The results of the multivariate hierarchical logistic regression models of the three PA outcomes are displayed in Table 3. Compared to students with low barriers, students with high barriers had smaller odds of exercising 60 minutes or more daily, performing muscle strengthening activities, and participating in at least one sports team (OR = 0.57, 0.65, and

0.71, respectively). The odds of exercising 60 minutes or more daily in students who perceived high benefits was 1.34 times the odds of students who perceived low benefits. However, no differences in perceived benefits were detected among the other PA outcomes.

Girls had lower odds of engaging in all three PA outcomes (OR = 0.64, 0.81, and 0.74, respectively). In addition, obese students had lower odds of exercising 60 minutes per day and performing muscle strengthening exercises 3 days per week compared to students with a healthy weight (OR = 0.71 and 0.74). The following predictors were also found to be significant in the analyses examining PA outcomes: trying to lose weight, perceived amount of daily PA, and social support. Again, significant nesting within schools was detected for all outcomes. Magnitude and significance of the barriers and benefits variables remain the same after multiple imputations were employed; however, small changes were seen in other covariates (see Appendix, Table 3–5).

Discussion

Appropriate interventions to address declining rates of PA during the critical period of adolescence are essential to health promotion and chronic disease prevention over the lifespan (Biddle & Asare, 2011; Ding et al., 2016; Janssen & LeBlanc, 2010). Previous research suggests that perceived benefits and barriers are important correlates of PA for adults and children; however, evidence supporting this relationship among adolescents has been inconclusive (Sterdt et al., 2014). The findings of this study expand knowledge about correlates of perceived benefits and barriers by younger adolescents as well as the association of perceived benefits and barriers with three types of PA among primarily Latino, middle school youth in a large, urban school district. Importantly, this study contributes to the limited body of research examining perceived benefits and barriers to PA among Latino adolescents. Our study found that while Latino students reported fewer perceived barriers to PA than non-Latinos, there were no differences in PA outcomes between Latino and non-Latino students. For example, all else equal compared to a non-Latino student, a student who identifies as Latino would have 22% lower odds of perceiving high barriers to PA. However, there would be no difference in the odds of participating in 60 minutes a day or more of PA, at least three days per week of muscle-strengthening PA, or participating in sports teams by ethnicity. This finding differs from a previous study of high school girls that found that Latino girls perceived greater barriers to PA than their white counterparts (Fahlman, Hall, & Lock, 2006). To the authors knowledge this is the first study examining perceived benefits and barriers among a sample of predominantly Latino, middle school aged adolescents of all genders. The mechanisms underpinning the relationship between ethnicity and perceived barriers to PA are unclear and merit further study.

Overall, the findings emphasize the importance of efforts to promote PA among adolescents. Echoing previous research (Fakhouri et al., 2014; UCLA Center for Health Policy Research, 2014), the study found that almost three-quarters of the students surveyed failed to meet daily PA recommendations despite the fact that all students surveyed were enrolled in physical education. The results also indicate that perceived benefits and barriers are important correlates of PA among adolescents. Perceived barriers showed a strong, negative association with all three PA outcomes: exercising 60 minutes or more daily, performing

muscle strengthening exercises at least three days a week, and participation on at least one sports team. Additionally, perceived benefits were significantly associated with exercising 60 minutes or more per day.

In addition to perceived benefits and barriers, the results of the study indicate that social support is an important correlate of PA for middle school students, as both family support for PA and friend support for PA were positively associated with all three PA outcomes. This supports previous findings, highlighting the important role of social support from family and friends to promote PA among young adolescents (Monique Gill et al., 2017; Silva, Lott, Mota, & Welk, 2014; Sterdt et al., 2014). Nonetheless, barriers remained a significant predictor of PA outcomes when accounting for social support, student perceptions of PA, gender, ethnicity, and body size.

Consistent with prior research that found disparities in PA by gender in nationally representative samples (Gortmaker et al., 2012; Katzmarzyk et al., 2016), our study found that girls in the sample were less likely to report achieving in all three PA outcomes. Disparities in PA for girls may be explained, in part, by their reporting higher perceived barriers and lower perceived benefits to PA. This confirms prior evidence from a previous study indicating girls perceive greater barriers to PA (Allison, Dwyer, & Makin, 1999). Gender differences in social norms around PA, body size, and body image may underpin girls' perception of PA (Spencer, Rehman, & Kirk, 2015), potentially increasing perceived barriers and decreasing perceived benefits. Accordingly, attempts to reduce perceived barriers and increase perceived benefits, thereby promoting PA, should include efforts to normalize active lifestyles for all genders. Previous work has also called for culturally tailored PA programs that meet the interests and needs of adolescent girls (Kelly et al., 2010).

The study also found significant disparities in PA outcomes by weight status. The results showed that obese students, as well as students who reported trying to lose weight, were less likely to exercise 60 minutes or more every day of the week. Obese students in the sample were also less likely to have participated on a sports team in the last year which aligns with findings from prior research (Bengoechea, Sabiston, Ahmed, & Farnoush, 2010; Deforche et al., 2006). Furthermore, overweight, obese, and students trying to lose weight reported higher perceived barriers. Previous research found that overweight youth were more likely to report body consciousness and other body-related concerns as frequent barriers to PA (Zabinski et al., 2003) suggesting future research should consider the relationship between body size, stigma, and PA among adolescents.

Conclusion

This article aims to provide a better understanding of the factors predicting perceived benefits and barriers as well as their association with PA outcomes among a population of primarily Latino, middle school students. In doing so, this study expands current understanding of the determinants of PA outcomes in a minority adolescent youth group. Latinos represent one of the fastest growing ethnic groups in the United States, with projections that suggest that Latinos will constitute more than 25% of the population by the year 2050 (Colby & Ortman, 2015). Given high rates of childhood obesity, disproportionate

burden of chronic disease among Latinos as well as low rates of PA among Latino adolescents, research focused on the correlates of PA among this group contributes to efforts to address the aforementioned disparities. The findings of this study add to the body of research that identifies perceived benefits and barriers as important correlates of PA among adolescents. Differences in predictors of perceived benefits and barriers found in this study suggest that it may advantage future researchers to conceptualize these constructs separately. Moreover, efforts to promote PA among adolescents should be sensitive to the possibility that differing perceptions of benefits and barriers drive PA practices. Finally, while the focus on benefits and barriers is important, a growing body of research supports addressing individual factors alongside ecological determinants (e.g. the availability of parks and green space in communities) to promote PA (Bauman et al., 2012). A deeper understanding of psychological correlates of PA, such as perceived barriers and benefits, that underpin PA behavior may facilitate the development of more effective multilevel interventions in all contexts.

Implications for School Nursing

Schools and physical education programs have been targeted as a critical setting in which youth can engage in regular PA (Cowell, 2014; Hills, Dengel, & Lubans, 2015). Yet, recent research suggests that the amount of PA students receive in physical education may be limited (Gill et al., 2016). Implementing programs that promote PA throughout the school day, such as short activity breaks and active transport would allow youth to engage in PA throughout the day rather than to depend upon physical education as the primary way to achieve the 60 minutes per day recommendation (Institute of Medicine & Food and Nutrition Board, 2013). As members of the broader school health, school nurses can collaborate with physical education teachers and administrators within the school as well as parent to support structured physical education curriculum and related policies as well as ecological approaches to promote (Cowell, 2014). Applying a comprehensive approach to PA offers promise to help overcome barriers to PA such as lack of time and equipment or inclement weather that prevents use of school playgrounds.

Further, a deeper understanding of correlates of PA such as perceived benefits and barriers, may enhance school nurses' ability to serve as health advocates on campus to facilitate the development of interventions that enable all students to participate in PA in- and outside of the classroom. These interventions should address the barriers as well as facilitators of PA. Interactive classroom activities provide an opportunity for students to identify benefits of PA and barriers that influence their engagement. During group discussion students may develop strategies for overcoming each of the barriers identified. Moreover, understanding determinants of PA can facilitate one-on-one counseling with students at higher risk for health issues associated with sedentary behavior.

Limitations and Strengths

One limitation of this study includes the cross-sectional nature of the data. Because the exposure, perceived benefits and barriers, and outcome, PA behaviors, were assessed at the same time we cannot provide sufficient evidence for a causal relationship. A second limitation of this study is that data collection was restricted to a single geographic area (Los

Angeles) which limits generalizability. Further, we detected statistically significant differences in covariates for students with and without FITNESSGRAM data, further limiting the generalizability of our findings. In addition, except for height and weight, all data collected including PA outcomes were self-reported by students. As such, these data are subject to recall and social acceptability bias.

Physical education teachers from each school collected height and weight data which may have resulted in data bias due to inconsistencies in measurement methods. A strength of the study was its large sample size and high response rate of 86.3%, thus minimizing non-response bias in the data. Also, the study sample consisted of primarily Latino students from a large, urban school district, who represent an understudied population in literature on the psychosocial correlates of PA.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1.

Sample Characteristics in Total and by Barriers and Benefits of Physical Activity

	Total	Barriers		Benefits	
Characteristics	**N = 3,859 Percent**	**Low N = 1,616 Percent**	**High N = 1,359 Percent**	**Low N = 1,137 Percent**	**High N = 2,327 Percent**
Gender					
Male	48.7	54.4	42.3***	44.4	50.1**
Female	51.3	45.6	57.7	55.6	49.9
Hispanic/Latino					
Yes	68.5	68.0	68.0	68.3	68.6
No	31.5	32.0	32.0	31.7	31.4
Language Spoken at Home					
English	27.9	30.8	26.4	28.0	27.8
Spanish	8.2	7.7	7.0	9.4	7.3
English and Spanish	55.6	52.9	57.4	54.6	56.2
Other	8.3	8.6	9.3	8.0	8.7
Trying to Lose Weight					
Yes	54.0	50.7	60.9***	51.2	59.5***
No	46.0	49.3	39.1	48.8	40.5
Weight Status					
Underweight	3.0	2.9	3.1***	4.0	2.5*
Healthy	52.8	59.0	48.0	53.9	52.9
Overweight	19.7	18.0	20.9	18.5	20.1
Obese	24.5	20.1	28.0	23.6	24.6
Perceived Amount of Daily Physical Activity					
Just Right/ Too Much	86.0	89.3	82.3***	83.9	86.8*
Too Little	14.0	10.7	17.7	16.1	13.2
Family Support					
High	31.8	33.1	28.7*	20.3	37.6***
Low	68.2	66.9	71.3	79.7	62.4
Friend Support					

	Total	Barriers		Benefits	
Characteristics	**N = 3,859 Percent**	**Low N = 1,616 Percent**	**High N = 1,359 Percent**	**Low N = 1,137 Percent**	**High N = 2,327 Percent**
High	17.1	17.2	15.5	11.7	19.8***
Low	82.9	82.8	84.5	88.3	80.2
Exercises 60+ mins. per day every day of the week					
Yes	25.7	32.6	18.7***	19.1	29.2***
No	74.3	67.4	81.3	80.9	70.8
Performs exercises to strengthen muscles at least 3 days of the week					
Yes	61.8	67.8	56.0***	55.9	65.6***
No	38.2	32.2	44.1	44.1	34.4
Participates in at least one sports team					
Yes	60.1	63.1	53.5***	55.4	62.2***
No	39.9	36.9	46.5	44.6	37.8

*p < 0.05

**p < 0.01

***p < 0.001

[1]Sample sizes for the analyses were restricted to students who had complete FITNESSGRAM data, complete benefits and barriers scales, and complete family and friend support scales. Of the 4,773 students, 914 did not have FITNESSGRAM data providing height and weight; 1,178 and 565 did not report complete perceived barriers and benefits scales, respectively; and 884 and 395 individuals did not report complete family and friend support scales, respectively. Due to missing data, some summary statistics presented were calculated with smaller sample sizes than reported in the table. Percents may not sum to 100 due to rounding.

[2]Significant differences in barriers status and benefits status by characteristics were tested using Wald chi-square tests in hierarchical logistic regression models.

Table 2.

Summary of Hierarchical Logistic Regressions Predicting High Barriers and Benefits of Physical Activity

Coefficients	Barriers N = 2,772 OR (95% CI)	Benefits N = 3,246 OR (95% CI)
Fixed Effects		
Female	1.61 (1.38, 1.88) ***	0.74 (0.63, 0.86) ***
Hispanic/Latino	0.78 (0.62, 0.98) *	1.10 (0.89, 1.37)
Language Spoken at Home		
English (reference)		
Spanish	1.08 (0.77, 1.52)	0.83 (0.61, 1.14)
English and Spanish	1.20 (0.96, 1.50)	1.08 (0.88, 1.34)
Other	1.14 (0.85, 1.55)	1.02 (0.75, 1.38)
Trying to Lose Weight	1.26 (1.05, 1.52) *	1.47 (1.23, 1.76) ***
Weight Status		
Underweight	1.51 (0.96, 2.39)	0.67 (0.44, 1.02)
Healthy (reference)	1.00	1.00
Overweight	1.32 (1.06, 1.63) *	1.00 (0.80, 1.23)
Obese	1.58 (1.27, 1.95) ***	0.87 (0.71, 1.07)
Random Effects		
School Level Error Std. Dev.[1]	0.20 ***	0.25 ***

* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$

[1] Sample sizes for the analyses were restricted to students who had complete FITNESSGRAM data, complete benefits and barriers scales, and complete family and friend support scales.

[2] Significance of school level error variance were tested using likelihood ratio tests.

Table 3.

Summary of Multivariable Hierarchical Logistic Regressions Predicting 3 Physical Activity Outcomes

	Exercising 60+ Minutes Per Day Every Day of the Week N = 2,334	**Performing Muscle Strengthening Exercises at Least Three Days a Week N = 2,337**	**Participation on at Least 1 Sports Team N = 2,341**
Coefficients	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**
Fixed Effects			
High Barriers	0.57 (0.46, 0.70) ***	0.65 (0.54, 0.79) ***	0.71 (0.59, 0.85) ***
High Benefits	1.34 (1.06, 1.68) *	1.18 (0.97, 1.44)	1.07 (0.88, 1.29)
Female	0.64 (0.53, 0.79) ***	0.81 (0.67, 0.97) *	0.74 (0.62, 0.88) **
Hispanic/Latino	0.90 (0.67, 1.20)	0.87 (0.66, 1.14)	1.01 (0.78, 1.31)
Language Spoken at Home			
English (reference)			
Spanish	1.13 (0.72. 1.76)	1.03 (0.69, 1.55)	1.47 (0.97, 2.21)
English and Spanish	0.85 (0.64, 1.13)	1.25 (0.97, 1.62)	0.91 (0.71, 1.16)
Other	1.17 (0.81, 1.68)	0.95 (0.67, 1.34)	0.73 (0.52, 1.02)
Trying to Lose Weight	0.72 (0.57, 0.91) ***	1.05 (0.85, 1.30)	1.03 (0.84, 1.27)
Weight Status			
Underweight	0.75 (0.41, 1.36)	0.77 (0.45, 1.31)	0.64 (0.38, 1.08)
Healthy (reference)	1.00	1.00	1.00
Overweight	0.95 (0.72, 1.26)	0.87 (0.68, 1.13)	1.17 (0.91, 1.50)
Obese	0.71 (0.53, 0.94) *	0.74 (0.57, 0.94) *	0.82 (0.64, 1.04)
Perceived Amount of Daily Physical Activity	2.39 (1.67, 3.41) ***	1.84 (1.44, 2.36) ***	1.47 (1.15, 1.87) **
High Family Support	1.67 (1.35, 2.08) ***	1.81 (1.46, 2.23) ***	2.09 (1.70, 2.57) ***
High Friend Support	1.76 (1.37, 2.28) ***	2.19 (1.65, 2.93) ***	1.88 (1.44, 2.46) ***
Random Effects			
School Level Error Std. Dev.[1]	0.17 *	0.52 ***	0.29 ***

* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$

[1] Sample sizes for the analyses were restricted to students who had complete FITNESSGRAM data, complete benefits and barriers scales, and complete family and friend support scales.

[2] Significance of school level error variance were tested using likelihood ratio tests.