Quantifying Physical Activity in Physical Education via Pedometry: A Further Analysis of Steps/Min Guidelines

Philip W. Scruggs

Background: The validity of common pedometer steps/min guidelines for 1st–12th grade physical education physical activity (PA) recommendations (ie, 33% and 50% PA) was investigated. Methods: Data sets from previous research, where physical education PA was quantified via pedometry, were combined. Participants (1st–12th grade, N = 1152) with concurrent steps/min and observed %PA scores were included. Data were analyzed using correlation, regression, and receiver-operator-characteristic (ROC) statistics. Alpha was set at .05. Results: Overall, by gender and school level group (ie, 1st–6th, 7th–12th) PA outcome measures were strongly correlated and significant (r = .85–.92). Steps/min2, lesson time3, stature4, and BMI5 were significant predictors (r12•345=.91) of %PA1. Steps/min accounted for 85.4% of the variance for %PA; however, the other predictors only accounted for an additional 0.5%. ROC analyses indicated that steps/min was an excellent discriminator (AUC ≥ .90) of %PA guideline achievement. Steps/min values of 60.6 and 82.2 were the most accurate cut points overall for the 33% and 50% PA guidelines, respectively. Steps/min cut points for gender and school level demonstrated agreement with the overall steps/min cut points. Conclusions: These findings support the contention that common steps/min guidelines can be applied in the surveillance of physical education PA.

Keywords: assessment, public health, surveillance

Policy has been set for the quality and quantity of physical education in the United States (U.S.) to address obesity. In 1990 and 2000 the United States Department of Health and Human Services (USDHHS)1,2 set as a targeted objective that students within physical education should engage in a significant amount of physical activity (PA) within physical education. Since then, additional education and public health entities have called on physical education to engage students in PA within physical education.3–11 In 2009 the Centers for Disease Control and Prevention (CDC)12 issued 24 strategies for targeting obesity within the U.S. Strategy 13 states that physical education PA should be increased (eg, 50% of the lesson time devoted to PA). In addition, the Robert Wood Johnson Foundation9 urges policy makers to strengthen the Physical Education for Progress Act; specifically that there should be a strong emphasis on physical education providing a significant dose of PA within class time.

Specific physical education documents at the national level, such as the CDC Physical Education Curriculum Analysis Tool (PECAT)3 and the National Association for Sport and Physical Education (NASPE)13 Appropriate Instructional Practice Guidelines, have called for enhancing PA levels within physical education and for appropriate assessment of PA. In the PECAT and NASPE documents, quality and appropriate practices in physical education include a) engaging students in PA for a significant portion of the lesson time, b) implementing PA assessment/technology tools appropriately (eg, using pedometers to quantify PA), and c) reporting to parents about student PA behavior. State level agencies have also adopted physical education PA recommendations. One such state, Idaho, adopted new physical education standards in 2010, where the PA objective states that practitioners engage students in developmentally appropriate PA for 33% (ie, elementary level) or 50% (ie, secondary level) of the lesson time.14 However, surveillance of physical education physical activity has been problematic due to issues with widespread standard adoption and/or implementation of a practical assessment mechanism.

Establishing policy to meet physical education PA standards (eg, 50% of physical education engaged in PA) is difficult without a mechanism for surveillance. A serious literature and policy assessment gap remains since physical education was challenged with increasing PA within physical education. One of the most urgently needed aspects related to the physical education PA strategy is a standardized and practical system for monitoring student PA within physical education by both practitioners and researchers.11 In the recent decade, research targeting the development of a valid, objective, and practical mechanism for surveillance of physical education PA has been sought.15–19

PA standards for physical education PA have been established for grade levels that are similar in chronological age (eg, 1st and 2nd, 3rd and 4th, 5th and 6th, etc) and validated using the Yamax spring-levered electronic pedometer.15–19 Initial studies by Scruggs and colleagues15,17,18 examined pedometer steps/minute as a measure to quantify the percent of time students spent
physically active in elementary (ie, 1st and 2nd, 3rd and 4th, and 5th and 6th grade) school physical education. The association between steps/minute and percent of time engaged in PA was moderately strong to strong \( r = .74 \pm .09, P < .01 \). Across the 3 studies by Scruggs and colleagues, a similar steps/minute criterion interval \( (r = .58 \pm 6.3) \) was found for the targeted recommendation of 33% of the class time engaged in PA, and the steps/minute criterion accurately quantified percent of time engaged in PA \( (r = .89 \pm .97, P < .01) \). The studies/minute interval found to most accurately define the 50% criterion was 82.5–88.1 (7th and 8th grades) and 81.8–83.1 (9th–12th grades), and the diagnostic efficiency was greater than 90.0% and ROC AUC = 97.0%–99.0%. However, to provide specific pedometer steps/min physical education PA standards for application across all grade levels for practitioner and researcher use, a secondary analysis of the previously cited physical education PA quantification studies was needed.

The validity of common pedometer steps/min guidelines for 1st through 12th grade physical education PA recommendations \( (r = .33 \pm .50) \) was investigated. Study objectives were to (1) examine the relationship between students’ steps/min and percent of a physical education lesson physically active \( (%PA) \) overall, by gender, and by elementary (ie, 1st through 6th grades) and secondary (ie, 7th through 12th grades) school levels; (2) examine the influence of lesson duration (min), stature (cm), and BMI (kg/m²) on the relationship between steps/min and %PA; (3) assess the validity of a common steps/min standard for 33% and 50% PA in physical education; and (4) examine the common steps/min standards across genders, and elementary and secondary school levels.

Methods

Participants and Context

Data sets from previous research, where physical education PA was quantified and participants had matched PA outcome measures, were combined. Participants were 1st–12th grade students \( (N = 1152, \text{see Table 1}) \) from the lower and upper Midwestern U.S., and Southwestern U.S. The sample was 17.7% non-Caucasian. Physical education lessons \( (N = 181) \) stemmed from 95 intact classes, were taught by 27 certified physical education teachers, and incorporated 28 content themes. Signed assent and parental consent was obtained \( (\text{ie, participants} < 18 \text{ yr}) \), and signed consent was obtained \( (\text{ie, participants} > 18 \text{ yr}) \). Institutional Review Board approval was obtained for the research.

Instrumentation

Primary instrumentation employed to collect data were the Yamax SW651 and SW701 pedometers (Yamax Corp., Tokyo, Japan), and the modified System for Observing Fitness Instruction Time (SOFIT) activity behavior coding scale.

Protocol

Pedometer (steps/min, predictor measure) and SOFIT PA \( (%PA, \text{criterion measure}) \) were concurrently measured. Steps/min was computed by dividing the physical education step count value by the lesson time \( (\text{ie, reset—start of lesson to record—end of lesson}) \) in minutes. Before data collection, pedometers were checked for measurement step count accuracy. All 117 pedometers demonstrated step count accuracy \( \geq 97.0\% \) for a 150 step test at treadmill speeds of 4.83 and 9.66 km/hr at 0.0% grade.

SOFIT %PA data were collected by trained observers, and quality checks were conducted on 7.0% of the observations. All observation quality checks scored above the 90% a priori interobserver agreement criterion. A detailed description of the participants, instrumentation and protocol are presented elsewhere.

Statistics

Microsoft Excel 2007 12.0 and IBM SPSS 18.0 were used for statistical analyses. Correlation and linear regression statistics were generated to examine the relationship between PA measures, and the influence of potential covariates. Steps/min cut points were generated using the ROC analysis. Diagnostic statistics of sensitivity \( (Se) \), specificity \( (Sp) \) and AUC from ROC statistical outputs were employed to determine steps/min cut point intervals that most accurately discriminated between achievement and nonachievement of the %PA criteria. Diagnostic criteria were set at \( Se \) and \( Sp \geq 80.0\% \), and the absolute-value difference between \( Se \) and \( Sp \leq 0.05 \) \( \text{[ISe—|Sp|]} \leq 0.05 \). Steps/min cut point intervals were represented by lower limit, optimal and upper limit values. The optimal steps/min value was the steps/min value where the \( Se \) and \( Sp \) difference was least \( (\text{ie, where} Se \text{and} Sp \text{were equalized}) \). Lower and upper limits were identified \( (\leq 0.05) \) using the absolute-value difference scores between \( Se \) and \( Sp \) ROC Se and Sp statistics were exported to Excel for \( Se \) and \( Sp \) difference score calculations. Diagnostic statistical analyses for the 33% and 50% PA criteria were conducted for all data combined, by gender, and by elementary and secondary school level. Alpha was set at \( \leq 0.05 \) for statistical significance.

Results

General

Participant demographic, anthropometric, and physical activity statistics by gender and school level are presented in Table 1. Physical education lesson duration was 34.84 ± 11.28 minutes for all data combined and 30.41 ± 2.75
### Table 1  Demographic, Anthropometric, and Physical Activity Statistics (Mean ± SD)

<table>
<thead>
<tr>
<th></th>
<th>School level</th>
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<tbody>
<tr>
<td></td>
<td>1st–6th grade</td>
<td>7th–12th grade</td>
<td>Total</td>
<td>1st–6th grade</td>
<td>7th–12th grade</td>
</tr>
<tr>
<td>n</td>
<td>Female: 374</td>
<td>Male: 380</td>
<td>Total: 754</td>
<td>Female: 192</td>
<td>Male: 206</td>
</tr>
<tr>
<td></td>
<td>8.18 (1.75)</td>
<td>8.38 (1.83)</td>
<td>8.30 (1.79)</td>
<td>15.17 (1.77)</td>
<td>15.00 (1.85)</td>
</tr>
<tr>
<td></td>
<td>130.39 (12.15)</td>
<td>132.21 (12.47)</td>
<td>131.31 (12.34)</td>
<td>162.05 (7.31)</td>
<td>169.33 (10.25)</td>
</tr>
<tr>
<td></td>
<td>30.32 (10.54)</td>
<td>31.60 (11.68)</td>
<td>30.97 (11.14)</td>
<td>59.19 (12.30)</td>
<td>63.24 (15.78)</td>
</tr>
<tr>
<td></td>
<td>17.37 (3.39)</td>
<td>17.57 (3.59)</td>
<td>17.47 (3.49)</td>
<td>22.47 (4.15)</td>
<td>21.83 (4.24)</td>
</tr>
<tr>
<td></td>
<td>1867.59 (430.98)</td>
<td>1996.48 (543.70)</td>
<td>1932.55 (494.93)</td>
<td>2528.48 (1260.84)</td>
<td>3337.98 (1290.02)</td>
</tr>
<tr>
<td></td>
<td>62.05 (13.44)</td>
<td>65.34 (15.79)</td>
<td>63.70 (14.75)</td>
<td>65.06 (31.65)</td>
<td>82.87 (23.76)</td>
</tr>
<tr>
<td></td>
<td>33.9 (8.8)</td>
<td>36.4 (9.6)</td>
<td>35.2 (9.3)</td>
<td>38.8 (17.9)</td>
<td>49.3 (14.5)</td>
</tr>
<tr>
<td>Abbreviations: BMI, Body Mass Index; Steps/Min, steps/minute in physical education; %PA, percent of lesson time physically active.</td>
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</table>
and 40.21 ± 14.86 minutes for the 1st through 6th and 7th through 12th school levels, respectively.

**Objective 1**

PA outcome measures were strongly correlated and significant for overall, gender and school level comparisons (see Figure 1; \( r = .85–.96, P = .0001 \)). The partial correlation analysis revealed a strong correlation between PA measures (ie, \( %PA_1 \) and steps/min\(_2 \)) when controlled for lesson time\(_3\), stature\(_4\), and BMI\(_5\) (\( r_{12.345} = .91, P = .0001 \)).

**Objective 2**

Analyzed covariates (ie, lesson time\(_3\), \( P = .004 \); stature\(_4\), \( P = .009 \); BMI\(_5\), \( P = .026 \)), while significant, were not found to meaningfully influence PA measure relation by improving the linear regression model (steps/min = (1.504 \times \%PA) + 9.772, \( r^2 = .854 \); steps/min = [1.519 \times \%PA] + [–.045 \times \text{htcm}] + [–.155 \times \text{BMI}] + [–.070 \times \text{lesson time}] + 21.006, \( r^2 = .859 \)).

**Objective 3**

Diagnostic statistics for all data combined indicated that steps/min intervals were valid indicators for the 33% and 50% physical education PA criteria. Steps/min cut point intervals of 59.5–61.8, and 79.6–84.1 were the most accurate values for the 33% and 50% criteria, respectively (see Table 2). ROC AUC analysis for all data combined confirmed steps/min to be an accurate discriminator between participants who met and did not meet the PA criteria (see Table 2).

**Objective 4**

The steps/min intervals found to be valid indicators overall, demonstrated excellent diagnostic accuracy for \%PA criteria by gender and school level comparisons (see Table 2). AUC statistics support steps/min as an accurate discriminator of meeting or not meeting the \%PA criteria across gender and school level (see Table 2).

**Conclusions**

This study examined the validity of common physical education steps/min outcomes for quantifying physical education \%PA recommendations. Findings indicate that common steps/min standards can be set for 33% and 50% PA within 1st–12th grade physical education. The 33% and 50% steps/min cut point intervals overall, by gender and by school level were found to overlap for each respective physical education \%PA recommendation. In addition, the factors of lesson time, stature and BMI were examined as predictors in the regression model for estimating \%PA. While these factors were significant predictors in the model, the additional shared variance explained was minimal (0.5%) and would not warrant the additional practitioner burden to account for the variables in determining whether physical education \%PA recommendations were met. Knowing whether physical education \%PA recommendations are being met is critical for the assessment of a key strategy targeting pediatric obesity in the U.S.

In 2009, the CDC\(^1\) published evidence based strategies for impacting obesity in the U.S. Specifically, Strategy 13 states that PA within physical education programs should be increased. Significant doses of physical education PA have been recommended by researchers, public health entities, and educational agencies\(^3,4,8–15\) and assessing PA with validity and practicality are critical elements in the application of a PA surveillance tool within physical education. In selecting a PA instrument, McClain and Tudor-Locke\(^2\) state that the PA outcome of interest is the most critical factor in instrument selection, and 1 PA tool is not appropriate for all research and practice contextual parameters. The outcome of interest targeted and recommended, in this study, for application by practitioners, researchers, and state education or health agencies for physical education program and student PA assessment is whether students in physical education meet \%PA recommendations. When considering the contextual parameters of PA surveillance for physical education such as practitioner time, instrument cost and immensity of the task, the simple pedometer and pedometer output of steps converted to steps/min in physical education offers practitioners, researchers, and officials a valid and practical method for physical education \%PA assessment and surveillance.

The overall data set steps/min cut point interval found to be appropriate for quantifying the 33% PA standard was 59.5–61.8, with an optimal cut point value of 60.6. A further examination of this cut point interval in relation to the other cut point intervals for the 33% PA data sets, suggest that the appropriate cut point interval could be tightened. To develop a tighter cut point interval where only the steps/min values across each data set were included, the lower steps/min limit for the girls and the upper steps/min limit for school level 1st–6th grade would be selected. The adjusted steps/min cut point interval of 59.6–61.2 would contain only steps/min values common to all data sets. Cut point intervals whether for the overall data set or the adjusted interval found here are in agreement with previous findings\(^15,17,18\) where 1st and 2nd (60.0–63.0 and 61.1–62.7), 3rd and 4th (58.5–61.3), and 5th and 6th (60.3–61.7) grade groups were studied separately to match NASPE\(^24\) grade level groupings for K–12 physical education standards. Findings here lend support for a common steps/min cut point interval across grade levels for the 33% PA recommendation. While the 33% PA recommendation might be more appropriate for elementary level physical education, as alluded to in Scruggs\(^,15\) it can serve as an initial benchmark for physical educators’ and/or students’ developmental progression toward the 50% PA recommendation commonly called for in the literature\(^8,9,12\).

Previous research quantifying steps/min for the 50% PA recommendation developed steps/min
Figure 1 — The dashed line in both scatter plots A (ie, School Level) and B (ie, Gender) represent the overall relationship between %PA and steps/min ($r = .92$, $P = .0001$). $A_1$ (1st–6th), $r = .85$; and $A_2$ (7th–12th), $r = .96$, $P = .0001$. $B_1$ (female) and $B_2$ (male), $r = .92$, $P = .0001$. 
Table 2  All Data Diagnostic Statistics for Steps/Min Cut Points for the 33% and 50% Physical Activity Criteria

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Data set</th>
<th>Lower limit (Se, Sp)</th>
<th>Optimal (Se, Sp)</th>
<th>Upper limit (Se, Sp)</th>
<th>AUC</th>
<th>AUC SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>33% PA</td>
<td>Overall</td>
<td>59.5 (91.7, 86.8)</td>
<td>60.6 (89.7, 86.9)</td>
<td>61.8 (86.4, 91.4)</td>
<td>95.9*</td>
<td>.0052</td>
</tr>
<tr>
<td></td>
<td>1st–6th</td>
<td>59.5 (88.0, 83.1)</td>
<td>60.2 (86.2, 86.2)</td>
<td>61.2 (83.2, 87.9)</td>
<td>92.7*</td>
<td>.0093</td>
</tr>
<tr>
<td></td>
<td>7th–12th</td>
<td>56.9 (98.0, 93.4)</td>
<td>61.3 (96.2, 96.2)</td>
<td>65.1 (93.2, 98.1)</td>
<td>99.5*</td>
<td>.0020</td>
</tr>
<tr>
<td></td>
<td>Girls</td>
<td>59.6 (92.1, 87.4)</td>
<td>60.7 (90.2, 90.3)</td>
<td>61.4 (86.9, 91.6)</td>
<td>96.0*</td>
<td>.0073</td>
</tr>
<tr>
<td></td>
<td>Boys</td>
<td>59.5 (91.4, 86.6)</td>
<td>60.6 (89.3, 89.2)</td>
<td>62.3 (85.8, 90.5)</td>
<td>95.6*</td>
<td>.0078</td>
</tr>
<tr>
<td>50% PA</td>
<td>Overall</td>
<td>79.6 (96.4, 91.7)</td>
<td>82.2 (94.2, 94.2)</td>
<td>84.1 (91.6, 96.3)</td>
<td>98.6*</td>
<td>.0027</td>
</tr>
<tr>
<td></td>
<td>1st–6th</td>
<td>76.2 (94.0, 89.1)</td>
<td>79.0 (92.0, 92.1)</td>
<td>81.2 (90.0, 93.8)</td>
<td>97.8*</td>
<td>.0061</td>
</tr>
<tr>
<td></td>
<td>7th–12th</td>
<td>80.7 (96.0, 91.0)</td>
<td>83.9 (94.9, 95.5)</td>
<td>85.1 (91.4, 96.4)</td>
<td>98.6*</td>
<td>.0042</td>
</tr>
<tr>
<td></td>
<td>Girls</td>
<td>77.4 (96.1, 91.2)</td>
<td>79.8 (93.4, 93.9)</td>
<td>83.9 (92.1, 96.9)</td>
<td>98.7*</td>
<td>.0043</td>
</tr>
<tr>
<td></td>
<td>Boys</td>
<td>80.8 (96.0, 91.1)</td>
<td>83.6 (94.0, 94.3)</td>
<td>84.4 (91.3, 95.7)</td>
<td>98.4*</td>
<td>.0038</td>
</tr>
</tbody>
</table>

Abbreviations: Se, sensitivity; Sp, specificity; PA, physical activity; %PA, percent of lesson time physically active; AUC, area under curve; SE, standard error.

* P < .05.

recommendations for 7th and 8th grade and 9th–12th grade groups that were generalizable to the respective grade groups.16,19 Previous findings across these 2 grade groupings were similar in that a steps/min interval of 82.5–88.1 and 81.8–83.1 were found for 7th and 8th grade and 9th–12th grade, respectively. The 50% PA steps/min cut point results found in this study were in agreement with Scruggs16 and Scruggs et al.,19 in that the overall data set (ie, 1st–12th grade) steps/min cut point interval was 79.6–84.1 and the optimal value was 82.2. An adjusted steps/min cut point interval should also be made for the 50% PA recommendation, as was done for the 33% PA recommendation. To develop a tighter cut point interval where only the steps/min values across each data set were included, the lower steps/min limit for the boys and the upper steps/min limit for school level 1st–6th grade would be selected. The adjusted steps/min cut point interval of 80.8–81.2 would contain only steps/min values common to all data sets. The steps/min cut point finding for the physical education 50% PA recommendation is of particular significance, as a common steps/min guideline can be applied across 1st–12th grade physical education for targeting a key strategy for impacting pediatric health.12 While there are many institutions and factors that impact pediatric PA and health, research supports a multifaceted approach where physical education (ie, the PA within physical education) plays a key role in youth accumulating a health and academic enhancing dose of PA.4,11,12,23 While physical education is not the same as PA,5–7 PA is an expected outcome of high quality physical education.3,8,9,12–14

PA within physical education and promoting and developing lifelong PA of students outside of physical education are outcomes of quality physical education programs.3,24 Assessment and surveillance of these PA outcomes are appropriate practices which will move physical education into the future as a critical component of the educational and public health mission of schools. The assessment and surveillance method proposed here to quantify physical education PA via pedometer steps/min, demonstrates validity and has been used as a component of measuring segmented daily PA via pedometer in the pediatric population.25,26 Daily step count (ie, steps/day) PA recommendations for youth vary, but general recommendations range from 11,000–13,000 and 13,000–15,000 for girls and boys, respectively.27,28 Applying the 33% and 50% steps/min standards found here to the daily steps/day recommendations (ie, assuming 13,000 step/day) for children and assuming physical education lesson lengths of 28 (ie, 30 minutes allocated), 40 (ie, 50 minutes allocated), and 75 (ie, 90 minutes allocated) minutes, physical education should contribute at least 13%–18%, 19%–25%, or 35%–47% for the different PA recommendations and lesson lengths, respectively. With the simple pedometer output of steps, practitioners can employ an assessment tool and protocol to address the key PA outcomes of within and outside of the physical education class.

A key consideration in the application of physical education PA assessment, specifically as applied in the field by practitioners, is practitioner and student burden in the protocol used for instrument use and data management. Depending on the type of assessment (ie, informal or formal, self/student or practitioner assessment, etc.) a practitioner uses in a given context, practitioners could adjust the step/min cut points to 60 and 80 for the 33% and 50% standards, respectively. The slight adjustments, while still valid step/min cut point values for the given %PA recommendations as noted in Table 2, allow for practitioners and students to conduct time efficient calculations for informal assessment. For example, at any point in a given lesson the practitioner could note the length of time in minutes students have worn (ie, from reset) the pedometer and multiply the given value of 60 or 80 by
the time (e.g., 20 minutes through a 40-minute lesson, students should have accumulated at least 1600 steps at the given time). For the researcher and practitioner collecting data for dissemination purposes, applying the tighter step/min cut point intervals of 59.6–61.2 and 80.8–81.2 for the 33% and 50% PA recommendations would be required. Implementing cut point intervals in high stakes testing and research-surveillance contexts would be an appropriate approach. The interval classification approach would allow for more accurate evaluations, as the number of students classified as false positives and false negatives would decrease, thus decreasing error.

PA instrument potential for measurement error has been documented.30,31 As PA instrument research advances, researchers and practitioners are provided with protocols for appropriate PA instrument measurement and implementation.22,32 A potential limitation (ie, source of error) here is the mechanism of spring-levered Yamax pedometer, as the spring-levered type pedometer has been shown to be less accurate at slower ambulatory speeds and when pedometer tilt angle is ≥ 10° in youth.33 However, the slower walking speed limitation of the spring-levered pedometer was not likely an issue, since the outcome of steps/min was examined in relation to SOFIT PA where moderate intensity PA was recorded. Pedometer tilt angle in the study was not assessed or the possible causes (e.g., type or degree of looseness of a waistband or amount of abdominal fat or protruding belly) of pedometer tilt angle. Based on the Se and Sp scores for the most accurate steps/min cut points, the error due to pedometer tilt angle or PA of a nonambulatory mode was minimal. In relation to the waist mounted pedometer for measuring PA, the pedometer would not be appropriate for measuring nonambulatory PA. The percent of nonambulatory PA in physical education was not assessed in this study; however, in all the physical education classes observed one would expect some modes of PA which the pedometer would not capture. Even for spring-levered pedometers, all pedometers do not have the same g force threshold for registering a step,34–36 so the steps/min cut point values found here to be valid might not be applicable to different brands or measurement mechanisms (ie, piezoelectric) of pedometers. While these limitations influence the generalizability of steps/min standards for physical education, they also offer future research possibilities such as a) could a piezoelectric pedometer generate different and more accurate steps/min standards for physical education %PA recommendations that would justify the additional cost? b) can the classification accuracy of steps/min cut points be increased if a data collection protocol is implemented to control for pedometer tilt or placement; c) would a different spring-levered brand of pedometer demonstrate similar steps/min cut point intervals; and d) what percent of a physical education lesson must be devoted to ambulatory PA for the pedometer steps/min standards to be applied appropriately?

In summary, a further analysis of steps/min physical education standards demonstrates that common steps/min cut point intervals and optimal values can be applied to 1st–12th grade physical education %PA recommendations with validity. Physical education has been challenged to play a vital role in pediatric health by providing a significant dose of PA during the school day, and practitioners, researchers and health and educational agencies have a valid outcome measure of steps/min in physical education to assess a key pediatric community strategy.

Acknowledgments

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