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Objective Measures of PETE Student Achievement and Maintenance of Physical Activity and Fitness

Timothy Baghurst
Oklahoma State University
Stillwater USA

Kevin Richard
Oklahoma State University
Stillwater USA

Ali Boolani
Clarkson University
Potsdam USA

Author Biographies

Timothy Baghurst is an Associate Professor of Health and Human Performance and serves as the program coordinator for Physical Education and Coaching Science at Oklahoma State University. His research focuses on modeling health in the health professions and male body image.

Kevin Richard is a doctoral candidate in Counseling Psychology and studies the relationship between exercise and psychological health, and how technology can be used as a way to objectively measure human behavior.

Ali Boolani is an Assistant Professor in the Department of Physical Therapy at Clarkson University. His research specializes on how physical activity can be used as interventions for various maladies.

Abstract

This study sought to determine whether using accelerometers would be an equitable substitution to fitness testing physical education teacher education (PETE) students for program accreditation purposes. Participants were 25 undergraduate physical education students who completed a PACER test and wore an accelerometer for 14 days. Participants took significantly more steps than 10,000 steps per day and averaged just over 30 minutes of moderate physical activity daily. There were non-significant relationships between moderate physical activity and PACER scores, but participants with higher levels of moderate physical activity had a strong significant relationship to more steps per day. The use of steps per day may serve as an equitable replacement to the PACER test, may be a less embarrassing measure, less likely be mediated by students' level of motivation at test time, and would serve to limit some of the legal issues that might arise from fitness testing students.

Key words: physical education, teacher education, accelerometers, assessment, credibility

Mesures objectives de l'activité physique et de la condition physique des étudiants-maîtres en éducation physique

Résumé

Cette étude visait à déterminer si, aux fins d'accréditation de programme, le recours aux accéléromètres constitue un substitut acceptable aux tests de condition physique administrés aux étudiants qui veulent devenir enseignants d'éducation physique,. Les participants étaient 25 étudiants d'éducation physique de premier cycle qui ont passé un test « beep » et porté un accéléromètre pendant 14 jours. Les participants ont fait considérablement plus de pas que les 10 000 pas usuels par jour et se sont adonnés à un peu plus de 30 minutes d'activité physique modérée à vigoureuse par jour. On a constaté des relations non significatives entre l'activité physique modérée et les résultats du test « beep », mais chez les participants avec des niveaux plus élevés d'activité physique modérée, on a remarqué une relation significative importante avec un nombre accru de pas par jour. Le recours au nombre de pas par jour pourrait constituer un substitut équitable au test « beep »,s'avérer une mesure moins gênante, ne pas être influencé par le degré de motivation des étudiants en période de repos et aider à réduire certaines préoccupations d'ordre légal liées à l'administration de tests pour évaluer la condition physique des étudiants.

Mots clés : éducation physique, formation des maîtres, accéléromètre, évaluation, crédibilité

Introduction

Fitness testing is evolving, and with advancements in technology, so have the methods of measuring physical activity levels. For national accreditation, physical education teacher education (PETE) programs must provide evidence that their students achieve and maintain a health-enhancing level of fitness (SHAPE America; Society for Health and Physical Educators America, 2015). SHAPE America publishes standards for K-12 physical education, for sport coaches, and for beginning physical education teachers to set an expectation or standard for the education PETE students pass on to their K-12 students (NASPE, 2008; SHAPE America, 2015). PETE students often meet these standards by completing fitness tests at the beginning and end of their program. However, recent research has shown that PETE programs vary widely in how they measure their students' physical activity levels, if at all (Baghurst, Richard, Mwavita, & Ramos, 2015). Additionally, research suggests that fitness testing may not be the best assessment method for complying with accrediting standards and determining if students are maintaining appropriate levels of fitness (Baghurst & Mwavita, 2014).

Fitness testing of PETE students usually measures the level of fitness an individual possesses around the time they are taking the test. However, this may not be indicative of the fitness levels the students normally exhibit as part of their daily physical activity levels. For example, a student can anticipate and prepare for a fitness test, but if they are being measured over a significant amount of time, then accurate behavioral predictions on the student's physical activity levels can be obtained (Trost, McIver, & Pate, 2005). There is no ubiquitously accepted measurement system for the level of physical activity PETE students should maintain in order to stay in compliance with the standards proposed by SHAPE America (2015). Therefore, the purpose of this study was to evaluate if objectively measuring PETE students' physical activity levels for 14 days would serve as a viable alternative to current fitness testing standards utilized by most PETE training programs.

The amount of steps a person accumulates in a day is a good measurement for physical activity (Lee et al., 2013), and an individual who completes 10,000 steps per day is considered to be achieving healthy levels of daily physical activity (Choi, Pak, Choi, & Choi, 2007; Tudor-Locke, 2010). Research has shown that 10,000 steps per day are equitable with 30 minutes of moderate to vigorous activity (Le Masurier, Sidman, & Corbin, 2003). Therefore, measuring the number of steps a person takes per day may be an accurate method of evaluating how much physical activity they engage in every week, which may be a more effective method for achieving PETE program accrediting requirements (Le Masurier et al., 2003). LaVine and Ray (2006) found that PETE students did not meet the minimum step requirements for a healthy lifestyle (i.e., 10,000 steps per day); therefore, current fitness testing that is being utilized to meet this standard (Baghurst & Mwavita, 2014) may not be accurately measuring whether PETE students are exhibiting appropriate levels of physical activity and fitness for overall health (Baghurst et al., 2015).

Webster et al. (2015) explained that PETE students should learn in a system where their physical activity behaviors, movement competency, nutrition habits, and fitness is appropriately established and maintained from program start to finish. By accurately and consistently measuring PETE students' physical activity behaviors, programs can be accurately informed on how well their students uphold the National Physical Education Standards proposed by SHAPE America (2015). However, fitness testing varies widely from program to program, and students are not required to consistently demonstrate levels of health-enhancing fitness (Bulger, Housner, & Lee, 2008; Baghurst et al., 2015).

Use of Accelerometers to Measure Physical Activity and Fitness

Physical activity assessment has advanced in the technology and hardware that can be worn by research participants for objective measurements of their behavior (Tudor-Locke, Johnson, & Katzmarzyck, 2009). Self-report data and survey methods have been the preferred approach to measuring physical activity, but these methods can be inaccurate and may not always provide valid reports of behavior (Tudor-Locke et al., 2004). The development of pedometers and then accelerometers has changed the way physical activity is measured and examined, allowing researchers to innovate new experimental designs by measuring physical activity at all times of the day. Murphy (2009) explained that accelerometers could be used to measure a plethora of scenarios including daily free-living, structured exercise, and nighttime activities, while recording the intensity and length of the physical activity.

An accelerometer is a small device that can be placed on the ankle, hip, or wrist of an individual to measure the number of steps they take per day, the amount of physical activity they achieved per day, and time spent while exercising (Korpan, Schafer, Wilson, & Weber, 2015). It uses an axis-based motion detection system that can tell the device what orientation it is in relation to the ground. Mathematical algorithms are programmed into both the device and its supporting software that computes the movement of the device into steps per day. The device measures changes in velocity or speed divided by time. Additionally, accelerometers can delineate between these different levels of physical activity by measuring acceleration forces, static movement, or continuous force (Peterson, Sirard, Kulbok, DeBoer, & Erickson, 2015).

By utilizing accelerometers, Le Masurier and colleagues (2003) found that 10,000 steps per day is equivalent to 30 minutes of moderate physical activity (MPA). According to the American College of Sports Medicine and the American Heart Association, MPA should occur for at least 30 minutes per day for at least five days per week, or vigorous physical activity (VPA) should occur for at least 20 minutes on three or more days per week (Haskell et al., 2007). Therefore, 10,000 steps per day is considered an appropriate level of physical activity that can enhance one's health, and could be utilized as an accepted standard for comparing physical activity levels across PETE students to determine if they are exhibiting appropriate physical activity levels.

Warburton, Nicol, and Bredin (2006) used accelerometers to establish that individuals who walked more than two hours per week activated biological mechanisms that were responsible for providing reductions to chronic disease and premature death. In addition, individuals who participated in routine walking of more than 30 minutes daily experienced positive levels of psychological health essential for fighting the effects of stress, depression, and cardiovascular disease. Utilizing accelerometer data, Blair and Morris (2009) reported that individuals who accrued moderate amounts of physical activity each week were less likely to develop a stroke, cancer, type 2 diabetes, obesity, and osteoporosis. The benefits demonstrated through these studies support the value of using measurable and objective measures such as accelerometers to consistently provide feedback about participants' behaviors.

Importance of Demonstrating Health-Enhancing Levels of Physical Activity

An accelerometer study that measured activity levels of children, adolescents, and adults in the United States found that levels of physical activity dropped dramatically from childhood into adolescence (Troiano et al., 2008). Further, Hallal et al. (2012) found that between ages 16-19, the levels for moderate and vigorous physical activity were low and almost non-existent, respectively. These findings indicate that students are not maintaining health-enhancing levels of physical activity as they transition from childhood into adolescence. For the clarification of this study, health-enhancing levels of physical activity are described as 10,000 steps per day or 30 minutes of moderate-vigorous physical activity for five days a week (Le Masurier et al., 2003).

The Centers for Disease Control and Prevention (2015) reported that only half of all adults in the US get sufficient levels of physical activity to improve their health, and physical activity does not appear to be an integral part of daily living in Western culture. Therefore, professionals are needed who can model and provide knowledge on health-enhancing physical activity and fitness.

Physical education teachers are at the forefront of teaching and facilitating physical activity in child and adolescent populations. If PETE students are to effectively increase the levels of physical activity of their students, they must operate in accordance of the national physical education standards proposed by SHAPE America (2015). According to Standard Three, "the physically literate individual demonstrates the knowledge and skills to achieve and maintain a health-enhancing level of physical activity and fitness," and Standard Five states that, "the physically literate individual recognizes the value of physical activity for health, enjoyment, challenge, self-expression, and/or social interaction."

Physical education teachers that do not follow these standards are less likely to adopt a lifestyle that incorporates appropriate physical activity, which ultimately can decrease the amount of physical activity of their students (Baghurst & Bryant, 2012). Modeling a healthy lifestyle is also essential in helping students learn (Melville & Maddalozzo, 1988), and students learn best when there is a variety of ways for them to absorb the material being delivered in class (Quennerstedt, Öhman, & Armour, 2014). A teacher's physique or their ability to model healthy activity may be such a learning tool; therefore, it is logical that PETE students should seek to model the positive benefits of engaging in a healthy lifestyle (e.g., positive affect, physique, physical health) to motivate students for lifelong health and exercise. If PETE students can demonstrate appropriate levels of physical activity as students in training, then they will have the knowledge of what is expected for their levels of physical activity following graduation. More importantly, PETE students can use this standard of physical activity to help them serve as role models to the K-12 student populations they will be teaching.

Study Purpose

Fitness testing in PETE programs is often used as a means of achieving accreditation status as well as demonstrating that graduating students are able to model health and fitness to their future students (Baghurst & Mwavita, 2014). However, fitness testing may not be the best measure for achieving these goals, and accelerometers may offer a truer reflection of students' physical activity behaviors than a fitness test. Further, non-invasive measures may eliminate some of the liability and legality issues involved with fitness testing (Staffo & Stier, 2000). For example, if a student is injured during these tests, who is held responsible? Staffo and Stier (2000) reported that only 20% of departments require a release prior to these assessments, and of those that do, only 67% required participants to sign the waiver. They suggest that both the department and instructor could be held liable in the unfortunate event of an accident.

Accelerometers are at the forefront of technologies that help to detect step count and caloric expenditure (Umstattd Meyer, Baller, Mitchell, & Trost, 2013), and research suggests that PETE students may not be physically active enough to achieve minimum levels of health (LaVine & Ray, 2006). Assessment of the physical activity outputs of PETE students via accelerometer data could serve as a replacement to current fitness testing because it provides longer and therefore perhaps more valid outcomes. Because fitness testing is generally a one-off occurrence, the true physical activity behaviors of PETE students are unclear. By assessing activity behaviors for 14 days, the data recorded will provide additional accuracy on how physically active the students really are. Therefore, the purpose of this study was to determine whether using accelerometers rather than fitness testing might serve as an alternate means to meeting accreditation requirements.

Specific research aims were to determine whether participants were: (a) achieving minimum physical activity levels per day for health as measured by steps per day; (b) achieving minimum levels of moderate to vigorous physical activity per day; (c) influenced by the knowledge of having their physical activity levels measured; (d) likely to have strong correlational scores between their average steps per day, fitness, and body mass index measures.

Method

Participants

Participants were 36 undergraduate students (20 male, 16 female) of mean age 21.28 (*SD* = 2.15) years that were declared second and third year majors in a physical education teacher education (PETE) program at a large state university in the Southern United States. To be included in the study, participants had to be enrolled in one of two required, lecture-based PETE classes, but in which the PACER assessment was an additional required component of the class used for program accreditation purposes. Although 36 students in the two experimental groups wore the accelerometers, only 25 students (13 male, 12 female) were included in data analysis, as not all participants wore their accelerometers the entire 14 days.

Prior to data collection, participants (n = 11) from another lecture-based class in the PETE program pilot-tested the accelerometers. The purpose of the pilot was to determine the battery strength of the accelerometers and evaluate whether students would generally wear the accelerometers consistently for the 14-day period.

Instruments

Participants were asked to wear an Actigraph wGTX-3 accelerometer for 14 days. The accelerometer collected movement data including total physical activity, steps taken per day, and how much activity was light, moderate, or vigorous. In the present study the formula presented in Freedson, Melanson, and Sirard (1998) for calculating these activity levels was adopted. Although the Actigraph accelerometer has the ability to measure light exposure levels, this was not assessed, but was important for the purposes of this study. Participants' physical activity levels were measured in 60-second epochs, which recorded a data point every minute the participants wore their accelerometers. Epoch length was determined through assessing current literature that compared various epoch length cut points with accuracy in extrapolating predictions in health related outcomes (Gabriel et al., 2010; Trost et al., 2005).

Participants were also required to complete the PACER test (Fitnessgram, 2015) and were measured for height and weight to calculate body mass index. The PACER test is a multi-stage measure of aerobic capacity. Participants transition between two lines separated by 20 meters for as long as possible while following the pace of synchronous beeps which gradually increase in speed. Participants must complete as many lengths as possible, which can be recorded in both levels and time. Once a participant fails a length for the second time, his or her level and/or time is recorded.

Procedure

Following university Institutional Review Board (IRB) approval, participants were recruited from three classes within the core curriculum of the PETE program where completion of the PACER was mandatory. The first class was used as a pilot to test the effectiveness of the accelerometer as well as the procedure to ensure that all accelerometers were functional and would operate for the duration of the study. All procedures were carried out in the same way for all three groups.

Both potential classes to were solicited for participation. Potential participants were informed that the purposes of the study were to measure daily physical activity levels of physical education students as well as their exposure to natural light (lux). No incentive for participation was provided beyond the opportunity for participants to see their data following the study.

To be eligible in the study, participants completed a consent form along with basic demographic data needed to calibrate the accelerometers. Once the demographic information was gathered, participants were randomly assigned to two groups. The first group was told their accelerometer would be measuring their exposure to light for the first week and then switch to measuring their physical activity levels after one week. The other group was told their accelerometers were measuring physical activity levels for the first week and then would switch to measure their light exposure after one week. Each consenting participant was given an accelerometer and asked to wear it on their non-dominant arm for a period of two weeks without removing it for any reason. Students who considered themselves ambidextrous were asked to wear it on the opposite arm they used for writing.

Deception was involved in the study. When accelerometers were distributed, participants were randomly informed their accelerometer was set to either measure light exposure for the first week and physical activity for the second week, or vice versa. However, the accelerometers measured physical activity levels for both weeks. This was to investigate whether participant knowledge of what the accelerometer was measuring would affect their daily physical activity levels.

Participants were not able to view any output on the accelerometers, which were set to record data from the end of the class period to exactly 14 days later. Following the 14 days of data collection, participants were debriefed as groups and informed of the deception and why it was necessary.

Data Analysis

A one-way ANOVA was used to test for differences in steps per day, sedentary activity time, light activity time, moderate activity time, and vigorous activity time by physical activity (PA) and light exposure (LE) interventions. Gender differences for steps per day, sedentary, light, moderate, and vigorous physical activity time were explored using a one-way ANOVA.

Table 1
Physical Activity Levels of Participants by Condition

	Physical Activity		**Light Exposure**		**Combined**	
	Total *M(SD)*	Per Day *M(SD)*	Total *M(SD)*	Per Day M(SD)	Total *M(SD)*	Per Day *M(SD)*
Steps Per Day	91543.64(21784.07)	13077.66(3112.01)	89685.64(17318.77)	12812.23(2474.11)	90614.64(19499.25)	12944.95(2785.61)
Sedentary PA (min)	4451.28(726.19)	612.17(132.94)	4602.88(505.17)	657.55(72.17)	4527.08(623.82)	634.86(108.31)
Light PA (min)	3404.56(361.39)	486.37(51.63)	3399.12(446.08)	485.59(63.73)	3401.84(401.79)	485.97(57.39)
Moderate PA (min)	1473.04(424.40)	210.43(60.63)	1475.08(409.93)	210.73(58.56)	1474.06(412.95)	210.58(58.99)

The primary interests were the presence of a significant difference ($p < .05$) between activity for LE and PA days and gender differences. A bivariate Pearson correlation was used to determine relationships between variables. An independent samples *t*-test was used to determine whether participants achieved the 10,000 steps per day benchmark.

Results

PACER and BMI Scores

Body mass index calculated from height and weight resulted in a mean score of 28.57 (*SD* = 6.23) and a range of 19.2 to 42.9. Using the health fitness zone set by Fitnessgram (2015), where a healthy zone for both sexes is 18-25, 19 participants had a BMI greater than 25. Participants achieved an average level of 31.8 (*SD* = 14.2; Range = 11-60) on the PACER test, where a healthy fitness zone for females is level 39+ and 45+ for males. Of the 25 participants, only 10 achieved this status, 8 of which were males.

Steps Per Day

Participants completed on average 12944 (*SD* = 2785.61) steps per day (Table 1), and an independent samples *t*-test revealed that participants took significantly more steps than minimum standards set at 10,000 steps per day [$t(49) = 7.48$ $p < .001$). A one-way analysis of variance calculated whether participants were more active when aware that their activity was being monitored, which was found to be non-significant ($F(1,48) = .11$, $p = .74$).

Activity Levels

When compared by group (PA vs LE), analysis yielded no significant difference for total steps, minutes spent in sedentary behavior, minutes spent in light activity, and minutes spent in moderate activity ($p > .05$). These variables were also non-significant when compared by day of the week or by gender ($p > .05$).

Participants did not achieve vigorous physical activity levels throughout the week in either group. However, they attained on average 210.43 (*SD* = 60.63) minutes of moderate physical activity during the seven days of physical activity measurement and 210.58 (*SD* = 58.56) minutes during the week of light measurement. Combined, participants acquired on average 30.08 (*SD* = 59.98) minutes of moderate physical activity daily.

Correlation between BMI, PACER, Steps Per Day, and Activity Levels

Correlations were calculated to investigate the relationships between fitness (PACER), body mass index, steps per day, and moderate activity levels. There was a significant negative relationship between body mass index and PACER ($p < .01$, $R = -.62$) and body mass index and mean steps per day ($p = .01$, $R = -.35$). For both, higher body mass index scores resulted in a lower performance outcome. There were non-significant relationships between moderate physical activity and body mass index and moderate physical activity and PACER scores ($p = .60$, $R = -.08$).

The relationship between PACER scores and mean total steps per day was also significant ($p = .05$, $R = .28$), where participants with higher PACER scores completed more steps per day. Steps per day also significantly correlated with BMI score, where participants with higher BMI levels took fewer steps per day ($p = .01$, $R = -.35$). There was no significant correlation between mean steps per day and time in sedentary activity ($p > .05$). However, significant relationships were found between mean steps per day and both light ($p = .04$, $R = -.29$) and moderate activity ($p < .01$, $R = .83$). Therefore, participants with higher levels of light activity completed fewer steps per day, but those with higher levels of moderate physical activity had a strong significant relationship to more steps per day.

Discussion

This study sought to determine whether using accelerometers would be an equitable substitution to fitness testing PETE students. Specific research aims were to determine whether participants were: (a) achieving minimum physical activity levels per day for health as measured by steps per day; (b) achieving minimum levels of moderate to vigorous physical activity per day; (c) influenced by the knowledge of having their physical activity levels measured; (d) likely to have strong correlational scores between their average steps per day and fitness and body fat measures.

Steps Per Day

Steps per day have been reported as an equitable substitute for measuring moderate physical activity, where 10,000 steps per day is regarded as necessary for health benefits equivalent to 30 minutes of moderate physical activity (Le Masurier et al., 2003). Measuring the physical activity of college students is important; the most recent National College Health Assessment from the American College Health Association (ACHA; 2014) reported that only half of students met minimum standards of moderate to vigorous physical activity. In the present study participants completed on average almost 13,000 steps per day over the 14-day measurement period. This is encouraging, as it suggests that PETE students are making efforts to achieve and maintain a health-enhancing level of fitness (SHAPE America, 2015).

Findings are contrary to those of LaVine and Ray (2006), who reported that PETE students only completed 9,000 steps per day, but increased this volume once they were aware they were below expected standards. These differences may be accounted by two factors. First, LaVine and Ray reported no gender; the present study was almost evenly split by gender. Males are generally more physically active during college (ACHA, 2014), and larger female ratio might account for these differences. Second, accelerometers were used in the present study whereas the devices utilized in the LaVine and Ray study were pedometers, which have been found to be less valid and reliable source than accelerometers (Corder, Brage, & Ekelund, 2007).

Daily Activity Levels

Participants did not achieve vigorous physical activity levels throughout the week in either group, but they did achieve an average of 30 minutes of moderate physical activity per day. The lack of vigorous physical activity readings may be due to the 60-second epoch set during data collection, and shorter epoch data points may elicit more specific measurements. However, according to Gabriel et al. (2010), shorter epoch lengths did not correlate with more accurate observations of movement behavior. For this study, a 60 second epoch was chosen to reduce the data size over 14 days of data collection, but Nilsson and colleagues (2002) suggested that epoch chosen can influence the degree to which vigorous physical activity can be measured.

Thirty minutes of moderate physical activity daily exceeds the minimum requirements by the American College of Sports Medicine and the American Heart Association (Nelson et al., 2007), which requires at least 30 minutes per day for at least five days per week. Therefore, participants in the present study were exercising at a level that according to research generates positive health benefits (Le Masurier et al., 2003).

Measurement Influences

In the present study, participants were unaware of their daily activity levels, but it was hypothesized that when participants were made aware of which week their daily physical activity was being monitored; they would be more physically active during that week. However, this was not found to be the case, and there was no significant difference between conditions. Immediate feedback may be more important in increasing physical activity. For example, LaVine and Ray (2006) reported that PETE student steps per day increased by over 6,500 when they were made aware of their initial activity levels and minimum expectations for health. Hackmann and Mintah (2010) also found that college students were more likely to be more physically active when wearing pedometers; therefore, it would be interesting to measure whether self-monitoring has an impact on physical activity levels rather than the awareness of being monitored as in the present study.

Irrespective of whether a student is likely to increase levels of physical activity when wearing a monitoring device, participants did not appear to be motivated or influenced by the knowledge that their physical activity levels were being monitored. This may be due to the duration of the study, 14 days in total, whereby the participants no longer cared about the monitoring. Therefore, it is possible that devices such as accelerometers could be used to measure physical activity without the concern that knowledge of measurement might falsely inflate physical activity levels.

Steps Per Day, BMI, and Fitness

That higher BMI scores correlated to lower scores on the PACER, less steps per day, and less time spent in moderate physical activity as hypothesized. Also expected was that steps per day and moderate physical activity would be strongly correlated (R = .83). This is in agreement with Le Masurier et al. (2003) who found that 10,000 steps per day are equivalent to 30 minutes of moderate physical activity (MPA).

Perhaps most interesting is that there was also a significant, but not strong (R = .29) correlation between PACER scores and means steps per day, where more steps per day led to higher PACER scores. It is important to note that only 40% of participants met the PACER healthy fitness zone. If participants are achieving both minimal daily steps per day and daily time spent in moderate physical activity, it is logical to expect a higher correlation to PACER scores.

The PACER test is a progressive 20-meter, multistage shuttle run that determines the health fitness zone a student is in. It serves as a common measure of PETE students' fitness levels (Baghurst & Mwavita, 2014). Based on the current findings (Table 1), measures of daily moderate physical activity, or steps per day, may be a more accurate reflection of a student's physical activity levels than a PACER score. Because the PACER requires a minimum standard, once achieved, a student might be inclined to stop. There is unlikely to be little motivation to exert maximal effort beyond any intrinsically developed desire. This may explain why others have noted significant, but only moderate correlations between moderate physical activity and PACER scores (Castelli & Valley, 2007).

Limitations and Future Research

Findings should be considered in light of the study's limitations, which provide avenues for future research. Although accelerometers provide more refined and accurate data compared to pedometers, as previously stated, epochs were set at 60 seconds, and a lower epoch may result in more data concerning vigorous physical activity. These findings are limited to one university recognized for its promotion of student health and wellness (Vlastaras & Baghurst, 2014). Therefore, similar results may differ for other PETE programs. Future research should also consider comparing whether PETE majors differ in physical activity levels to students in other kinesiology-based majors where modeling health and fitness might also be expected. Last, participation was optional, and those who were confident of their physical activity levels may have been more likely to participate. Almost one-third of the participants did not provide complete data sets. Although eliminating their data is a strength of the study, participants who did not provide a complete data set may have opted to do so because of embarrassment or a perceived failure to be physically active enough. Future research could investigate participants' confidence of achieving minimal physical activity levels a priori.

Summary

According to SHAPE America's (National Association for Sport and Physical Education; 2010) *A Philosophical Position on Physical Activity & Fitness for Physical Activity Professionals*, modeling "can influence many attitudes and behaviors, including health practices, motor skill acquisition and the adoption of physical activity patterns. Physical educators, coaches and other professionals in fitness and physical activity carry strong modeling status among many children and youths" (p. 2-3). This study demonstrates that PETE students can and are achieving levels of physical activity above minimum levels for health-enhancing benefits, which would serve to positively model physical activity to their future students. Conversely, PACER scores were less than desirable suggesting a disconnect between physical activity being completed outside of the PETE program and the supposed lack of personal fitness.

These findings indicate that the use of steps per day could be used as an equitable replacement to the PACER test, but further research is necessary. This substitution may serve as a less embarrassing measure, may not be mediated by periodic levels of motivation, and would serve to limit some of the legal issues that might arise from fitness tests (Staffo & Stier, 2000). Therefore, for the many PETE programs that do fitness test for accreditation requirements (Baghurst & Mwavita, 2014), steps per day should be considered.

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