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ASSESSMENT

# Comparison of Assessment Methods for Muscular Power in Physical Education

*Benjamin Sibley*

## Abstract

*In the process of educating physically literate individuals, physical educators are tasked with assessing health-related fitness of their students. It is essential to identify or develop appropriate field tests of muscular power for use in physical education settings. This study assessed jumping power in a sample of fourth, sixth, and eighth graders via a novel calculation method and compared different field tests and calculations for assessing muscular power. Participants (n = 99), aged 9 to 14 years, were recruited from fourth-, sixth-, and eighth-grade physical education classes in one K–8 school. Three jump measurements were taken within the context of a physical education class: vertical jump (VJ) via a Vertec device, countermovement jump (CMJ) based on flight time via MyJump iOS app, and standing long jump. Vertical jump scores assessed via the Vertec device were significantly greater than those for the CMJ. The mean power for participants in this study was 873 W for a CMJ and 1544 W for a VJ. Standing long jump only had a moderate correlation with power calculated from a CMJ (r = .41). Results confirmed that calculations of power that factor in VJ and body weight provide a better indication of power than does jump performance alone. The equation used to calculate jumping power offers a novel approach for physical education that is accurate and feasible.*

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In the process of educating physically literate individuals, physical educators are tasked with assessing health-related fitness of their students (Corbin et al., 2014). Since the 1960s, cardiorespiratory endurance, strength, muscular endurance, flexibility, and body composition have been classified as health-related fitness components (Corbin, Dowell, & Landiss, 1968) and these fitness components are currently included in the FitnessGram test battery (Meredith & Welk, 2010). However, recently there have been calls to include power in the group of health-related fitness components (Corbin, Janz, & Baptista, 2017; Corbin et al., 2014). Power is the ability to exert strength explosively or with speed and is typically classified as a skill-related fitness component. Whereas health-related fitness components are strongly associated with positive health outcomes, the components of skill-related fitness (agility, balance, power, speed, coordination, and reaction time) are more closely associated with athletic performance and are considered to be only loosely associated with health. Research has shown that power is associated with greater bone mineral density and bone health (Baptista, Mil-Homens, Carita, Janz, & Sardinha, 2016; Janz, Letuchy, Burns, Francis, & Levy, 2015; Weaver et al., 2016). As well, a report by the Institute of Medicine (IOM, 2012) concluded that there is adequate experimental and prospective longitudinal evidence to support the relationship between health and a multidimensional construct of musculoskeletal fitness that includes power.

As such, it is essential to identify or develop appropriate field tests of muscular power for use in physical education settings. Indeed, regarding tests of musculoskeletal fitness, the IOM (2012) concluded, “Current literature in this area is too fragmented to permit identification of any specific musculoskeletal fitness test item that is unequivocally linked to health in the general population of healthy youth” (p. 176). The most commonly used tests of power in physical education settings are the vertical jump (VJ) and the standing long jump, with the latter being included in the ALPHA-Fitness assessment (Ruiz et al., 2010) used in Europe. Both of these tests require minimal equipment and involve the explosive propulsion of the body through the lower body musculature. However, these jumping tests have critical flaws that limit their utility in assessing muscular power. For the standing long jump, motor skill proficiency plays a significant role, as takeoff angles, arm swing, and leg positioning during flight affect jumping performance (Corbin et al., 2017). Landing safely on a maximum effort jump can also be problematic for students with heavier body weight, posing a risk for joint pain or injury. For both tests, an outcome measure of jumping height or distance fails to account for the effect of body weight on performance.

The mathematical expression of power is (Force × Distance) / Time. In a jumping motion, the distance and time over which force are applied occur when force is exerted against the ground when the individual extends their hips, knees, and ankles. The distance is the vertical change of distance of the center of mass from the bottom of the preparatory crouch to the moment of maximum extension prior to takeoff (push-off distance).The time is the duration of that phase of the movement. The force in the equation is the force exerted by the musculature to overcome gravity and propel the body into the air. The greater the body mass, the greater the force required to overcome gravity. Therefore, a student who weighs more is going to have to exert more power to move their body weight the same distance as a student who weighs comparably less.

Research has demonstrated that power can be accurately and reliably predicted from VJ when both the individual's body mass and the push-off distance during the jump are accounted for (see Figure 1; Jiménez-Reyes et al., 2017; Samozino, Morin, Hintzy, & Belli, 2008). Push-off distance is the vertical displacement of the jumper's center of mass during the jumping motion while the feet are still on the ground. Measuring push-off distance requires two measurements: the distance from the ground to the greater trochanter of the femur at the bottom of the preparatory crouch, and the distance between the same two points at takeoff, with the difference between these two measurements being the push-off distance. The former distance can be measured by having the individual assume and hold the preparatory crouch position and measuring the distance from the greater trochanter to the ground. The latter can be measured by having the individual lay on the ground with hips, knees, and ankles extended and measuring the distance from the greater trochanter to the tip of the toes.

In a physical education setting, accurately measuring push-off distance could prove problematic. The overall procedure is time consuming, which is a valid consideration for any field test designed to be administered in a physical education class. Also, the accuracy with which school-age children will be able to assume and hold the bottom of the preparatory crouch position is likely to be highly variable. However, push-off distance is likely largely a function of overall height. It may be that a fraction of overall height could be substituted into the power calculation, rather than a measurement of push-off distance. Therefore, this study compared different field tests and calculations for assessing muscular power; assessed jumping power in a sample of fourth, sixth, and eighth graders using the aforementioned method; and specifically tested if substituting a percentage of overall body height for push-off distance in a calculation of power yields accurate and reliable results.

## Method

Participants ($n$ = 99), aged 9 to 14 years, were recruited from fourth-, sixth-, and eighth-grade physical education classes in one K–8 school. Because of an uneven response rate from different grade levels (fourth grade, $n$ = 40; sixth grade, $n$ = 12; eighth grade, $n$ = 47), analyses were only performed on the complete sample and not by grade level. Table 1 shows descriptive statistics for the sample. Parental consent forms were sent home with students. The research study was then explained to students with signed and returned parental consent forms, and they were asked to sign an assent form if they agreed to participate in the study. These procedures were approved by the university institutional review board and the school district research review board. Four body measurements were obtained from participants. Body weight was measured via a standard scale and height via a stadiometer. Leg length, measured from the hip to the tip of the toe, and floor-to-hip height, measured with the student standing in a prejump crouch position, were also assessed.

**Table 1**
*Sample Descriptives and Jumping Performance Measures*

| Descriptive | Overall ($M \pm SD$) | Female ($n$ = 45) ($M \pm SD$) | Male ($n$ = 54) ($M \pm SD$) |
|---|---|---|---|
| Age (years) | 11.88 ± 1.91 | 11.44 ± 1.82 | 12.24 ± 1.92 |
| Height (m) | 1.58 ± 0.14 | 1.54 ± 0.13 | 1.60 ± 0.14 |
| Weight (kg) | 49.61 ± 17.57 | 47.74 ± 18.19 | 51.17 ± 17.04 |
| VJ: Vertec (m) | 0.36 ± 0.09 | 0.33 ± 0.06 | 0.39 ± 0.10 |
| VJ: Flight time CMJ (m) | 0.22 ± 0.06 | 0.20 ± 0.05 | 0.23 ± 0.06 |
| Long jump (m) | 1.60 ± 0.49 | 1.42 ± 0.46 | 1.76 ± 0.46 |

*Note.* VJ = vertical jump; CMJ = countermovement jump.

Three jump measurements were taken within the context of a physical education class. For the flight time–based VJ calculation, participants were video recorded from the waist down while performing a countermovement jump (CMJ) with hands on the hips using the MyJump iOS application. Research has shown this app to provide valid and reliable results for assessing VJ (Balsalobre-Fernández, Glaister, & Lockey, 2015; Gallardo-Fuentes et al., 2016). Three jumps were recorded for each participant. The app then calculates the participant's VJ based on flight time by marking on the video the points of takeoff and landing and also calculates power using the formula shown in Figure 1.

$$\bar{P} = mg\left(\frac{h}{h_{PO}} + 1\right)\sqrt{\frac{gh}{2}}$$

where
$\bar{P}$ = mean vertical power (in W),
$m$ = body mass (in kg),
$g$ = gravitational acceleration (9.81 m $s^{-2}$),
$h$ = jump height corresponding to the vertical distance covered by the body center of mass during aerial phase (in m), and
$h_{PO}$ = vertical push-off distance (in m).

***Figure 1.*** Formula utilized to calculate power (Samozino et al., 2008).

VJ was also assessed via a Vertec device. Standing reach was established and then the device was positioned to allow the participant to contact the highest vane possible. A standing 2-ft takeoff VJ with free arm swing was utilized. Three attempts were measured, with the highest recorded.

Standing long jump was measured via standard testing procedures. The participant stood behind a line marked on the ground. A 2-ft takeoff and landing was used, with swinging of the arms and bending of the knees to provide drive. The participant attempted to jump as far as possible, landing on both feet. Three attempts were assessed, with the farthest recorded. The measurement was taken from takeoff line to the nearest point of contact on the landing.

## Results

Table 1 shows the descriptive statistics for the sample, including means and standard deviations for the three jumping measures. A paired-samples *t* test compared the two methods of VJ assessment. Vertec-assessed VJ scores were significantly greater that flight time–assessed CMJ scores, $t(88) = 20.85$, $p < .001$, $d = 2.09$.

To test if a fraction of overall height could be substituted for the measured push-off distance, a height fraction was calculated by dividing the mean measured push-off distance by the mean overall height of the sample (0.273 m / 1.579 m = 0.173). The estimated push-off distance was then calculated by multiplying each participant's height by the height fraction. A paired-samples *t* test tested if the estimated push-off distance was significantly different from the measured push-off distance. These two values were not significantly different from each other, $t(98) = -0.13$, $p > .05$.

A 2 × 2 (VJ Method × Push-Off Assessment) repeated-measures ANOVA compared the four methods of power calculation (CMJ + Measured Push-Off, Vertec + Measured Push-Off, CMJ + Estimated Push-Off, Vertec + Estimated Push-Off). Table 2 shows the means and standard deviations. There was a significant main effect for VJ method, Wilks's Lambda = .330, $F(1, 88) = 178.75$, $p < .001$, multivariate partial $\eta^2 = .67$, such that the power estimates based on CMJ were significantly lower than power estimates based on Vertec measurement. The main effect for push-off assessment method (measured vs. estimated) and the interaction effect were not significant.

**Table 2**
*Estimates of Power (W) From Vertical Jump*

| | Overall | | Female | | Male | |
|---|---|---|---|---|---|---|
| **Jump** | ***M*** | **± *SD*** | ***M*** | **± *SD*** | ***M*** | **± *SD*** |
| Flight time–assessed CMJ | | | | | | |
| Measured push-off distance | 873.56 | ± 328.66 | 785.23 | ± 215.13 | 1003.89 | ± 408.46 |
| Estimated push-off distance | 850.98 | ± 315.38 | 787.24 | ± 246.87 | 973.16 | ± 407.29 |
| Vertec-assessed VJ | | | | | | |
| Measured push-off distance | 1544.20 | ± 722.88 | 1331.90 | ± 612.68 | 1743.42 | ± 752.04 |
| Estimated push-off distance | 1500.95 | ± 697.23 | 1336.68 | ± 634.39 | 1633.10 | ± 709.16 |

*Note.* CMJ = countermovement jump; VJ = vertical jump.

To compare different methods of estimating power, differences between correlation coefficients were tested using the Williams-Hotelling test (Williams, 1959). For these tests, power calculated from CMJ with a measured push-off distance was the standard from which other measures were correlated. In adults, this power calculation has a correlation of $r = .98$ with force platform–assessed power (Samozino et al., 2008). Table 3 shows correlations of all jumping measures and power calculations. To test if VJ provided a better measure of power than standing long jump, the correlations of those two variables with the power calculation based on the CMJ with measured push-off were compared. VJ correlated better with the power calculation than standing long jump did, $t(86) = 2.178$, $p < .05$. To test if the calculation of power using the estimated push-off distance provided a favorable measurement compared to VJ alone, the correlations of those two variables with the power calculation based on the CMJ with measured push-off were compared. The correlation of the power calculation using the estimated push-off distance ($r = 0.77$) was greater than that of VJ alone ($r = 0.60$), $t(86) = 3.59$, $p = .001$.

**Table 3**
*Correlations Among Jumping Measurements and Power Calculations*

| Jumping measurements and power calculations | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| 1 Vertec-assessed VJ | 1 | | | | | | |
| 2 Flight time–assessed CMJ | .60 | 1 | | | | | |
| 3 Long jump | .51 | .39 | 1 | | | | |
| 4 Power: CMJ + Measured PO | .60 | .63 | .41 | 1 | | | |
| 5 Power: CMJ + Estimated PO | .68 | .68 | .41 | .94 | 1 | | |
| 6 Power: Vertec + Measured PO | .69 | .23 | .39 | .84 | .79 | 1 | |
| 7 Power: Vertec + Estimated PO | .77 | .27 | .40 | .77 | .85 | .93 | 1 |

*Note.* VJ = vertical jump; CMJ = countermovement jump; PO = push-off. All correlations are significant at the 0.05 level (2-tailed).

## Discussion

This study assessed 9- to 14-year-olds' jumping performance, compared some methods of estimating muscular power from jumping performance, and examined if simplifying one of the measurements for calculating power yielded accurate results. The mean power for participants in this study was 873 W for a CMJ and 1544 W for a Vertec-measured VJ. Only a few other studies have assessed jumping power in similar-aged samples, all using a CMJ with no arm swing. Baptista et al. (2016) found a mean jumping power in a sample of 7- to 9-year-olds ($M_{age}$ = 8.5 years) of 817 W for boys and 702 W for girls. These power values were estimated from jump height and body weight via a regression-based estimation equation. Duncan, Hankey, and Nevill (2013) found a mean jumping power of 2452 W in a sample of 12- to 16-year-olds ($M_{age}$ = 14.3 years), and Gomez-Bruton et al. (2017) found a mean jumping power of 2136 W in a sample of 9- to -17-year-olds ($M_{age}$ = 13.6 years), with both studies assessing power with a force platform. Both the age group and power assessments found in the present study fall in the middle of these values (greater power than younger sample, less power than older samples), supporting the validity of the findings. Across studies, there is a large increase in power in the two older samples relative to the two younger ones. More research is needed to more precisely describe how muscular power changes with age.

Calculations of VJ and power assessed by Vertec were higher than those assessed by CMJ. This runs counter to other research that found Vertec assessment underreports VJ compared to CMJ (Buckthorpe, Morris, & Folland, 2012; Leard et al., 2007). However, some research suggests that the presence of a vertical target can improve jump performance (Ford, Myer, Smith, & Byrnes, 2005). For the younger population used in this study, the visual target of the Vertec vanes may be highly salient, especially when compared to the relatively foreign movement of jumping as high as possible with one's hands on the hips. It should be noted that in this study the estimates of power based on these jumping measures were highly correlated ($r$ = .84–.85). Given the high correlation, either method could be used in a fitness test battery; however, different health-referenced criteria standards would need to be established for each. Assessing

CMJ height requires technology to determine flight time; therefore, traditional VJ assessment may be more viable for physical education.

Standing long jump only had a moderate correlation with power calculated from a CMJ ($r = .41$), indicating that VJ and standing long jump are evaluating power differently. Future research should compare how these measures correlate with health-related measures, such as bone mineral density, to determine which is more relevant to be included in a health-related fitness battery.

The results confirm that calculations of power that factor in VJ and body weight provide a better indication of power than does VJ performance alone. This result is not surprising, given that a person's body weight provides the resistance during a jumping task. However, if the goal of fitness testing in physical education is to provide students with accurate feedback regarding how their fitness relates to their health, it is essential to use a measure of power that accounts for body weight. The use of raw jumping scores could give lighter students false positive feedback and heavier students false negative feedback.

While the Samozino et al. (2008) power calculation has been shown to be highly accurate, the process of measuring students' leg length and crouching floor-to-hip height to determine push-off distance may make this assessment less feasible in a physical education setting. As such, most of the other estimation equations proposed in the research literature only utilize jump height and body weight (for a summary, see Gomez-Bruton et al., 2017). In this sample, estimating push-off distance as a fraction of overall height yielded highly accurate results. As students age, their body proportions change. Therefore, future research will need to determine if different fractions of overall height based on age, as well as on sex, are more accurate. Because of the relatively small sample size in this study, no attempts were made to calculate these finer delineations. Once these height fractions are known, they could be included in the power calculation equation, and the only values that would need to be input by the physical education teacher would be the student's height, weight, and jumping score.

It is important to note that the power calculation method developed by Samozino et al. (2008) that was used in this study differs conceptually from the regression-based power estimation calculations developed in other research (Duncan et al., 2013; Gomez-Bruton et al., 2017). Regression-based equations attempt to predict the variable of interest (power) from other measured variables, usually body weight and jump height, by regressing these variables on an assessed measurement of the outcome, most often power assessed via a force platform. The estimation equation mathematically manipulates the measured variables to try to estimate the outcome variable and, in the case of power estimations, typically results in some form of systematic bias (Gomez-Bruton et al., 2017). Essentially, the process involves working backward to try to predict a specific outcome. In contrast, this study used an equation derived from an analysis of the mechanical principles involved in jumping (e.g., work, force, gravitational acceleration) to arrive at a calculation of power. Since it was derived from physical laws, rather than being an abstract estimation, it is less likely to be subject to the biases seen in the prediction equations. Research has confirmed that this method is valid and reliable for calculating power and force-velocity profiles for squat and CMJ (Jiménez-Reyes et al., 2017).

There are limitations to this research study. The criterion measure of power calculated from CMJ has been shown to be highly accurate in adults compared to force platform measurements; however, this has not yet been evaluated in youth. While the physics underlying the calculation would not be different in children, it is possible that children's jumping form has more variability, leading to a less accurate estimation. Future research should validate the equation used to calculate power in children and could also use force platform–assessed power as a criterion measure. This study also utilized a convenience sample of mostly fourth and eighth graders. Future research should examine these jumping power calculations in other age groups and in diverse populations.

In conclusion, this research adds to the body of literature on youth jumping power by documenting the muscular power of children aged 9 to 14 years by showing differences in jumping power via different jumping methods and by implementing a novel power calculation equation in a youth sample. The results support the use and feasibility of the Samozino et al. (2008) power calculation method in physical education settings. More research needs to further validate this method with other age groups and diverse samples and to establish relationships of muscular power with bone health for purposes of developing health-referenced criterion fitness test items.

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COACHING EDUCATION

# Educational Preparation of College Coaches: "Are We Winning Yet?"

*Craig Stewart and Alex Koch*

## Abstract

*The education of all coaches is an important issue regardless of the level. However, it is assumed that coaches at the college level have significant advantages over coaches at other levels. This study investigated that assumption in determining the educational demographics of coaches in a college Division I conference in the western United States. The findings are discussed in reference to practices of college coaches, the barriers in coach education at all levels, and the effects of the growth of sport participation in the private sector.*

This project investigated the educational levels of coaches from a western college athletic conference. In doing so, the authors hoped to determine the extent of their academic preparation for coaching and consider their status in relationship to current trends in coach education.

To enjoy sport and perform at their highest level, athletes need the best coaching possible. Individual and team performances depend on coaches who have prepared in many areas (Irwin, Hanton, & Kerwin, 2004). Sport in the United States is highly valued (U.S. Anti-Doping Agency, 2011) and the need for well-educated and experienced coaches has never been greater. According to the Bureau

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of Labor Statistics (2016), in 2014 over 250,600 coaches were employed at high school, collegiate, and professional levels. However, there is little information concerning the number of coaches in private sports, in which 40 million to 50 million youth (under the age of 19) participate, in the United States (Cook, 2016). In contrast, approximately 9 million coaches in Europe are involved in youth sports (Rankin-Wright & Lara-Bercial, 2018). As the expansion and emphasis on sport participation increases, more athletes will need high-quality coaches who not only maintain participation and improve performance but also keep athletes safe.

## Literature Review

The importance of well-educated coaches at all levels has been repeatedly emphasized (Becker, 2009; Bowes & Jones, 2006; Williams et al., 2003; Vaughan, 2018). In spite of its importance (Bureau of Labor Statistics, 2016), formal coach education has not been well received. It has been described as lacking conceptual framework (Bennett & Culpan, 2014), being undertheorized (Jones, 2006), and overemphasizing the technical aspects of coaching while neglecting the complex humanistic components of the coach–player relationship (Galvan, Fyall, & Culpan, 2012).

Similarly, researchers have made numerous attempts to determine the levels of formal education for coaches at various levels. Gould, Giannini, Krane, and Hodge (1990) determined the educational backgrounds of U.S. national team coaches and found mixed results. In 1992, Stewart and Sweet reported that the knowledge of high school coaches was barely average. They found educational deficits in diagnosing, prevention, and rehabilitation of injuries; creation of instructional and practice plans; motivation techniques; and human nutrition. Irwin et al. (2004) found that less than 40% of elite coaches considered formal coaching courses essential. However, all had participated in some coaching education courses during their careers.

Other researchers have determined that formal coach education courses and degrees had little effect on coaching expertise (Erickson, Côté, & Fraser-Thomas, 2007). Erickson et al. (2007) reported that formal coaching education classes and clinics had little effect on overall coaching knowledge. Coaches in their study felt their knowledge originated more by observing mentors and other coaches or in informal learning settings such as sport-specific conferences. Similarly Nash, Sproule, and Horton (2011) concluded that coaches often learned from practical experiences such as playing the sport or interacting with an experienced mentor. Only a few gained any expertise through coach education programs. Many coaches from those studies reported that formal coach education courses offered little to their professional development. Coaches who had attended formal coach education programs felt these contributed little to their profession. Nash et al. (2011) established that coaches who felt that education was not important were neglecting continuing and formal education because of the low levels of perceived benefits. Because coaching education is not the preferred method for coaches to gain knowledge, specifying the top choices could further knowledge of the role of and best practices for coach education.

With the ever expanding role of sport in the private sector in the United States, another issue significantly affects the knowledge and practices of coaches. The concept of youth sport is no longer confined to activities such as Little League baseball, Pop Warner football, or AYSO soccer. Its popularity now includes highly competitive traveling, "elite" teams whose level of performance is surpassed only by an increasing cost. It is safe to state that there are as many "youth" under the age of 19 who are playing in these expensive private activities as in the public sector. This is important because according to the *Aspen Report: Project Play 2020*, 70% of coaches in the private sector are not trained in six core competencies required of a qualified coach: general safety and injury prevention, effective motivational techniques, CPR and basic first aid, physical conditioning, concussion management, and sport-specific skills and tactics (Solomon, 2017).

Coaching is a complex, multifaceted endeavor that requires a vast skill set and knowledge base. Though some coaches gain formal education through colleges or universities, content and methods vary greatly. Coaches frequently learn more from senior coaches and mentors than from clinics or educational programs. Apart from formal education, informal learning through other coaches is an integral method for coach development (Blackett, Evans, & Piggott, 2015; Erikson et al., 2007). Although understanding how coaches pursue formal education and methods of continuing education is an extensively studied topic, much is still unknown.

Martindale and Nash (2013) recognized that while sport science can have significant and positive effects on coaches and athletes, the general consensus is still that the transfer of sport science knowledge to coaches is poor. Through systematic analysis of the relationship between coaches and sport scientists, Martindale and Nash determined that a majority of information related to coaching was directed at the elite coach. In so doing, coaches below the elite level are often ignored. Coaches at those junior, yet vital, levels experience neither the relevance nor the application of a large amount of sport science knowledge. Martindale and Nash observed that perhaps the scientists failed to understand the needs of coaches at those levels. That failure significantly affects the duties of those coaches and the relationships between them and sport scientists. Coaches at entry and intermediate levels interact, teach, and train the majority of young athletes. When scientific information is directed only at elite coach and their athletes, the meaning is lost to coaches at entry and developmental levels. Even if those coaches have an interest, they must overcome barriers such as effective time management, access to the information, contact with sport scientists, and perhaps the greatest obstacle of technical and often pretentious language.

Therefore, this study investigated the level of education of Division I college coaches in an athletic conference in the western United States. The goals were not only to determine the current status of level of education but also to aid sport administrators and formal coach educators in promoting continuing education for coaches at all levels of sports.

## Method

After the institutional review board process was followed and permission was granted, a questionnaire was constructed and pilot tested on coaches at a Midwestern university. After minor revisions, the survey was e-mailed to all universities that participate in any sport in that western conference. Of the 427 coaches contacted, 109 (25%) completed the survey. For a complete list of the sports of the coaches surveyed, see Table 1. The questionnaire included 13 questions based on the work of Stewart and Sweet (1992).

**Table 1**
*Sports Currently Coaching*

| Sport (activity) | *n* |
|---|---|
| Women's Track and Field | 25 |
| Men's Track and Field | 24 |
| Football (Division I-FCS) | 21 |
| Volleyball | 11 |
| Women's Basketball | 11 |
| Women's Cross Country | 11 |
| Men's Cross Country | 11 |
| Men's Basketball | 10 |
| Women's Soccer | 8 |
| Men's Tennis | 6 |
| Women's Tennis | 3 |
| Women's Golf | 3 |
| Women's Softball | 3 |
| Dance | 2 |
| Swimming | 2 |
| Women's Gymnastics | 2 |
| Men's Golf | 1 |
| Men's and Women's Skiing | 1 |
| Rowing | 1 |
| Women's Hockey | 1 |

## Results

Table 2 shows the basic demographics for the respondents. Male coaches outnumbered female coaches about 2 to 1, with the majority having played the sport they currently coached. Of coaches, 79% ($n$ = 86) were members of a professional coaching association. The length of their coaching careers ranged from 1 to 41+ years (Table 3).

Table 4 shows the coaches' report of formal education. About half had either a bachelor's or master's degree with less than half of the degrees related to physical education or sport. Of the relevant courses they had completed, the most commonly identified were sport psychology ($n$ = 63) and strength and conditioning ($n$ = 64). Approximately 50% listed introductory or advance coaching concepts as completed coursework. Notably, only 13% ($n$ = 15) of the coaches had completed none of the individual courses listed.

**Table 2**
*Basic Demographics of Responding Coaches (n = 109)*

| Demographic | *n* |
|---|---|
| Gender | |
| Female | 38 |
| Male | 79 |
| Current position | |
| Head coach | 41 |
| Assistant | 68 |
| Had played sport coaching | 107 |
| Played at college level | 100 |

**Table 3**
*Years Coaching of Respondents (n = 109)*

| Years of coaching experience | *n* | % |
|---|---|---|
| 0–5 years | 22 | 20.18 |
| 6–10 years | 23 | 21. 1 |
| 11–15 years | 15 | 13.76 |
| 16–20 years | 16 | 14.67 |
| 21–25 years | 10 | 9.17 |
| Over 25 years | 22 | 20.18 |

The final two questions of the survey pertained to the requirements and methods placed upon coaches for continuing education. Ninety percent of the coaches responded that none of their employers required continuing coach education. The remainder listed sport clinics, CPR classes, seminars, and NCAA rules and policies education. Table 5 shows a list of their primary sources of continuing information. Of the options, the most often selected were national or regional coaching conferences (45%). In the open-ended comment box, answers ranged from access to YouTube, independent Internet research, NCAA publications, Internet surfing, visitation to other universities, college classes, observing other coaches, mentoring programs, and other coaching associations. Unfortunately, but not surprisingly, few reported any degrees or other training in teaching.

**Table 4**
*Level of Education of Responding Coaches (n = 109)*

| Level of education | *n* | % |
|---|---|---|
| Advanced degrees | | |
| Master's | 57 | |
| Bachelor's | 50 | |
| Academic area(s): Degree in | | |
| Health, physical education, exercise science, or sport related | 45 | |
| Major or minor in coach education | 4 | |
| Relevant courses taken during degree(s) (in order of frequency) | | |
| Strength & conditioning | | 58 |
| Sport psychology | | 57 |
| Introduction to coaching | | 55 |
| Advanced concepts | | 48 |
| Had taken none of the courses listed | | 13 |

**Table 5**
*Primary Sources for Continuing Coach Education*

| Source for continuing coach education | *n* | % |
|---|---|---|
| Formal coaching conferences | 49 | 44.50 |
| Informal interaction with peers | 28 | 25.80 |
| Professional publications | 12 | 11.00 |
| Senior coaches in my field | 11 | 10.90 |
| Web-based workshops | 4 | 3.69 |
| NONE | 5 | 4.57 |

## Discussion

The results of this study are similar to those in Nash, Sproule, and Horton (2017), in which few coaches had gained their expertise through formal coach education programs. According to this study, only four coaches had earned a major or minor in coach education. Gaining education through a coach education program or degree is not indicative of being a good or successful coach. However, it is striking that at a Division I level so few coaches have a degree related to coaching or teaching. Regardless of how few coaches received a formal education in coaching, the answers to this survey offer an insight to their educational demographics.

Despite most of their degrees being in something unrelated to coaching, some courses were relevant to their profession. Over 50% of coaches identified sport psychology, human anatomy, coaching (introduction), and strength and conditioning, while several other courses were well into the 40% range (Table 4). However, few listed courses related to pedagogy.

Contrary to Erickson et al. (2007), who stated that coaching knowledge comes from observing mentors and other coaches, the coaches in this study identified more formal sources. Coaching conferences (45%) was the top choice for continuing education (Table 5). Despite continuing education not being required by their respective employer, some coaches sought to advance their knowledge in their profession. In this study, a majority of coaches (79%) belonged to more than one coaching association and had several certificates at many levels. That involvement allows coaches to at least be exposed to new information. Even though coaching has few requirements for certifications or memberships in associations, these coaches chose to interact with peer groups. Because continuing education was not required, it is encouraging to see so many coaches seeking organizations that can expose them to current information.

The many issues related to coach education are not new. In 1977, Bourdieu characterized coaching as organized inventiveness in which experience was more essential to the profession. A year later, Campbell (1978) observed that one of the major issues plaguing the sport sciences was the distribution of research to coaches. Only two years later, Only two years later, Burke (1980) concluded that to have real value, coach education requires better communication between sport scientists and coaches at every level of competition. Targeting research to enhance athletic performance is but one half of the investigative process. The other essential component is the dissemination of findings to those who will implement them in the preparation of their athletes. The need to bridge the communication gap between coaches and researchers is also not new (Sands, 1998; Thompson, 1982). More recently, Gilbert and Trudel (2004) investigated the proliferation of journals related to coaching and sport science. They determined that while the increase in sport science journals had contributed to the knowledge base of those disciplines, it created even more problems for coaches. With the increased emphasis on the sport sciences has come an extreme specialization within the vocations. Numerous journals cover areas such as sport psychology, sport sociology, sport administration, and risk management in sport, at regional, national, and international levels. With this specialization has come a level of language that often creates its own barrier to even elite coaches.

The majority of coaches need access to current sport-specific information in a language they can read and understand. Unfortunately, most sport scientists exist in an academic world characterized by a *publish or perish* mentality (Williams & Kendall, 2007). Just as the elite coach must perform within certain stressful parameters, so must sport scientists. Most are professors who are often striving for tenure. That creates barriers of academic procedures, statistical analysis, and terminology/jargon that are not easily understood by, much less applicable to, the average coach. If those barriers could be recognized and overcome by national governing bodies, national organizations such as the National Collegiate Athletic Association, high school associations, and private national, state, and local associations, the process of coach education and the welfare of all athletes would improve. But to support that approach, university and college administrations need to recognize the importance of research that applies to the real world and reward sport scientists who produce in that area.

It is common agreement that one of the mutual goals between the sport scientist theorist and the practical coach is the heightening of athletic performance (Williams & Kendall, 2007). Yet still, current sport science information is not easily accessible by the majority of coaches. Too often, academic expectations force the sport scientists to choose between resources available to the sport coach and pathways to tenure. Scientists, whether a physiologist, psychologist, or nutritionist, normally pursue research problems in their own discipline and ultimately publish in journals read by other scientists. Those publications usually take months, if not years, to be available and are characterized by language not conducive to practical application. Conversely, coaches normally need to solve in a timely manner problems that are specific to an individual athlete or team and that call for solutions that are multidisciplinary in nature. Most coaches do not have the time or inclination for the extensive work involved in researching, locating, reading, and understanding material characterized by scientific terminology (Williams & Kendall, 2007). This breeds the general perception that research in sport science does not meet the needs of most coaches. Williams and Kendall (2007) recommended that the two groups should attempt to compromise by the scientists communicating more in coaching clinics and practical journals while coaches get more accustomed to the complicated language used in some sport sciences. The existence of solid rapport between some elite coaches and sport scientists suggests the importance of relationships between them. It also recognizes the equal value and respect of both groups' expertise and the need for the practical application of current knowledge in sport. However, what is not being considered is the relationship between coaching at the two levels that form the foundations of the elite levels and the potential of athletes as they move toward the higher levels.

Reade, Rodgers, and Hall (2008) related several barriers in meeting the practical needs of coaches through ongoing education. Coaches at all levels have many responsibilities that must be prioritized. Unfortunately, continuing education, whether formal or informal, is often lower on that list. Next, the funding for resources in coaching is usually an issue and any educational experience that requires expenditures in time or money is, again, low on a priority list. The final barrier has three components. First, coaches must locate the specific information; second, in a timely fashion (when they need it); and most important, in a "user-friendly" format. To overcome those, the coaches, the administrators who provide the time and financial resources, and the sport scientists need to take a unified approach to produce formats that can be easily found, read, and understood. Regardless of their levels of advanced education, most coaches will not attempt to overcome even one of those barriers without ample support and encouragement. These are only a few of the issues in coach education that produce coaches who rely on more informal sources for the periodic updates in sport science. As noted, most coaches rely on interactions with other coaches in both applied and social settings such as coaching clinics (Cushion, Armour, & Jones, 2003). However, those practices have shortcomings. Cushion et al. (2003) observed that perhaps those informal coach-to-coach interactions could result in information and practices being "lost in translation" or achieved at the expense of more current, innovative, and/or critical analysis of coaching tactics and techniques. Without sufficient background and understanding, coaches remain in danger of leaving their profession unaffected by new knowledge and insight.

## Recommendations for Additional Research

This study was limited by the small number of subjects and by the one athletic conference examined. Certainly more research should be accomplished in the ongoing issues around coach education, especially with the continued growth of sport in the private sector. In addition, more attention needs to be paid to the limited exposure of coaches to the teaching element of their profession. Along with the poor communication between sport scientists and coaches is the lack of education on how to teach. Historically, there has been as much emphasis on how to teach in coaching as on what to teach. But now, with more coaches than ever being unprepared, how to teach continues to be somewhat ignored. That failure is as threatening to the players and the sport as the lack of dissemination of the sport sciences.

## Conclusions

The mutual goal of sport scientist and the practical coach is the heightening of athletic performance (Williams & Kendall, 2007), yet today current sport science information is not reaching many coaches. As a group, the college coaches in this study exhibited an encouraging amount of formal education, yet their academic areas were often not related to sport science or physical education. Their primary sources were, understandably, sport-specific conferences, interaction with other coaches, or informal sources easily accessible via the Internet. More important, continuing education beyond basic rules and regulations upgrades was not required and education in teaching theory or application was limited.

In conclusion, the education of coaches at all levels is still weak and based upon the expansion of private sports in the United States, the number of undereducated coaches continues to increase. A unified approach to coach education by all shareholders in sports is required to meet the growing needs of athletes and coaches at all levels.

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PEDAGOGY

# Perceptions of Physical Education Teachers Regarding the Use of Technology in Their Classrooms

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## Abstract

*The purpose of this study was to determine the perceptions of physical educators regarding their accessibility to educational technology, the availability of technical help, and specific obstacles to incorporating technology in their classrooms. Respondents were 201 adapted and general physical education instructors who taught at middle and high schools in two large school districts in the Southwestern United States. Respondents completed three sections of a previously validated survey utilized in a nationwide 2011 educational technology study involving literacy teachers. Results indicated the top available technologies for instruction were laptop computers, digital projectors, computer labs with Internet connections, iPods, and pedometers. High percentages of respondents indicated they had a sufficient level of available technological support from library/media specialists, school administrators (for obtaining resources), in-school and district technology coordinators, and other teachers in their building. The top perceived barriers to implementing educational technology were lack of understanding of how to integrate technology, lack of incentives to use technology, lack of time because of high-stakes testing, difficulty of managing a classroom when students are using computers, and lack of technical support. A comparison of these results with previous research demonstrates a rapid recent increase in school use of educational technology and underscores the need to help physical education teachers better*

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*incorporate new technology in their classrooms. Results also provide a baseline from which future studies may track the progress of technology use in physical education classrooms.*

Technology is an essential tool to help physical education teachers deliver quality instruction (Browne, 2015; National Association for Sport and Physical Education, 2009; Society of Health and Physical Educators, 2017). A report by the Office of Educational Technology (2017) concluded that educational technology has the potential to provide equity and accessibility in learning so that all learners can access information resources. In physical education, access to technology is particularly important with the availability of new phone applications focused on physical activity tracking and proper nutrition; consequently, student usage is expected to become more feasible in the future (Beale, 2012; Ptomey et al., 2015). New applications that help teachers track students' behavior and students' progress and that engage students in learning new information and improve their skills can be downloaded to a phone or tablet computer. Portable Bluetooth sound system devices and portable projectors that present video or slides are additional technologies physical education teachers can use. However, despite prominent calls for integrating technology into instruction and the widespread availability of Internet access in schools, the integration of technology has not kept pace with developments outside of classrooms and schools (Jones, Baek, & Wyant, 2017).

Ouyang and Stanley (2014) analyzed various theories of learning in regard to educational technology and identified specific benefits students receive when technology is integrated into the classroom. These benefits include a greater potential interest in the activity, more collaboration between students, a potentially greater number of trials, quicker feedback, and better connectivity of the learning activity to outside life. Consequently, it appears important that teachers correctly and flexibly use a variety of educational technologies to make their instruction more effective.

Researchers have identified a number of barriers to implementing technology in education including not enough time within a class period, lack of access to technology, lack of technical support, not enough time to plan for integrating technology into instruction, insufficient time to teach basic computing skills, lack of incentives to integrate technology, inadequate professional development for integrating technology, time demands of high-stakes testing, and equipment failure or malfunction (An & Reigeluth, 2011; Hutchison & Reinking, 2011; Jones, Bulger, Illg, & Wyant, 2012; Lee, Park, Whyte, & Jeong, 2013; Razaghi, 2014; Rogers, 1999). In addition, teacher reluctance to incorporate technology can also be cited as a barrier, because they do not believe it will enhance the quality of their instruction or they do not believe it is worth the time or cost to do so (Wyant, Jones, & Bulger, 2015). Generally, research on the use of instructional technology in physical education is limited (Browne, 2015; Kretschmann, 2015).

The purpose of this study was to determine the perceptions of adapted and general physical education instructors regarding their accessibility to specific forms of technology, the availability of technical help, and obstacles to incorporating technology in their classrooms. This research was deemed important because there is a need to help physical educators identify helpful technology and successfully overcome barriers preventing them from implementing technology in their classrooms. In addition, research on the use of instructional technology in physical education is limited (Browne, 2015; Kretschmann, 2015).

## Method

Respondents were adapted and general physical education instructors who taught at K–12 public schools in two large school districts in the Southwestern United States. This study used three sections of a previously validated survey that was utilized in a nationwide study involving 1,441 K–12 literacy teachers (Hutchison & Reinking, 2011). This survey instrument was chosen because of the potential to track the progress of educational technology in K–12 schools over 6 years (2011–2017). That survey was initially developed by a panel of experts who surveyed the educational technology literature and developed a set of constructs. Three of the constructs were (1) specific technologies available for teaching, (2) availability of technical help for teachers, and (3) specific obstacles to incorporating technology in classrooms. Survey items for each construct were developed and pilot tested with a group of 100 K–12 teachers. Cronbach's alpha for internal consistency ranged from .88 to .96 for the constructs guiding development of the survey (Hutchison & Reinking, 2011).

For this research, those three sections were used with the exception that some additional physical education–specific technology items were added to the list of available technologies (i.e., accelerometers, pedometers). A demographic section solicited demographic items, including age, years of certified teaching experience, teaching assignment (Adapted Physical Education, General PE, or Other), and grade level. Prior permission to solicit and analyze this data was provided by the university institutional review board.

Respondents were initially identified through a random sample of elementary, middle, and high school physical education teachers in two counties in the Southwestern United States in October 2017. E-mail addresses were secured through district directories. An e-mail including a Qualtrics link and asking them to participate in the study was sent to their e-mail addresses. Approximately 250 e-mails were sent to potential respondents; however, several were returned as incorrect or nonfunctioning. Respondents were also encouraged to forward the survey link to other physical educators. A reminder e-mail was sent to the respondents approximately 2 weeks after the initial mailing. Respondents were informed of the purpose of the research, that the survey was confidential, and that they were required to complete an informed consent form prior to accessing the survey. At the end of 4 weeks, the data were downloaded from Qualtrics into an Excel spreadsheet.

## Results

Of the 201 respondents, 122 (60.7%) were female and 79 (39.3%) male. The mean for teaching experience was 9.4 years. Approximately 90% of the respondents indicated their primary teaching assignment was general physical education, 8% were adapted physical education teachers, and 1.5% gave no indication. Approximately 47% indicated their primary teaching level was K–5, 35% taught Grades 6 to 8, and 22% taught Grades 9 to 12 (i.e., several of the respondents indicated more than one level).

A majority of the respondents indicated that some of the technologies were not available for them, including heart rate monitors, interactive whiteboards, and accelerometers. However, over three quarters of the respondents indicated they had access to digital projectors; computers connected to the Internet (PE classroom); computers connected to the Internet (in a classroom); student e-mail, and pedometers, iPad, laptop, and computers (personal use; see Table 1). The percentages for a number of the available educational technologies were much higher than for the 2011 national survey of literacy teachers (Hutchison & Reinking, 2011), most notably, student e-mail (61.7% vs. 11.4%), laptop computers for teacher use (86.6% vs. 41.1%), digital projectors (84.6% vs. 66.7%), iPods (72.6% v.s 5.8%), document camera (55.2% vs. 15.3%), digital video recording equipment (59.7% vs. 32.0%), and laptop computers for each student (50.7% vs. 12.3%). The percentages for technical support were also higher for this survey than for the 2011 survey (Hutchison & Reinking, 2011), specifically, library/media specialist (84.6% vs. 70.5%), another teacher who assists with technology (67.7% vs. 48.0%), and in-school technology coordinator (70.1% vs. 31.9%). High percentages of respondents indicated a sufficient level of available technological support from library/media specialists, school administrators (for obtaining resources), in-school and district technology coordinators, and other teachers in their buildings (see Table 2).

**Table 1**
*Physical Education Teachers' Perceptions of Technologies Available for Instruction*

| | Yes | | No | |
|---|---|---|---|---|
| **Survey question** | **%** | ***n*** | **%** | ***n*** |
| Laptop computer(s) at school for your personal use | 86.6 | 174 | 13.4 | 27 |
| Digital projector(s) | 84.6 | 170 | 15.4 | 31 |
| Computer(s) connected to the Internet (in a designated classroom) | 78.1 | 157 | 21.9 | 44 |
| iPod | 72.6 | 146 | 27.4 | 55 |
| Computer(s) connected to the Internet in school (outside of physical education classroom) | 72.1 | 145 | 29.9 | 56 |
| Pedometers | 71.6 | 144 | 28.4 | 57 |
| Student e-mail | 61.7 | 124 | 38.3 | 77 |
| Digital video recording equipment | 59.7 | 120 | 30.3 | 81 |
| Document camera | 55.2 | 111 | 44.8 | 90 |
| Laptop computers for each student | 50.7 | 102 | 49.3 | 99 |

**Table 1 (cont.)**

| Survey question | Yes % | Yes n | No % | No n |
|---|---|---|---|---|
| Personal Data Assistant (PDA) for your use | 49.8 | 100 | 50.2 | 101 |
| Heart rate monitors | 48.3 | 97 | 51.7 | 104 |
| Interactive whiteboard(s) | 35.8 | 72 | 64.2 | 129 |
| Accelerometers | 32.3 | 65 | 67.7 | 136 |

**Table 2**
*Availability of Technical Support for Using Technology*

| Survey question | Yes % | Yes n | No % | No n |
|---|---|---|---|---|
| Library/media specialist | 84.6 | 170 | 15.4 | 31 |
| Administrative support (for obtaining resources) | 77.1 | 155 | 22.9 | 46 |
| District technology coordinator (for techical support) | 77.1 | 155 | 22.9 | 46 |
| In-school technology coordinator (for technical support) | 70.1 | 141 | 29.9 | 60 |
| Another teacher who assists with technology | 69.7 | 140 | 30.3 | 61 |
| District technology coordinator (for instructional support) | 65.2 | 131 | 34.8 | 70 |
| In-school technology coordinator (for instructional support) | 59.2 | 119 | 30.8 | 82 |

Responses for the 4-point (0 to 3) Likert section pertaining to obstacles to integrating technology into physical education were compressed into two categories so that they could be reported as percentages: (1) not a barrier or to a small extent and (2) a moderate or large barrier. The items that had the highest percentages of a moderate or large barrier were (1) lack of understanding to integrate technology in literacy instruction (68.5%), (2) lack of incentives to use technology (67.8%), (3) lack of time because of high-stakes testing (66.7%), (4) difficulty of managing a classroom when students are using computers (66.7%), and (5) lack of technical support (62.1%; see Table 3). Chi-square comparisons of the responses by gender revealed females were significantly more likely than males to perceive a number of the items as moderate or large barriers to integrating technology into their physical education classes. These items included a lack of time both to prepare for and to teach classes that integrate technology, not being able to find reliable educational technology, and not being provided sufficient technology-related professional development.

**Table 3**
*Perceptions of Physical Education Teachers Regarding Obstacles to Integrating Technology Into Their Classrooms*

| | Moderate or a large extent | | None or to a small extent | |
|---|---|---|---|---|
| **Obstacle** | **%** | ***n*** | **%** | ***n*** |
| Lack of understanding to integrate technology in literacy instruction | 68.5 | 137 | 31.5 | 63 |
| Lack of incentives to use technology | 67.8 | 135 | 32.2 | 64* |
| Lack of time because of high-stakes testing | 66.7 | 132 | 33.3 | 66* |
| Difficult managing classroom when on computer | 66.7 | 132 | 33.3 | 66* |
| Lack of technical support | 62.1 | 123 | 37.9 | 75 |
| Lack of professional development to integrate technology | 58.2 | 114 | 41.8 | 82 |
| Lack of time to prepare for using technology | 58.1 | 115 | 41.9 | 83 |
| Thinking that technology doesn't fit my beliefs about learning | 57.4 | 113 | 42.6 | 84 |
| Lack of access applicable to technology | 57.4 | 113 | 42.6 | 84 |
| Lack of time during class | 57.1 | 113 | 42.9 | 85 |
| Internet text too difficult for students to read | 55.8 | 110 | 44.2 | 87 |
| Not knowing how to evaluate student when online | 54.8 | 109 | 45.2 | 90 |
| Not knowing how to incorporate technology and teach content | 54.8 | 108 | 45.2 | 89 |
| Difficulty controlling information students access online | 53.5 | 106 | 46.5 | 92 |
| Lack of understanding of copyright issues | 50.8 | 101 | 49.2 | 98 |

**Table 3 (cont.)**

| Obstacle | Moderate or a large extent | | None or to a small extent | |
|---|---|---|---|---|
| | % | *n* | % | *n* |
| Lack of time to teach students complex tasks | 50.7 | 101 | 49.3 | 98* |
| Lack of support from school administration | 48.0 | 94 | 52.0 | 102 |
| Not knowing how to use technology | 46.7 | 92 | 53.3 | 105 |
| Not knowing how skilled students are using technology | 42.9 | 85 | 57.1 | 113 |
| Thinking technology integration not useful for classes | 34.8 | 69 | 65.2 | 129 |
| Considering technology to be unreliable | 34.2 | 68 | 65.9 | 131 |

*Significantly higher female than male percentages at $p < 0.05$.

## Discussion

Similar to Hutchison and Reinking (2011), this study shows that the lack of time, incentives, understanding, and access were the primary obstacles to utilizing technology in the classroom successfully. Since time for instruction and learning is limited during a class period, it is understandable why participants rated those survey items as moderate to large barriers. In addition, some of the respondents may have felt comfortable in their ways, with no incentive to learn how to implement new technology into their teaching (Wyant et al., 2015). With constant new technological advances, it may seem overwhelming for some teachers to be constantly having to learn new programs and teach their students to use them (O'Neil & Krause, 2019).

For a majority of instructors attempting to implement technology in their classroom setting, one of the main areas of concern was a lack of sufficient technical support at their schools. Butler and Sellbom (2002) stated that specific faculty members should be identified to assess and evaluate the effects of technologies on learning on their campus. This will allow other teachers at the school to implement technology and make them want to learn new areas they are not accustomed to. It is encouraging that over 65% indicated receiving an adequate level of technical support from their school administrations and that their districts have a technology coordinator to prescribe technical support. However, in contrast, it is concerning that 62% cited a lack of sufficient technological support as an obstacle to integrating technology into their classes. This finding suggests that given the rapid improvements in technology, teachers may feel a need for additional support to “keep up” with new applications. That is, even though support personnel is provided, it is not perceived as being sufficient when instructors need immediate help or want help in determining how to integrate new technology into their teaching (Buabeng-Andoh, 2012). For example, new technology such as cell phone applications are becoming available frequently and it is challenging and time consuming for teachers to keep up with those advancements.

It is interesting that females were significantly more likely than males to identify barriers such as a lack of time both to prepare for and to teach classes that integrate technology, not being able to reliable educational technology, and not being provided sufficient technology-related professional development. These findings suggest that males may have an edge in utilizing technology in teaching physical education. Future research can address the effectiveness of technology in in-service education to narrow this gap for female physical education teachers.

In conclusion, while physical education and literacy teachers are two different groups of educators, the findings demonstrate the rapid increase in education technology and technology support in K–12 schools over 6 years (2011–2017) and are consistent with other research findings (Wastiau et al., 2013). Because research on the use of instructional technology in physical education is limited (Browne, 2015; Kretschmann, 2015), these results provide a baseline that may be compared with subsequent studies.

A great way to integrate technology into more physical education classrooms would be to offer to teachers monthly workshops that emphasize strategies related to these specific areas (McNeill & Fry, 2012). Each workshop could provide demonstrations of how instructors can save time with a particular type of technology and could show how different types of technologies can be used for different purposes or tasks within their classrooms. Informative sessions of this type would provide teachers with hands-on practice with the technology, which would likely lead to later use with their classes (Goktas, Yidirim, & Yildirim, 2009).

Because physical educators are responsible for providing a standards-based curriculum, integrating technology can take time away from other activities during classes. Given the importance of moderate to vigorous physical activity, physical educators may not have sufficient time to devote to technology-based activities such as digitally tracking calories or recording fitness scores. However, the integration of technology in physical education is important because it has the potential to empower students to utilize that technology for self-directed moderate to vigorous physical activity outside of class via cell phone and tablet applications, digital exercise measures, and heart rate trackers (Browne, 2015; Beale, 2012).

This study was limited to 201 physical educators in one Southwestern state. Researchers could include a larger sample size and focus on comparing the responses of adapted and general physical educators to determine different obstacles they have encountered, particulary because adapted physical education instructors are required to create more activity modifications for their students. Because the lack of time, for a variety of reasons, was a main reason the physical educators were not able to implement technology effectively into their teaching, researchers could interview physical educators to determine reasons they feel they have little time to learn about, implement, and use technology within their classrooms. Because the pace of technological change is so fast, it appears important to frequently survey both students and teachers to track the progress of the implementation of educational technology, particularly in regard to measuring student physical activity outcomes. Future research should also track the effects of other formats such as Google Classroom and other innovative class communication applications (McNeill, Mukherjee, & Singh, 2010; Ouyang & Stanley, 2014).

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PEDAGOGY

# Faculty Beliefs Concerning the Preparation of Physical Education Teacher Education Students for Appropriate Practices

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## Abstract

*Teachers are expected to follow appropriate practices within their content areas. For physical education (PE) teachers, many of these practices are outlined in the Society of Health and Physical Educators' (SHAPE America, 2009)* Appropriate Instructional Practice Guidelines, K–12. *This study examined the extent to which undergraduate physical education teacher education (PETE) programs are preparing their preservice PE teachers for implementing appropriate practices. PETE faculty (N = 124) across the United States responded to an electronic survey assessing their institutions' current practices in the five constructs of Learning Environment, Instructional Strategies, Curriculum, Assessment, and Professionalism adapted from SHAPE America's (2009)* Appropriate Instructional Practice Guidelines, K–12. *PETE faculty generally agree that their programs are preparing students to implement appropriate practices, particularly in the area of Instructional Strategies. PETE programs may wish to examine what they are doing to prepare their majors to implement appropriate practices and develop strategies to improve any areas of weakness, as these practices are indicators of high-quality physical education.*

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Like all professionals, teachers are expected to follow best practices in their field. In education, "best practices" are often referred to as "appropriate practices." The National Association for the Education of Young Children (NAEYC, 2018) defines developmentally appropriate practices as those based on knowledge of child development and learning, what is appropriate for individual children, and what is culturally important. This framework is grounded in the research on child development and learning and in knowledge about educational effectiveness, promoting optimal learning and development (NAEYC, 2018).

There are appropriate practices for teaching in general and within specific content areas such as physical education (PE). Every child deserves developmentally appropriate experiences in PE (Graham, 1992). A developmentally appropriate PE program views motor skill development as sequential and age related, recognizes that children progress through similar sequences of motor development, and recognizes that the rates at which children progress through sequences of motor development vary (Grineski, 1992). PE is no different than any other subject taught in schools in that every child deserves to be understood, valued, and helped to learn. Athletic students and poorly skilled students alike have the same right to a positive, enjoyable, and beneficial experience in PE (Graham, 1992).

The first official document on appropriate practices in PE was published in 1992 by the National Association for Sport and Physical Education's (NASPE) Council on Physical Education for Children (COPEC). The original document was titled *Developmentally Appropriate Physical Education Practices for Children* (COPEC, 1992) and has since been revised. It was most recently updated in 2009 and exists as three documents for the elementary, middle, and high school levels titled *Appropriate Instructional Practice Guidelines for Elementary School Physical Education* (NASPE, 2009a), *Appropriate Instructional Practice Guidelines for Middle School Physical Education* (NASPE, 2009b), and *Appropriate Instructional Practice Guidelines for High School Physical Education* (NASPE, 2009c), respectively. The Society of Health and Physical Educators (SHAPE America, 2009) published a side-by-side comparison of these three documents in *Appropriate Instructional Practice Guidelines, K–12*. This document provides expert consensus regarding many appropriate and inappropriate practices observed in K–12 school PE programs. It guides teachers, administrators, and policymakers in creating and maintaining high-quality school PE. This study was based on this document.

PE teacher education (PETE) students' notions of good PE practice are often informed by their own K–12 school experience (Doolittle, Dodds, & Placek, 1993; Placek et al., 1995). Their ideas of good practice may rely heavily on what their own former PE teachers did, even if those practices included things that we as a profession view as inappropriate. Examples include having students pick teams, playing dodgeball or other human target sports in PE class, and using or withholding physical activity as punishment for misbehavior. Indeed, the need for position statements such as the *Appropriate Instructional Practice Guidelines, K–12* (SHAPE America, 2009) was identified by professionals throughout the United States who expressed concern about the widespread use of inappropriate teaching practices and curriculum, particularly with young children (Bredekamp, 1992).

PE teachers must know the difference between appropriate and inappropriate practice. A review of the literature found several studies that examined PE professionals' (including preprofessionals') knowledge of appropriate PE practices. One study investigated the knowledge and use of appropriate instructional strategies by PE teachers. Results were positive and showed that a majority of the PE teachers were knowledgeable about appropriate and inappropriate instructional strategies. Most teachers in the study reported using appropriate strategies and not using inappropriate strategies (Strand & Bender, 2011). Another study examined PETE students' knowledge of appropriate instructional strategies and found that overall, PETE students could identify appropriate practices, particularly senior PETE majors (Senne & Strand, 2009). Two studies examined PETE students' knowledge of appropriate practices in elementary school PE. Generally speaking, the PETE students tended to correctly identify appropriate practices in a survey (Barney & Christenson, 2013; Barney & Strand, 2006). A similar study examined PETE students' knowledge of appropriate practices in middle school PE. Once again, the results were generally positive in that PETE students correctly identified appropriate practices on a survey (Barney, Christenson, & Pleban, 2015).

This information is reassuring. However, no study has investigated the preparation of PE teachers for implementing appropriate practices from the standpoint of those who train these teachers. PETE faculty have a major responsibility in preparing quality PETE students, as teacher preparation programs are the first step in improving the quality of PE as a whole (Barney et al., 2015; Barney & Strand, 2006). PETE faculty have the opportunity in the teaching and training of their majors to break a cycle of inappropriate instructional practices (Barney & Christenson, 2013). PETE programs should include NASPE's documents on appropriate practices and expose PETE students to appropriate practices throughout their courses of study (Barney et al., 2015; Barney & Strand, 2006). Therefore, this study examined the extent to which undergraduate PETE programs are preparing preservice PE teachers for implementing appropriate practices.

## Method

### Participants

Participants were PETE faculty (*N* = 124) who responded to an electronic survey sent to the undergraduate PETE program director at each of the 488 active PETE programs across the United States in spring 2018. The overall response rate was 25.4%. Some participants chose not to respond to all of the demographic questions included at the end of the survey; therefore, the number of responses to these questions vary slightly. In total, all 124 participants reported the gender with which they identify (about 58% female, 41% male, 1% other) as well as their academic rank (about 34% full professor, 31% associate professor, 21% assistant professor, 10% instructor/lecturer, 2% adjunct, and 2% other). The average participant had taught for approximately 21 years as a PE teacher educator not counting graduate school, and their undergraduate PETE program had about four full-time faculty members, three part-time/adjunct faculty members, and one graduate student. Table 1 shows further descriptive information regarding participants and their PETE programs.

**Table 1**
*Descriptive Information About Participants and Their PETE Programs*

| Demographic survey question | Frequency | % | *n* | Min | Max | *M* | *SD* |
|---|---|---|---|---|---|---|---|
| Categorical | | | | | | | |
| 1. With which gender do you identify? | | | | | | | |
| Female | 72 | 58.1 | | | | | |
| Male | 51 | 41.1 | | | | | |
| Other | 1 | .8 | | | | | |
| Total | 124 | 100 | | | | | |
| 2. What is your academic rank? | | | | | | | |
| Full Professor | 42 | 33.9 | | | | | |
| Associate Professor | 39 | 31.5 | | | | | |
| Assistant Professor | 26 | 21.0 | | | | | |
| Instructor/Lecturer | 12 | 9.7 | | | | | |
| Adjunct | 3 | 2.4 | | | | | |
| Other | 2 | 1.6 | | | | | |
| Total | 124 | 100 | | | | | |
| Continuous | | | | | | | |
| 3. How many years have you been a physical education teacher educator, not counting graduate school? | | | 117 | 0 | 45 | 21.4 | 10.8 |
| 4. How many full-time faculty teach in the undergraduate PETE program at your institution? | | | 123 | 1 | 18 | 3.61 | 2.70 |
| 5. How many part-time/adjunct faculty teach in the undergraduate PETE program at your institution? | | | 123 | 0 | 25 | 3.20 | 3.91 |
| 6. How many graduate students teach in the undergraduate PETE program at your institution? | | | 124 | 0 | 25 | .63 | 2.57 |

*Note.* There were 124 total respondents; however, not all respondents completed every demographic question at the end of the survey.

## Procedure and Instrumentation

Approval to conduct the study was obtained from the university's institutional review board prior to data collection. For the purpose of the study, the researcher used Qualtrics to develop a survey consisting of six demographic questions and 77 Likert scale questions representing the 77 appropriate practices outlined in SHAPE America's (2009) *Appropriate Instructional Practice Guidelines, K–12*. For the Likert scale questions, participants ranked on a 5-point scale the extent to which they agreed or disagreed that their institution was preparing PETE majors to implement each of the 77 practices. Response options included 1 (*strongly disagree*), 2 (*disagree*), 3 (*neutral*), 4 (*agree*), and 5 (*strongly agree*). For example, for appropriate practice 5.2.1, "The teacher is the physical activity expert in the school" (SHAPE America, 2009), the corresponding survey question read, "My undergraduate PETE program prepares preservice PE teachers to be the physical activity expert in the school." Participants then indicated their level of agreement with the statement.

Consistent with the *Appropriate Instructional Practice Guidelines, K–12* (SHAPE America, 2009), the questions/practices were organized into five sections: (1) Learning Environment, (2) Instructional Strategies, (3) Curriculum, (4) Assessment, and (5) Professionalism. Each section, henceforth referred to as constructs, covered specific areas of concern in PE. Examples of the many areas covered include safety, diversity, equity, and inclusion (Learning Environment construct); class organization, learning time, and teacher feedback (Instructional Strategies construct); concept knowledge, developing health-related fitness, and interdisciplinary instruction (Curriculum construct); fitness testing, grading, and program assessment (Assessment construct); and professional growth and advocacy (Professionalism construct). Breaking up the survey into these five constructs not only matched the organization of the document from which the questions were derived but also functioned to reduce survey fatigue for the participants.

A preliminary version of the survey was reviewed for content validity and for clarity and readability by two PETE faculty experts from two universities. One had over 40 years of combined teaching experience in PE and PETE and research experience involving the development of survey instruments. The other had 15 years of combined teaching experience in PE and PETE. The two experts were provided with the survey and a copy of the *Appropriate Instructional Practice Guidelines, K–12* (SHAPE America, 2009) for reference. Independently, they systematically reviewed each of the 77 survey questions to be sure the questions reflected the *Appropriate Instructional Practice Guidelines, K–12* as closely as possible in terms of content and organization. They also reviewed the 77 survey questions and six demographic questions for overall clarity and readability. They provided written feedback to the researcher and changes were made to the survey questions in accordance with their feedback. Care was taken not to compromise the integrity of the original appropriate practice statements. A full copy of the survey can be obtained from the researcher upon request.

An outdated list of undergraduate PETE programs in the United States and their directors was obtained from a colleague who had conducted a study involving a survey of PETE program directors (Webster et al., 2016). Program directors were initially identified via program websites and phone calls were made to those colleges and universities whose contact person could not be determined from their website. The 488 contacts on the final list were e-mailed an invitation to participate in the survey. The e-mail contained the purpose of the study, the reason that they were being invited to participate (because they were identified as the PETE program director for their institutions), the deadline to participate, a link to the survey, and a link to opt out of the survey. A reminder e-mail was sent once per week over the next 3 weeks for a total of three follow-up e-mails. The reminder e-mails contained the same information as the original e-mail invitation. The survey period closed 1 month from the day that the original e-mail invitation was distributed.

## Data Analysis

Descriptive statistics were used to analyze all demographic and Likert scale data. A Cronbach's alpha test was used to determine the reliability of the survey instrument. A paired-samples *t* test was used to analyze differences in responses between the five constructs. An independent-samples *t* test was used to determine whether responses differed based on participants' gender. A one-way ANOVA was used to analyze participant responses based on academic rank. A Pearson's correlation was used to determine differences in responses based on years of experience, number of full-time faculty teaching in their PETE programs, number of part-time faculty in their PETE programs, and number of graduate assistants. SPSS software was used for all statistical analyses.

## Results

This study was delimited to the five constructs of (1) Learning Environment, (2) Instructional Strategies, (3) Curriculum, (4) Assessment, and (5) Professionalism adapted from the *Appropriate Instructional Practice Guidelines, K–12* (SHAPE America, 2009). Table 2 shows the results of the Cronbach's alpha test for reliability. In total, the Learning Environment section of the survey included 23 questions, Instructional Strategies had 15, Curriculum had 23, Assessment had 12, and Professionalism had 4, for a total of 77 questions. The survey instrument was found to be highly reliable with internal consistencies for each section ranging from .86 to .94.

Table 2 shows descriptive statistics for participants' level of agreement with each construct. Overall, agreement was high for all five constructs. Mean level of agreement was highest for the construct of Instructional Strategies ($M$ = 4.53, $SD$ = .50), followed by Professionalism, ($M$ = 4.41, $SD$ = .66), Assessment ($M$ = 4.38, $SD$ = .58), Learning Environment ($M$ = 4.36, $SD$ = .49), and Curriculum ($M$ = 4.33, $SD$ = .50). At the item level, mean level of agreement ranged from 3.71 ($SD$ = 1.00) to 4.80 ($SD$ = .51) across all of the Likert scale questions. The mean level of agreement ranged from 3.74 to 4.71 for the appropriate practices under the construct of Learning Environment, 4.13 to 4.73 for the practices under Instructional Strategies, 3.71 to 4.80 under Curriculum, 3.98 to 4.54 under Assessment, and 4.24 to 4.50 under Professionalism.

**Table 2**
*Survey Reliability and Descriptive Statistics for Constructs*

| Construct | Number of items | Cronbach's alpha | *N* | Min | Max | *M* | *SD* |
|---|---|---|---|---|---|---|---|
| Learning Environment | 23 | .935 | 124 | 1 | 5 | 4.36 | .494 |
| Instructional Strategies | 15 | .937 | 124 | 1 | 5 | 4.53 | .495 |
| Curriculum | 23 | .940 | 124 | 1 | 5 | 4.33 | .504 |
| Assessment | 12 | .941 | 124 | 1 | 5 | 4.38 | .584 |
| Professionalism | 4 | .855 | 124 | 1 | 5 | 4.41 | .659 |

Table 3 shows the results of the paired-samples *t* test. A significant difference was found in mean level of agreement between the construct of Instructional Strategies and each of the other four constructs: Learning Environment, $t(123) = -7.62, p < .001$; Curriculum, $t(123) = 7.75, p < .001$; Assessment, $t(123) = 5.49, p < .001$; and Professionalism, $t(123) = 2.65, p = .009$. A significant difference was also found in mean level of agreement between the constructs of Curriculum and Professionalism, $t(123) = -2.07, p = .04$.

**Table 3**
*Paired-Samples Test for Differences Between Constructs*

| Construct comparison | *t* | *df* | Sig. (two-tailed) |
|---|---|---|---|
| 1. Learning Environment – Instructional Strategies | −7.62 | 123 | .000** |
| 2. Learning Environment – Curriculum | 1.00 | 123 | .318 |
| 3. Learning Environment – Assessment | −.599 | 123 | .550 |
| 4. Learning Environment – Professionalism | −1.24 | 123 | .216 |
| 5. Instructional Strategies – Curriculum | 7.75 | 123 | .000** |
| 6. Instructional Strategies – Assessment | 5.49 | 123 | .000** |
| 7. Instructional Strategies – Professionalism | 2.65 | 123 | .009** |
| 8. Curriculum – Assessment | −1.78 | 123 | .078 |
| 9. Curriculum – Professionalism | −2.07 | 123 | .040* |
| 10. Assessment – Professionalism | −.740 | 123 | .461 |

*$p < .05$. **$p < .01$.

Tables 4 and 5 show the descriptive statistics for level of agreement with each construct by gender and the results of the independent-samples *t* test, respectively. Two significant differences were found based on PETE faculty gender. One was between female ($M = 4.44$, $SD = .32$) and male ($M = 4.30$, $SD = .46$) faculty for the construct of Learning Environment, $t(121) = -2.09, p = .039$. The other was between female ($M = 4.63$, $SD = .31$) and male ($M = 4.44$, $SD = .44$) faculty for the construct of Instructional Strategies, $t(121) = -2.84$, $p = .005$. Tables 6 and 7 show the results of the one-way ANOVA and the Pearson's correlation, respectively. No statistically significant differences were found between participants for academic rank, years of experience, number of full-time faculty, number of part-time faculty, or number of graduate assistants.

**Table 4**
*Descriptive Statistics for Constructs by Gender*

| Construct | Gender | *M* | *SD* | *SE* |
|---|---|---|---|---|
| Learning Environment | Male | 4.30 | .460 | .064 |
| | Female | 4.44 | .324 | .038 |
| Instructional Strategies | Male | 4.44 | .438 | .061 |
| | Female | 4.63 | .314 | .037 |
| Curriculum | Male | 4.30 | .420 | .059 |
| | Female | 4.40 | .393 | .046 |
| Assessment | Male | 4.31 | .546 | .076 |
| | Female | 4.47 | .456 | .054 |
| Professionalism | Male | 4.32 | .621 | .087 |
| | Female | 4.52 | .547 | .064 |

**Table 5**
*Independent-Samples Test for Gender Differences*

| | | *t* test for equality of means | | |
|---|---|---|---|---|
| Construct | | *t* | *df* | Sig. (two-tailed) |
| Learning Environment | Equal Variances Assumed | −2.09 | 121 | .039* |
| | Equal Variances Not Assumed | −1.97 | 83.9 | .052 |
| Instructional Strategies | Equal Variances Assumed | −2.84 | 121 | .005** |
| | Equal Variances Not Assumed | −2.69 | 85.0 | .009 |
| Curriculum | Equal Variances Assumed | −1.43 | 121 | .155 |
| | Equal Variances Not Assumed | −1.42 | 103 | .160 |
| Assessment | Equal Variances Assumed | −1.81 | 121 | .073 |
| | Equal Variances Not Assumed | −1.75 | 95.3 | .083 |
| Professionalism | Equal Variances Assumed | −1.91 | 121 | .058 |
| | Equal Variances Not Assumed | −1.87 | 99.0 | .065 |

$^{*}p < .05$. $^{**}p < .01$.

**Table 6**
*One-Way ANOVA for Academic Rank Differences*

| Construct | | *SS* | *df* | *MS* | *F* | Sig. |
|---|---|---|---|---|---|---|
| Learning Environment | Between Groups | .329 | 3 | .110 | .443 | .723 |
| | Within Groups | 29.7 | 120 | .248 | | |
| | Total | 30.0 | 123 | | | |
| Instructional Strategies | Between Groups | .150 | 3 | .050 | .200 | .896 |
| | Within Groups | 30.1 | 120 | .251 | | |
| | Total | 30.2 | 123 | | | |
| Curriculum | Between Groups | .721 | 3 | .240 | .943 | .422 |
| | Within Groups | 30.6 | 120 | .255 | | |
| | Total | 31.3 | 123 | | | |
| Assessment | Between Groups | .688 | 3 | .229 | .667 | .574 |
| | Within Groups | 41.3 | 120 | .344 | | |
| | Total | 42.0 | 123 | | | |
| Professionalism | Between Groups | 1.89 | 3 | .630 | 1.47 | .227 |
| | Within Groups | 51.5 | 120 | .429 | | |
| | Total | 53.4 | 123 | | | |

## Discussion

This study examined the extent to which undergraduate PETE programs are preparing their preservice PE teachers for implementing appropriate practices, as outlined in SHAPE America's (2009) *Appropriate Instructional Practice Guidelines, K–12*. All 124 participants in the study were undergraduate PETE program directors from colleges and universities across the United States. Therefore, it can be assumed that the participants were the most likely individuals to (1) have an understanding of appropriate PE practices and (2) be familiar with the PETE curriculum at their institutions.

Overall, PETE faculty generally agree that their programs are preparing their PETE majors to implement appropriate practices. This is good news for the field and is consistent with other studies that have examined PETE students' knowledge of appropriate practices (Barney & Christenson, 2013; Barney et al., 2015; Barney & Strand, 2006; Senne & Strand, 2009) and PE teachers' knowledge and use of appropriate practices (Strand & Bender, 2011). In particular, faculty were significantly more likely to agree that they pre-

**Table 7**
*Correlations Between Constructs and Years Teaching Physical Education Teacher Education, Number of Full-Time Faculty, Number of Part-Time Faculty, and Number of Graduate Students Teaching in PETE Program*

| Construct | | Years as PETE faculty | Full-time faculty in PETE program | Part-time faculty in PETE program | Graduate students teaching in program |
|---|---|---|---|---|---|
| Learning Environment | Pearson Correlation | .000 | −.109 | .034 | −.062 |
| | Sig. (two-tailed) | .999 | .229 | .708 | .492 |
| | *n* | 117 | 123 | 123 | 124 |
| Instructional Strategies | Pearson Correlation | −.037 | −.105 | .078 | −.051 |
| | Sig. (two-tailed) | .693 | .248 | .390 | .575 |
| | *n* | 117 | 123 | 123 | 124 |
| Curriculum | Pearson Correlation | −.140 | −.141 | .033 | −.004 |
| | Sig. (two-tailed) | .131 | .120 | .719 | .962 |
| | *n* | 117 | 123 | 123 | 124 |
| Assessment | Pearson Correlation | −.082 | −.082 | .057 | −.039 |
| | Sig. (two-tailed) | .378 | .370 | .530 | .666 |
| | *n* | 117 | 123 | 123 | 124 |
| Professionalism | Pearson Correlation | .001 | −.021 | .008 | −.024 |
| | Sig. (two-tailed) | .990 | .817 | .928 | .794 |
| | *n* | 117 | 123 | 123 | 124 |

pare PETE majors to implement appropriate practices in the area of Instructional Strategies than any other area. Faculty were also significantly more likely to agree that they prepare PETE majors in the area of Professionalism over the area of Curriculum.

Female faculty were significantly more likely than male faculty to agree that they prepare PETE majors to implement appropriate practices in the areas of Learning Environment and Instructional Strategies. However, it should be noted that female faculty also made up the majority of the survey respondents (approximately 58% identified as female). Responses were otherwise similar across all other demographics measured. Academic rank (full professor, associate professor, etc.), years of experience teaching PETE, and number of full-time faculty, part-time faculty, and graduate students teaching in the PETE program did not appear to make a difference in the extent to which PETE faculty believe their programs are preparing preservice PE teachers for implementing appropriate practices.

## Limitations

This study had several limitations. The first is the assumption that those who responded to the survey were indeed the undergraduate PETE program directors. With 488 PETE programs, it is possible that program directors were incorrectly identified in some cases despite exhaustive efforts to update a list of active PETE programs as accurately as possible for this study. All four e-mails that were sent during the data collection period instructed recipients to forward the e-mail to the correct PETE contact person at their institution if they had been incorrectly identified. However, some unintended recipients may not have taken this step and may have responded to the survey anyway.

Another limitation is that the data are subjective, as the study relied on PETE faculty beliefs about their programs. Even though they were the program directors, it is possible that participants were not fully aware of what is (or is not) taught in every course within their PETE programs. The average undergraduate PETE program had approximately seven other instructors including full-time faculty, part-time faculty, and graduate assistants. Therefore, the faculty member who completed the survey for this study likely teaches relatively few of the undergraduate PETE courses, even if they oversee the program.

A third limitation is the relatively low response rate of 25.4% despite efforts to maximize responses to the electronic survey. The majority of undergraduate PETE program directors in the United States ultimately did not participate in the study, so the findings cannot be generalized to all PETE programs. Those who chose to participate may tend to emphasize appropriate practices in their PETE programs, which could possibly skew the responses to the survey toward agreement.

## Directions for Future Research

Future research may wish to take this study a step further and examine what PETE faculty are doing to prepare their students to implement appropriate practices when they enter the field. Some faculty may spend significantly more time teaching certain appropriate practices over others. For example, some faculty may have students complete extensive projects or field experiences directly related to certain appropriate practices, whereas others may communicate these practices indirectly as a by-product of other course material. Still others might report that they "prepare" their majors for appropriate practices but may in fact teach these concepts only in passing in a single course. While it was beyond the scope of this study, having PETE faculty provide documentation would provide more detailed insight into how they are teaching these topics. Examples of documentation include course syllabi, lessons plans, assignments with rubrics, or student work samples.

Based on the results of this study and other studies (Barney & Christenson, 2013; Barney et al., 2015; Barney & Strand, 2006; Senne & Strand, 2009; Strand & Bender, 2011), one could expect to enter a K–12 school gymnasium and see appropriate practices taking place. However, this is not always the case. Plenty of PE teachers still have students playing elimination games and grade students solely for dressing out and participating, for instance. Clearly, knowledge alone does not guarantee practice. For this reason, future studies might examine PETE students' perceptions of appropriate practices and intentions to implement them when they become PE teachers. It is possible that while generally cognizant of appropriate practices, as demonstrated in several research studies (Barney & Christenson, 2013; Barney et al., 2015; Barney & Strand, 2006; Senne & Strand, 2009), PETE students may not necessarily intend to follow these practices, because of personal beliefs about teaching that have already developed by the time they enter teacher training that may be incongruent with appropriate practices (Doolittle et al., 1993; Placek et al., 1995). Future studies might also examine barriers that PE teachers experience in implementing appropriate practices.

## Conclusion

In conclusion, this study provides a starting point for understanding whether PETE educators are adequately preparing preservice PE teachers to implement appropriate practices in their content area. It is promising that most of the undergraduate PETE program directors in this study generally felt that they were already doing so. However, approximately three quarters of PETE programs in the United States did not participate in the study and the preparation of their majors for implementing appropriate practices from the viewpoint of the faculty is therefore unknown.

PETE faculty who wish to evaluate the teaching of appropriate practices in their programs might start by formally reviewing appropriate PE practices, especially if they have not done so recently (or never done so). The average program director in this study had been teaching PETE for over 21 years not counting graduate school, but appropriate practices for PE were updated less than a decade ago from the time this study was conducted (NASPE, 2009a, 2009b, 2009c; SHAPE America, 2009). For those who have been in the field even longer, such as the participant who has been teaching PETE for 45 years, there may have been no formal statements on appropriate PE practice until well into their careers. After reviewing the most current appropriate PE practices, PETE faculty must reflect carefully on whether they are preparing their majors to implement these practices upon entry into the profession. They may then choose to develop strategies to address identified areas of weakness in their PETE programs, as each appropriate practice is an indicator of high-quality PE.

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PEDAGOGY

# Investigating the Effects of Federal Funding on Students' Attitudes Toward Physical Education

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## Abstract

*Students' attitudes toward physical education (PE) affect decisions to be physically active, are affected by the teacher and the curriculum, and become less positive as children get older. Federal funding has been granted to improve physical education programs, yet it is unknown how this funding affects attitudes and decisions to remain active. Attitudes toward PE of students from three schools that received large federal grants (n = 2,962) were compared to attitudes of students from two schools that did not receive funding (n = 3,252) for 3 years. Federal funding does not appear to slow decreases in students' attitudes. Significant differences between groups only appeared in fourth and fifth grade, with small effect sizes. Though funding added equipment, curricula, professional development, and technology to PE programs, more than funding—instead a focus on teaching and implementation—is likely needed to improve students' attitudes toward PE.*

For several years, the U.S. Department of Education provided competitive funding to local education agencies and community-based organizations to support implementation of programs that improve the physical activity (PA) levels and nutrition habits of

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students, through the Carol M. White Physical Education Program (PEP) grants. Part of the rationale for the funding included research that suggested PA was connected to academic success (Howie & Pate, 2012) and research that showed a relationship between PA and increased cognitive function (Hillman et al., 2014; Sardinha et al., 2016). Another part of the rationale was to combat problems associated with a sedentary lifestyle. PA levels have been shown to decrease over time with school-aged children (Nadar, Bradley, Houts, McRitchie, & O'Brien, 2008), which is a concern because physical inactivity over the life span is a primary cause of several chronic diseases, including obesity, diabetes, hypertension, and stroke (Booth, Roberts, & Laye, 2014). Clearly, developing habits for a healthy lifestyle, especially at an early age, is a worthwhile investment of public funds. Though PEP grant funding recently expired, the Every Student Succeeds Act (2015) provides evidence of ongoing federally funded education reform efforts that include physical education (PE).

PE–based U.S. federal grants, such as PEP grants, have focused on the fitness levels, PA levels, and nutritional habits of students. Concerns exist regarding the appropriateness of these outcome measures to measure the effectiveness of grant funding. Changes in fitness levels or PA may or may not be attributable to grant-related programming, as observed changes could be temporary in nature (i.e., training effect) or a result of natural maturation of students and thus unrelated to grant-sponsored activities. In addition, there have been reported concerns about training teachers to collect accurate data and about the reliability and validity of the instrumentation (pedometers and self-report measures) related to PEP grants (Dauenhauer, Keating, & Lambdin, 2018). It seems that asking PE teachers to undergo the time-consuming process of training for data collection procedures and then take class time to complete the data collection process may not yield meaningful data. It also seems that measuring (possibly inaccurately) short-term behavior changes (i.e., fitness or PA levels) may not provide the best indication of a successfully funded PE grant aimed at helping children lead healthy, physically active lives—a commonly stated goal of PE programs (Society of Health and Physical Educators, n.d.).

Conversely, the effects of grant-supported PE programs on the attitudes of students toward PE may be a more important indicator of the success of a grant project; positive attitudes have been identified as a factor in students deciding to remain active outside of school (Hagger, Chatzisarantis, Culverhouse, & Biddle, 2003) and into adulthood (Kohl & Hobbs, 1998)—a goal for PE programs. Research on attitudes toward PE has highlighted the appropriateness of continuing to investigate this construct (see Silverman, 2017, or Subramaniam & Mercier, 2017). Because attitudes may be important indicators of current and future PA, several PE–based studies have focused on investigating attitudes. Similar to the observed decreases in children's PA levels, attitudes toward PE become less positive over time. Attitudes toward PE have been shown to be highly positive for fourth- to fifth-grade students and to decrease from sixth to eighth grade (Mercier, Donovan, Gibbone, & Rozga, 2017; Phillips & Silverman, 2015; Subramaniam & Silverman, 2007). With attitudes affecting future PA and funding efforts striving to promote PA, it would be appropriate to study the effects of funding on the attitudes of students.

The effect of federal funding of PE programs on the attitudes of students, however, remains unexplored. Funding is often spent on curricular enhancements (e.g., new curricula, new equipment, new technology) or teacher training (e.g., professional development). Because the teacher and the curriculum have been shown to affect attitudes (Phillips & Silverman, 2015; Silverman, 2017; Subramaniam & Silverman, 2007), funding to support these areas could affect students' attitudes. Theoretically, money spent on PE program improvements will positively affect the attitudes of students toward PE, leading to increases in future PA. To date, however, no empirical results support or refute this claim. Past PE–based federal grants required the collection of several outcome measures (i.e., fitness levels, PA levels, nutrition habits) but no process or fidelity measures (i.e., teaching, instruction, curricula implementation). It remains unknown if funding PE programs in the areas of teaching and curriculum—areas shown to affect students' attitudes—affects students' attitudes and if the current funding of PE programs is money well spent. Therefore, this study investigated the attitudes of fourth- to eighth-grade students in schools that received a large federal grant (PEP), compared to students' attitudes in schools that did not receive such funding—helping to identify if money was spent in a meaningful way to promote lifelong PA.

The dual-component view of attitude (affect and cognition) is favored by researchers who have explored attitudes within PE (Silverman, 2017). Within this framework, cognition (the usefulness or importance of an attitude object) and affect (how fun or enjoyable the attitude object is) affect the formation and development of attitudes. This preferred view of measuring attitude is highlighted by investigations on teachers' and students' attitudes toward PE and fitness testing, which have used instruments that employ the dual-component model (Donovan, Mercier, & Phillips, 2015; Keating, Guan, Ferguson, Chen, & Bridges, 2008; Mercier et al., 2017; Mercier & Silverman, 2014; Phillips & Silverman, 2015; Subramaniam & Silverman, 2007). Attitudes are not fixed and may change over time on a two-way continuum of favorable to less favorable (Albarracin & Shavitt, 2018) or from positive to negative (Fishbein & Ajzen, 2010).

These studies have allowed for an understanding of students' attitudes toward PE—showing that attitudes become less positive over time, the curriculum and the teacher affect attitudes, and cognition and affect play a role in overall attitudes. However, few of these studies have been longitudinal (Silverman, 2017). The majority of studies on attitudes in PE present results from one-time data collection samples (Donovan et al., 2015; Keating et al., 2008; Mercier & Silverman, 2014; Phillips & Silverman, 2015; Subramaniam & Silverman, 2007). Results from only one longitudinal study exist, with data collected at one site for 3 years (Mercier et al., 2017). This study sought to further understanding of students' attitudes, building upon previous studies by collecting data from multiple sites (five school districts) for multiple years (3 years at each school). The multisite, longitudinal study design with proper psychometrically developed and validated instrumentation for the specific (large) sample group allowed for meaningful data on students' attitudes to be collected, analyzed, and discussed confidently. In addition to providing a clearer picture of students' attitudes, this study allowed for an investigation on funding of PE program grants and their effects on attitudes. Thus, a secondary purpose of this study was to support or refute previous findings through a stronger study design than the one-time data sampling studies and the one longitudinal (one site) study that used this validated instrument.

## Method

Students from five suburban Eastern U.S. school districts participated in a voluntary survey measuring attitude, which was completed and collected during PE classes. Three school districts had been awarded PEP grants, which ranged in amount from approximately $850,000 to $1,300,000 and ran for 3 consecutive years (District A: 2011–2014, Districts B and C: 2012–2015). These districts will be referred to as the funded group. District A had an average population of 3,554 students; District B, 5,745 students; and District C, 6,743 students. Two comparison districts were involved in data collection from 2012 to 2015. The average student population for District D was 4,892 and for District E was 5,996. These two districts were purposefully selected because they had similar types of racial and socioeconomic diversity as their funded cohorts. District B closely resembles the characteristics of District D, and District C is comparable to District E. Table 1 shows a more complete list of the demographic composition by district.

**Table 1**
*District Demographics*

| | | % | | | | |
|---|---|---|---|---|---|---|
| **District** | **Number of students** | **Caucasian** | **Hispanic** | **Black** | **Asian** | **Free/ reduced lunch** |
| Funded | | | | | | |
| A | 3,554 | 78 | 11 | 6 | – | 9 |
| B | 5,745 | 84 | 5 | – | 6 | 4 |
| C | 6,743 | 8 | 63 | 26 | – | 60 |
| Unfunded | | | | | | |
| D | 4,892 | 77 | 5 | – | 16 | 4 |
| E | 5,996 | 47 | 36 | 8 | – | 36 |

From each district, students were randomly sampled from each grade in each year, in accordance with federally approved random sampling procedures. Informed parental opt-out and child assent forms were completed in accordance with institutional review board and school district protocols. A total of 6,214 participants completed usable surveys (2,962 from PEP grant schools and 3,252 from unfunded schools). Table 2 shows the results by grade level.

**Table 2**
*Participant Characteristics*

| | | Grade | | | | | |
|---|---|---|---|---|---|---|---|
| **Group** | **Gender** | **4** | **5** | **6** | **7** | **8** | **Total** |
| Funded | Boys | 161 | 303 | 607 | 337 | 116 | 1,524 |
| | Girls | 141 | 308 | 564 | 317 | 108 | 1,438 |
| | Total | 302 | 611 | 1171 | 654 | 224 | 2,962 |
| Unfunded | Boys | 177 | 363 | 571 | 406 | 215 | 1,732 |
| | Girls | 162 | 331 | 526 | 340 | 161 | 1,520 |
| | Total | 339 | 694 | 1097 | 746 | 376 | 3,252 |
| Total | | 641 | 1305 | 2268 | 1400 | 600 | 6,214 |

Data for this study were collected via validated instruments designed to measure students' attitudes toward PE. Instrument development showed that the teacher and the curriculum affected affective and cognitive aspects of attitudes in different and meaningful ways. Both instruments covered the same four factors, affective curriculum, affective teacher, cognitive curriculum, and cognitive teacher, which, when combined, provide an overall attitude score. Fourth- and fifth-grade students completed a 16-item scale (Phillips & Silverman, 2015; Cronbach's alpha = .91), while sixth, seventh, and eighth graders completed a 20-item scale (Subramaniam & Silverman, 2007; Cronbach's alpha = .95). A study investigating the use of the two instruments, with participants from this sample, showed the appropriateness of using these two instruments to measure and compare students' attitudes toward PE over time (Donovan et al., 2015). Participants responded to each instrument item by circling their chosen rating on a 5-point Likert-type scale that ranged from 1 = *no way!/strongly disagree* to 5 = *definitely!/strongly agree*.

### Data Sources, Evidence

The three districts that received grants used their funding in similar ways. They acquired significant amounts of new equipment, including fitness machines, rock walls, and other gymnasium supplies. Further, they purchased and provided PE teachers (K–12) professional development to enhance PE curricula, such as YES!, HOPSports, and SPARK. These districts also purchase technologies such as tablet computers for teachers, heart rate and/or activity monitors for students, and interactive gaming/movement products. In addition to professional development, teachers from all three PEP grant districts experienced a large increase in professional conference attendance, as funding was allocated for teachers to participate. Funded program additions for all three schools could be categorized as aiming to improve teaching or the curriculum, aspects shown to affect students' attitudes. All funded schools received training on evaluation measures including how to collect and record data, including FitnessGram assessments, PA recall measures, pedometer/accelerometer results, nutrition surveys, and attitude surveys. Neither of the two unfunded school districts experienced changes in equipment or curriculum; they did not add any significant technologies, increase professional development opportunities, or increase conference attendance. No teaching or curricular enhancements occurred in these districts. Unfunded schools' teachers did receive training on how to administer the attitude survey. Multiple classroom observations within each district (funded and unfunded) each year, collection of artifacts such as yearly activity charts, and several conversations with each district's PE administrator confirmed these characteristics within each program.

## Results

Before the MANOVA, we reviewed a number of assumptions to determine that the MANOVA would be a valid analysis for the dataset. A number of outliers were removed from the large dataset, and the final sample included data for 6,214 students (funded group, $n$ = 2,962; unfunded group, $n$ = 3,252). The Mahalanobis distance (maximum value = 5.23) was less than a critical value of 13.82 for two independent variables, indicating that there were no multivariate outliers that would skew the analysis. Additionally, the bivariate correlations between each dependent variable ranged from .735 to .805, indicating that the variables were correctly related, but did not show indications of multicollinearity (correlations were less than .90). Two assumptions that were not satisfied included Levene's test of homogeneity of variance and the Shapiro-Wilk test of normality, which are common sources of error for large datasets, especially when the group sizes are not equal (Glass & Hopkins, 1996). To help address these issues, we transformed the data to standard normal (*z* scores) and reviewed the quartile-quartile plots of the data, comparing the distribution of the data for the funded and unfunded groups. The data for each dependent variable (total attitude and the four attitude subcomponents) fell close to the reference line, indicating the data for each group came from populations with the same distribution of data (NIST/SEMATECH, 2012). Additionally, to account for these limitations, we selected Pillai's trace as the criterion of choice (Tabachnick & Fidell, 2012).

We performed a 2 × 5 between-subjects MANOVA for the two independent variables of funded (funded vs. unfunded) and grade (4–8) on the four attitude subscales (affective curriculum, affective teacher, cognitive curriculum, and cognitive teacher). Results of the two-way MANOVA with two independent variables (funded and grade) on the four subcomponents of attitude revealed a significant Grade × Funded interaction, $F(20, 24812) = 2.41$, $p < .001$, partial η2 = .002, such that the PEP grant appears to have had a greater effect in lower than upper grade levels (Figure 1); however, the association was small, as indicated by the small value of the partial eta squared. Further, the multivariate results showed that the main effect of funding was not significant, $F(5, 6200) = 1.15$, $p = .33$, providing additional information about the lack of effect of funding. The main effect of grade was significant, $F(20, 24812) = 59.05$, $p < .001$, partial η2 = .045. This result is in line with prior research.

To examine the interaction further, we used between-subject tests that showed that the Grade × Funded interaction was significant for affective curriculum, $F(4, 6204) = 6.07$, $p < .001$, $\eta^2 = .004$; affective teacher, $F(4, 6204) = 2.47$, $p < .042$, $\eta^2 = .002$; and cognitive curriculum, $F(4, 6204) = 4.37$, $p = .002$, $\eta^2 = .003$. A review of the means by Grade × Funded schools (Table 3) showed that the scores for the funded schools were higher in fourth and fifth grade for these

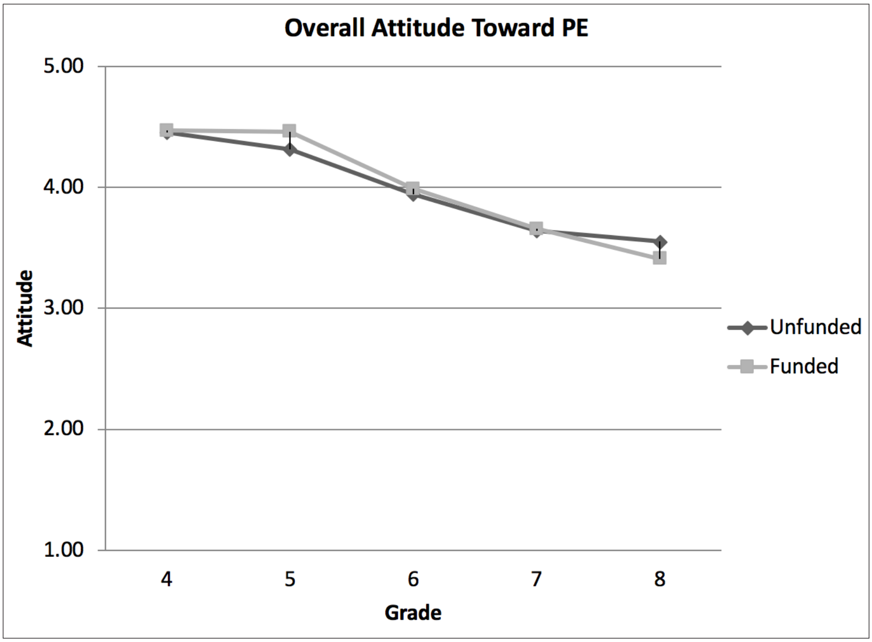


***Figure 1.*** Overall attitude toward physical education by grade and funded group.

three subcomponents of attitude, both affective components (curriculum and teacher), and the cognitive curriculum subcomponent. However, the partial eta squares were small and thus there was a question about the importance of this interaction effect.

In line with findings from prior research, there was a significant effect of student grade level on attitudes for all students, regardless of funding. Students' attitudes tended to decrease (i.e., become less positive) in higher grade levels. The multivariate test was significant (reported above), as were the univariate tests for each subattitude component. Overall attitudes dropped from a mean of 4.46 in Grade 4 to a mean of 3.44 in Grade 8. This effect was found for all four subscales: affective curriculum, $F(4, 6204) = 204.81$, $p < .001$, $\eta^2 = .117$; affective teacher, $F(4, 6204) = 266.17$, $p < .001$, $\eta^2 = .146$; cognitive curriculum, $F(4, 6204) = 285.10$, $p < .001$, $\eta^2 = .155$; and cognitive teacher, $F(4, 6204) = 223.29$, $p < .001$, $\eta^2 = .126$.

Least significant difference (LSD) post hoc analyses of grade-level statistics revealed a consistent and statistically significant drop

**Table 3**
*Overall and Subscale Attitude Descriptive Statistics by Grade and Funded Group*

| | | | Overall attitude | | Affective | | | | Cognitive | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Curriculum | | Teacher | | Curriculum | | Teacher | |
| Grade | Group | *n* | *M* | *SD* | *M* | *SD* | *M* | *SD* | *M* | *SD* | *M* | *SD* |
| 4 | Funded | 302 | 4.47 | (.53) | 4.42 | (.68) | 4.63 | (.61) | 4.39 | (.66) | 4.46 | (.64) |
| | Unfunded | 339 | 4.45 | (.56) | 4.41 | (.70) | 4.59 | (.58) | 4.36 | (.74) | 4.45 | (.66) |
| 5 | Funded | 611 | 4.46 | (.64) | 4.45 | (.74) | 4.56 | (.71) | 4.39 | (.77) | 4.44 | (.72) |
| | Unfunded | 694 | 4.31 | (.70) | 4.25 | (.81) | 4.41 | (.81) | 4.27 | (.83) | 4.31 | (.78) |
| 6 | Funded | 1,171 | 3.99 | (.75) | 4.03 | (.81) | 4.07 | (.82) | 3.84 | (.87) | 3.99 | (.80) |
| | Unfunded | 1,097 | 3.94 | (.74) | 4.01 | (.81) | 4.00 | (.85) | 3.78 | (.91) | 3.97 | (.76) |
| 7 | Funded | 654 | 3.66 | (.73) | 3.69 | (.82) | 3.75 | (.81) | 3.48 | (.87) | 3.71 | (.78) |
| | Unfunded | 746 | 3.64 | (.84) | 3.68 | (.89) | 3.73 | (.91) | 3.44 | (1.02) | 3.71 | (.86) |
| 8 | Funded | 224 | 3.41 | (.76) | 3.41 | (.88) | 3.54 | (.81) | 3.16 | (.94) | 3.53 | (.77) |
| | Unfunded | 376 | 3.55 | (.84) | 3.59 | (.95) | 3.63 | (.92) | 3.39 | (.97) | 3.58 | (.86) |

*Note*. Scale range is 1–5, where 5 indicates more positive attitudes.

in overall attitudes for each grade level transition from Grade 4 (*M* = 4.46) to Grade 5 (*M* = 4.38, $p = .019$) to Grade 6 (*M* = 3.96, $p < .001$) to Grade 7 (*M* = 3.62, $p < .001$) to Grade 8 (*M* = 3.44, $p < .001$). This pattern also held for both affective subscales through all grades and for both curriculum subscales beginning with the transition to sixth grade.

## Post Hoc Analysis

Upon further examination of the results, one additional descriptive statistic became apparent. While the mean attitude scores for students from funded and unfunded schools dropped from about fifth grade and continued through to eighth grade, the variances of these scores seemed to increase. Table 3 shows more details on the standard deviations of attitude scores and Figure 2 shows a visual display of this trend. This pattern seems to hold for each attitude subscore for the funded and unfunded groups.

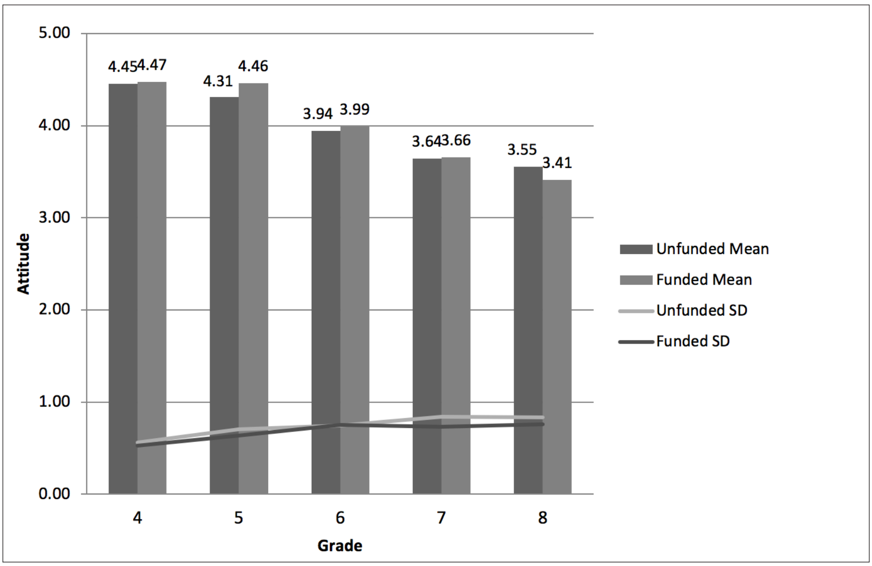


***Figure 2.*** Means of overall attitude by grade and funded with standard deviations.

One final post hoc analysis examined the means by school district to see if attitudes differed by district in some discernible pattern. Because this study and past studies identified that grade had an effect on attitudes, we tested a combination of grade and district on attitudes to determine if both of them had an effect on overall attitude. Using SPSS, we found the standard regression equation yielded a model indicating that both grade and district had an effect on attitudes, with $R = .40$ and $R^2 = .157$, suggesting that 15.7% of the variance of attitudes was predicted by grade and district: $F(2, 6211) = 579.99$, $p < .001$. The standardized coefficients for the regression equation are −.03 for district and −.39 for grade, with $p < .01$ for each independent variable, indicating that for every 1 standard deviation change in attitude, there is a −.03 change per district and a −.39 change by grade.

## Discussion

Studies examining students' attitudes toward PE have identified that attitudes toward PE become less positive as students get older (Mercier et al., 2017; Phillips & Silverman, 2015; Subramaniam & Silverman, 2007). The major finding from this study is that federal funding aimed at improving PE programs does not appear to have contributed to slowing the decrease in positive attitudes toward PE. Over 3 years, in five school districts, with over 6,200 data points, students' attitudes toward PE decreased each year, regardless of whether students attended a grant-funded or an unfunded school. It appears that the ways federal funding was spent (i.e., technology, professional development, curricula, and equipment) did not promote positive attitudes that could lead to increased lifelong PA.

The only significant difference between students in funded (PEP grant) and unfunded schools occurred in fourth and fifth grades. Though students' attitudes still decreased from fourth and fifth grade, students' attitudes were more positive in funded schools than unfunded schools during this time. Students in funded schools appear to have enjoyed the curriculum (affect curriculum) and their teacher (affect teacher) more than their counterparts in unfunded schools did during these grade levels. These students also found the curriculum to be more useful (cognitive curriculum). These results support that affect and cognition affect attitude (Silverman, 2017). It could be that the SPARK curriculum and related professional development contributed to the more positive attitudes observed within the fourth and fifth graders and that this curriculum was more effective at affecting attitudes at these grade levels. The small effect size with a large sample size suggests that these results should be discussed with some caution and that replication or additional studies are needed for the results to be discussed with more confidence.

It is disappointing that large federal funding in three schools for 3 years did not slow the observed decrease in positive attitudes of students in Grades 6 to 8 when compared to students in two unfunded schools over the same period. Other work has identified this period as the onset of decreasing positive attitudes (Mercier et al., 2017; Subramaniam & Silverman, 2007), and it was hypothesized that significant funding spent on expanding gymnasium equipment, increased technology, teacher professional development, and curricular enhancements would contribute positively to differences in students' attitudes. It has been reported that middle school students do not hold very positive attitudes toward school (Moon & Callahan, 1999), and most Internet searches will likely show a decrease in attitudes among early adolescents toward most constructs. Because of the reported effect of attitudes on outside-of-school PA (Hagger et al., 2003) and the need to promote PA, PE teachers should continue to look for ways to promote positive attitudes among students. It may be unrealistic to think that attitudinal scores will increase over time (grade level), and it could be that an appropriate goal would be to attempt to slow the decrease in positive attitudes, helping more children remain physically active for longer periods.

Another interesting finding was that as overall mean attitude scores dropped, the related standard deviations increased. From a data perspective, this indicates that the scores tended to have greater dispersion or variability as the students aged. The results suggest that as grade level increased, the sample consisted of more students with both highly positive attitudes and highly negative attitudes as compared to the younger grade levels, where students seemed to have more similar attitudes to each other. It seems that students have stronger, more developed attitudes over time. This is important because, though attitudes are not fixed (Albarracin & Shavitt, 2018) and can change over time (Mercier et al., 2017), it may be more challenging to affect more developed attitudes in older children. Targeting younger children (fourth to sixth grade), who have less varied and more positive attitudes than older students, may yield the most beneficial results.

Districts were purposefully selected to have similar types of racial and socioeconomic diversity in funded and unfunded cohorts. We were interested in the roles of race and socioeconomic status and their relationship to attitudes, especially as a result of funding. While district was significant in this equation, the the effect was small, thus indicating that grade continues to be the primary predictor of attitudes for this sample. This supports prior findings that as students increase in grade, their attitudes toward PE begin to decline. It is also of note that students from the two low-socioeconomic status, more diverse schools (one funded and one unfunded) had overall mean averages that consistently ranked in the middle of the five schools' overall averages. This suggests that race and socioeconomic status did not play a large role in changing students' attitudes as a result of funding. Figure 3 shows a Means × Grade × District breakdown.

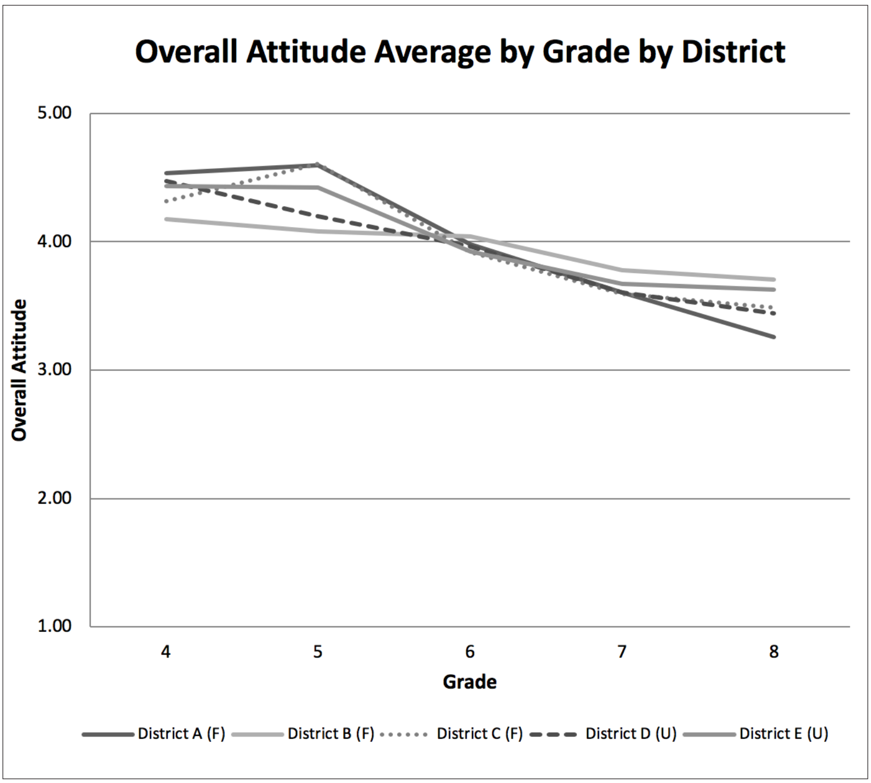


***Figure 3.*** Overall attitude average by grade by district. (F) = funded district; (U) = unfunded district.

While money was spent on aspects of teaching (i.e., professional development) and curriculum (i.e., SPARK) in funded districts, aspects shown to affect students' attitudes, few differences were seen between students in funded and unfunded schools. One explanation for this could be the lack of process measures included in the formal evaluation of the funding programs. Without a focus on teaching and implementation, an important step in evaluation is missing. It is unknown how teachers used SPARK, tablet computers, or knowledge from teacher workshops in their planning and instruction. Research has indicated the one-time teacher professional development sessions are often unsuccessful (Patton & Parker, 2015; Sears, Edgington, & Hynes, 2014). It could be that teachers gained knowledge through attending conferences or school-sponsored workshops, but without continued support, they were unable to implement this information on a regular basis. Technology, equipment, and curricula may have sat unused and unable to aid teachers in promoting the development of positive attitudes. Simply purchasing curricular resources and equipment and funding teacher development opportunities without focusing on teaching does not appear to lead to PE goals such as improved positive attitudes.

The lack of process variables or focus on teaching should be included in meaningful program evaluation. The reported problems with data collection (Dauenhauer et al., 2018) suggest a need to be concerned with the accuracy of results from other PEP grant data sources. The Dauenhauer et al. (2018) study and this study serve to start (or continue) the conversation on how government agencies can best aid in supporting PE programs by critically evaluating the most recent attempt by the U.S. government to support PE. It may be of benefit for SHAPE America and PE teacher education leaders to work with the federal government to develop programs that would be of the greatest benefit to students.

A limitation of this study is that is it unknown how curriculum, technology, and knowledge gained through professional development were specifically implemented in PE classes and, in turn, the effects of these curricular and teaching decisions on attitudes. While it was beyond the scope of this study to investigate implementation at the lesson level, the study allowed us to identify that simply spending money on teaching and the curriculum does not lead to increases in students' attitudes. Future research could use interventions developed specifically to improve affective and/or cognitive components of attitude. Those studies may be smaller in scope and could include fidelity measures ensuring compliance with the intervention.

A strength of the study is that given the density of this investigation—following thousands of students, in multiple schools within five school districts, and over 3 years—the design allowed for the investigation of a large sample and for comparisons between districts. The results align with those of studies on students' attitudes toward PE (Donovan et al., 2015; Keating et al., 2008; Mercier et al., 2017; Mercier & Silverman, 2014; Phillips & Silverman, 2015; Subramaniam & Silverman, 2007), yet were determined through a multisite longitudinal design. This large-scale study from five sites, over 3 years, with over 6,200 data points addressed the secondary purpose of the investigation and furthered understanding of attitudes, confirmed previous results, and allowed for the findings to be presented and discussed with confidence.

## Conclusion

Significant differences in attitudes between funded and unfunded groups were only observed in Grades 4 to 5, with very small effect sizes, even after programmatic changes were implemented in areas shown to contribute to decreases in students' attitudes (i.e., the teacher and the curriculum). Teaching, learning, and formation of attitudes are complex processes. It appears that simply adding equipment, curricula, and technological enhancements with some form of professional development does not contribute in major ways to slowing decreases in positive attitudes. How lessons with new equipment, curricula, and technology were implemented and how knowledge gained from professional development was applied were not variables of interest in this study, but these questions need to be considered in future work because they likely can help identify the reasons for continued decreases in attitude.

The results of this study show that simply spending money on PE programs will not lead to changes in attitudes. In need of consideration, however, is the process of evaluating federal grants for the benefits they provide to children. We suggest that grant evaluations, such as the Every Student Succeeds Act grants, focus on process variables, such as the quality of teaching or fidelity measures assessing the use of curricula and equipment. Such variables, compared to outcome measures that are hard to reliably assess such as self-reported PA levels or large-scale fitness assessments, would lead to more effective and long-term programmatic changes. These changes could address identified concerns associated with decreasing student attitudes, leading to increases in PA. While every district will not be able to receive a large federal grant, finding ways to improve curriculum, add equipment, and provide meaningful professional development can contribute to positive attitudes and to physically active children—goals well worth an investment of time and resources.

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PEDAGOGY

# Motivational Climate in the Physical Education Context Through the Perspective of Teachers and Students

*Stergiani Deliligka, Ioannis Syrmpas, Alexandra Bekiari*

## Abstract

*This mixed methods study examined (a) physical education teachers' self-reported motivational climate and (b) students' perceptions about the motivational climate promoted by their teachers, to identify the coherence between students' and teachers' views from elementary, middle, and high schools. Fifteen PE teachers (9 males, 6 females) participated in the qualitative study; 899 students (447 males, 452 females) participated in the quantitative study. The majority of teachers promoted a mastery motivational climate. Additionally, students' reports confirmed teachers' perceptions about the motivational climate.*

Students embrace and achieve healthy behaviors through physical education (PE) activities (Moreno & Llamas, 2007; Nuviala, Gómez-López, Pérez, & Nuviala, 2011). The effectiveness of the educational process, including PE, could be apparent from students' effort and emotional state throughout the activities (Barić, Vlašić, & Erpič, 2014). As a consequence, the motivational climate that contains PE

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teachers' or coaches' communicational manners and actions for the PE lessons or training accomplishment plays a determinant role in students' or athletes' actions or behaviors and in the their involvement (Duda, 2013). The effect of PE teachers is manifold and of utmost importance, because PE teachers could incite and encourage students' active role during the learning process and beyond this particular action (Bekiari, 2014, 2016; Granero-Gallegos, Baena-Extremera, Gómez-López, & Abraldes, 2014). Furthermore, the role of PE teachers is vital and affects students' social and emotional behavior (Bekiari, Deliligka, & Hasanagas, 2017; Bekiari, Kokaridas, & Sakellariou, 2006; Bekiari & Syrmpas, 2015; Gómez-López, Baena-Extremera, Granero-Gallegos, Castañón-Rubio, & Abraldes, 2015). The motivational climate that PE teachers promote is a determinant factor in students' awareness of the significance of PE (Moreno & Llamas, 2007). Several studies have shown that a person's motivation is structured from internal elements (e.g., goal orientation) and from environmental elements (e.g., motivational climate; Duda, 1992, 2001; Duda, Chi, Newton, Walling, & Cately, 1995; Nicholls, 1989, 1992; Roberts, 1993).

Motivational climate is considered a social-environmental factor that directs the goals of an action in achievement conditions in every context (e.g., sports, education; Ames, 1992b). This term derives from achievement goal theory, which asserts the segregation of two types of motivational climate, a mastery or task-involving climate and performance or ego-involving climate (Ames, 1992a; Ames & Archer, 1988; Maehr & Nicholls, 1980; Nicholls, 1984, 1989; Roberts, Treasure, & Conroy, 2007).

In motivational climate, the "significant others" (e.g., teachers, parents, peers) are expressly involved in the promotion of conditions where an action or the environmental circumstances are developed, setting the direction of the climate toward task or ego (Duda & Ntoumanis, 2005; Roberts & Treasure, 1992). Teachers may promote a motivational climate based either on social comparison and rivalry or on learning and cooperation (Bortoli, Bertollo, Vitali, Filho, & Robazza, 2015).

Usually, a PE lesson takes place in a competitive environment; as a result, students are more interested in differentiating the level of their abilities against others' abilities, or they aim at the best possible practice of their potential (Barić et al., 2014). A mastery motivational climate promoted in a PE class may increase students' perceived ability about physical activity and increase their satisfaction (Baena-Extremera, Granero-Gallegos, Bracho-Amador, & Pérez-Quero, 2012; Fernández-Río, Méndez-Giménez, Cecchini, & González, 2012; Gråstén, Jaakkola, Liukkonen, Watt, & Yli-Piipari, 2012), which leads to engagement in plenty of sports activities (Atkins, Johnson, Force, & Petrie, 2015; Fox, Goudas, Biddle, Duda, & Armstrong, 1994; Malete, 2006; Yli-Piipari, Barkoukis, Jaakkola, & Liukkonen, 2013).

A mastery motivational climate promotes intrinsic motivation (Bryan & Solmon, 2012; Ommundsen & KvalØ, 2007; Papaioannou, 1995; Spittle & Byrne, 2009; Standage & Gillison, 2007). It encourages learning new skills, participation in collaborative learning, and personal improvement; as well, it encourages praise of every physical effort (Ames, 1992b; Papaioannou & Kouli, 1999; Roberts et al., 2007). Moreover, adaptive effects such as enjoyment, devotion, optimism, dignity, confidence (Braithwaite, Spray, & Warburton, 2011; Cunningham & Xiang, 2008; Mouratidis, Vansteenkiste, Lens, & Vanden Auweele, 2009), self-evaluation, and satisfaction (Atkins et al., 2015; Kavussanu & Harnisch, 2000; Le Bars, Gernigon, & Ninot, 2009) result from a task-involving climate. According to the findings of studies (Barić et al., 2014; Duda, Chi, Newton, Walling, & Cately, 1995; Newton & Duda, 1999), students who comprehend their own skills practice more self-referenced criteria to assess those abilities. The attempts and the effort to improve their capabilities suggest task-oriented targets.

A mastery motivational climate in elementary, middle, and high school contributes to occupation with intense physical activity and to students' cognitive processing after PE class (Theodosiou & Papaioannou, 2006). The findings of another study suggest that the promotion of a mastery climate encourages students to adopt a task orientation approach and to put in more effort to improve their performance. Moreover, students have reported being keen on participating in physical activities (Morgan & Carpenter, 2002). The promotion of a mastery climate in a PE context may increase students' participation in physical activities (Parish & Treasure, 2003) and cause students to adopt a positive attitude toward exercise and healthy diet (Digelidis, Papaioannou, Laparidis, & Christodoulidis, 2003). The promotion of a mastery motivational climate encourages students to adopt a discipline behavior in PE (Cervelló, Jiménez, del Villar, Ramos, & Santos-Rosa, 2004; Papaioannou, 1998; Spray, 2002).

On the contrary, performance-oriented climate fosters social comparison, demonstration of competence, outcome, and outperforming others (Ames, 1992a; Ames & Archer, 1988; Keegan, Spray, Harwood, & Lavallee, 2010). Performance-oriented motivational climate prompts feelings of anxiety, fear, pressure, disorientation, lack of interest, and dropping out (Braithwaite et al., 2011; Cumming, Smoll, Smith, & Grossbard, 2007; Granero-Gallegos et al., 2014; Liukkonen, Barkoukis, Watt, & Jaakkola, 2010; Nerstad, Roberts, & Richardsen, 2013; Ommundsen & KvalØ, 2007; Van De Pol, Kavussanu, & Ring, 2012). It decreases intrinsic motivation (Ferrer-Caja & Weiss, 2000; Standage, Duda, & Ntoumanis, 2003) and promotes displeasure, lowered effort, obligation inconsistency (Liukkonen et al., 2010; Ntoumanis & Biddle, 1999), and adverse psychobiosocial conditions in a PE setting (Bortoli et al., 2015). However, one study revealed that a perceived high mastery and performance motivational climate promotes students' intrinsic motivation and competence (Goudas & Biddle, 1994).

Research has revealed that PE teachers who teach a specific class (Marsh, 1987, 2007; Papaioannou, Marsh, & Theodorakis, 2004) and the students who are members of this class (Marsh, Martin, & Cheng, 2008) may influence students' perception of classroom motivational climate. Although PE teachers play a determinant role in creating the motivational climate in a PE context, there is little information about PE teachers' perceptions of the motivational climate they promote in a PE context. One study revealed that according to teachers' perceptions, students who encounter failure in a performance motivational climate tend to avoid actively participating in the lesson. On the other hand, students in a mastery motivational climate continue to make an effort. Overall, highly skilled students thrive in mastery and performance climates, whereas low-skilled students manage better in a mastery-oriented condition. Boys are able to deal more efficiently with the competitive environment developed in a performance-oriented motivational climate, compared with girls

(Solmon, 1996). Instructors have pointed out their important role as an influence to their athletes through the motivational climate (Zomermaand, 2010). This study reveals PE teachers' perceptions about the motivational climate they develop during the learning process. It also provides insights into motivational climates developed by PE teachers. Additionally, this study examined the extent to which students' perceptions of the motivational climate promoted by their teachers were in accordance with their PE teachers' perceptions of the motivational climate.

The purpose of Study 1 was to examine teachers' self-reported motivational climate. The purpose of Study 2 was to examine (a) differences between students' gender, (b) differences between schools, and (c) differences between educational level concerning students' perceptions about the motivational climate in the PE context.

## Method: Study 1

An approval from the ethics committee of the Department of Physical Education and Sport Science at the University of Thessaly was received. The majority of the research in this field has been conducted through qualitative or quantitative methods of data collection. However, Creswell, Plano Clark, Gutmann, and Hanson (2003) suggested that mixed methods research could help researchers to eliminate or reduce the limitation of a certain method of data collection. Therefore, in this study, quantitative (questionnaire) and qualitative (open-ended questions) data were collected simultaneously. The triangulation of mixed methods research may help to elicit information about the motivational climate in the PE context. The PE teachers who participated in the qualitative study were recruited purposefully based on their students' participation in the quantitative study.

### Participants

The qualitative study included one-to-one interviews with 15 PE teachers (elementary school, $n = 5$; middle school, $n = 5$; high school, $n = 5$; 9 males, 6 females). The teachers ranged in age from 42 to 58 years old ($M = 50.73$, $SD = 4.27$) and their teaching experience varied between 10 and 33 years.

## Data Collection

Prior to data collection, the first author informed the interviewees about the main purpose of the survey and then the interviewees signed a consent form. The respondents participated voluntarily in the study and were informed that they could bow out of the interview at any time. They were also informed about the anonymity of their participation and the confidentiality of the research. The interviewer was a doctoral student who took part in other qualitative data collections as well. The 15 interviews were held in the school setting of participants' choosing, such as in a private room or the gym. The teachers were interviewed individually excluding their teaching hours and each interview averaged 35 min. During the procedure, the researcher wrote in a notebook any memos that would be helpful. The interviews were digitally recorded and later transcribed verbatim. Following the transcription, participants' names were encoded with letters and numbers. More specifically, the letter A represents teachers in elementary schools; letter B, teachers in middle schools; and letter C, teachers in high schools (e.g., A1, B2, C3).

## Interview Protocol

A semistructured interview protocol was designed to elicit valuable information about PE teachers' attitudes and self-perceptions of the motivational climate exhibited during the lesson. The interview protocol was based on literature concerning motivational climate. Patton's (2002) methodological recommendations were followed. The interview format included background questions (e.g., age, qualifications, teaching experience). Then questions followed regarding the motivational climate (mastery- or performance-oriented lesson). This research used real-world settings where "phenomenon of interest" could "unfold naturally" (Patton, 2002, p. 39). Thus, short scenarios of possible teaching conditions that may promote these behaviors were included (Creswell, Hanson, Clark Plano, & Morales, 2007). For example, the following questions were included:

- You are starting a lesson. You notice that your students are indolent and in a bad spirit. What do you do?
- You are preparing your students for school tournaments. What do you advise them?

- There is an A student who manages to accomplish in an excellent way the goals of a lesson and there is a weak students who makes a lot of mistakes. How do you deal with each one during the lesson?
- In which cases do you praise your students?

## Trustworthiness

The establishment of data trustworthiness was implemented through the strategies described by Shenton (2004) including (a) well-established research methods; (b) the sample was randomly selected; (c) background, qualifications, and experience of interviewers; (d) the data analysis was documented individually by three researchers to ensure convergence of the findings; (e) and to form good relationships with the interviewees, the researcher chatted with them before the procedure and got to know them to ensure honesty. To ensure external reliability, the researchers followed these practices: (a) interviews took place in the gym or PE teacher's office and (b) data were accumulated during formal discussion after an appointment was arranged with each participant (LeCompte & Goetz, 1982). Finally, to establish internal reliability, the researchers showed the interview data to participants to assess whether the reports depicted participants' perceptions.

## Data Analysis

The raw data from the interviews were analyzed via thematic analysis. The depiction of the phenomenon through thematic analysis is accomplished by the emergence of significant themes (Daly, Kellehear, & Gliksman, 1997). The interview data were analyzed deductively and inductively. Deductive analysis uses a preexisting set of categories (usually based on existing theory and research) to organize the quotes (Patton, 2002), whereas an inductive reflection generates ideas directly from the data (Strauss & Corbin, 1998). According to the thematic analysis process of coding the data, meticulous "reading and re-reading of the data" help one to become familiar with the content of the interviews (Rice & Ezzy, 1999, p. 258). Open and axial coding were conducted. Open coding recognized similarities and differences in the data and axial coding identified the themes (Corbin & Strauss, 2015). Based on PE teachers' insights and relevant literature, this study attempts to report on teachers' self-perceived motivational climate. The motivational climates were categorized as either mastery or performance (Ames, 1992a; Duda, 2013; Nicholls, 1989). For example, the teachers were asked, “You are preparing your students for school tournaments. What do you advise them?” One teacher answered, “The advice is that we are interested only in participation, we are interested in enjoying the game, and the score comes last.” This answer was coded as mastery climate. Throughout the process, the researchers acted as peer debriefers. Two of the researchers became the “critical friends” to enhance reliability and find potential bias (Marshall & Rossman, 2006). They read and coded the interview segments. The following themes emerged from the thematic analysis: (a) mastery climate and (b) performance climate. The interrater reliability coefficient was determined by the percentage of agreement between the researchers, which was 90%. The data were entered into the NVivo 8 data management program to be processed.

## Results: Study 1

PE teachers’ statements revealed a variety of reasons that guide their decision to create a mastery or performance motivational climate. The statements were represented by the themes of PE teachers’ satisfaction, focus on low-skilled students, rewarding effort, triggering interest, gameplay and scoring match, and school tournaments. Based on the frequency of PE teachers’ reports concerning the motivational climate they promote, five profiles were formed in each of the emerging subthemes.

More specifically, seven PE teachers (A2, A3, B1, B2, C1, C3, and C5) who promote only mastery motivational climate were categorized in the first profile, whereas seven (A1, A4, B3, B4, B5, C2, and C4) PE teachers promoted mastery and performance climate. Therefore, based on how frequently they prefer each cluster of motivational climate, they were categorized within three profiles. More specifically, the second profile included four PE teachers (A1, A4, B5, and C2) who appeared to promote a high mastery and low performance motivational climate. Additionally, two PE teachers (B3 and C4) who promoted a medium mastery and medium performance climate were categorized within the third profile. Within the fourth profile, one PE teacher (B4) reported promoting a low mastery and high performance mastery climate. Finally, one PE teacher (A5) was categorized within the fifth profile. Based on her reports, she promoted the performance motivational climate.

## Mastery Climate

Seven PE teachers (A2, A3, B1, B2, C1, C3, and C5) who were categorized within the mastery climate profile indicated consistently that they foster a mastery-oriented climate. This section presents characteristic examples of their perceptions.

**PE teachers' satisfaction.** In this subtheme, the data analysis indicated that teachers feel more satisfied when they see their students feeling happy and everyone participates in class. For example, A3 stated, "When I am teaching and see that children enjoy it and I notice in their eyes that they take pleasure of what we did, and then I am truly happy." Similarly, C1 reported, "In my lesson, the thing that is most important for me is students' participation. When I see them participating in class, I feel great satisfaction." In concurrence with this view, C5 stated,

> When I see that everyone is participating in my lesson, they try, and I realize that I have accomplished to pass the meanings that are important to achieve our goals, and then I feel satisfied. In high school the aim is lifelong learning, gaining all the essential qualifications to join your favorite sport, and have a hobby to exercise with joy when school years are over. I believe that when you accomplish students' participation by their will and not as a forced task (i.e. just trying not to get expelled), I feel pleased.

**Focus on low-skilled students.** All the teachers pointed out that they focus on every single student during teaching, but particularly their utmost attention goes to the low-skilled students. B1 reported, "Generally I am focusing on the overall of the class, but of course, in cases that it is needed I give particular attention individually to students that need extra help." C3 mentioned, "Firstly, I am concerned about the whole class. When students need some help, I always advise them so that everyone can move on to the next level of the lesson."

**Rewarding effort.** A significant dimension acknowledged in this theme was that the teachers always desire rewarding and encouraging weak students for all their effort and every improvement they accomplish. For example, A2 said,

> I reward every student for its personal accomplishments because each one has its abilities and skills. As a teacher, I should approach the aim of the lesson for every student . . . I appraise someone when I see that he is trying, has a good character and participates every time. Participation and effort are in the first row for my evaluation; the result hierarchically is pretty down in the row.

Similarly, B2 reported,

> I praise the weak student whenever does a promising and good effort. Whereas, I will try to keep the talented student humble and not cultivate his ego through repeated rewards. When you consistently trigger their ego and pride, the results are the opposite of what you aimed for.

C5 pointed out,

> From the first lesson, I point out that I'm not interested in their performance, but in their participation. When a student is trying hard but can't achieve everything, I will be more understandable, and I will embrace his skills. I will reward him more vividly comparing to a student who can manage a lot of things, but he is not trying at all.

**Triggering interest.** To trigger students' interest when students are feeling low at the start of a lesson, the teachers try to create a positive climate. Usually, they talk about a subject that students are interested in, will lighten the atmosphere with a joke or by playing games, or will encourage students by letting them play anything they please at the end of the lesson. For example, A3 reported,

> I try to set them enjoyable games I know they will get interested in and they will want to take part in. So when I notice that they are tired and I tell them we will play this game, immediately they get excited, and they enjoy this approach.

C1 stated,

> I never actuate them to do something with a strict tone, ever. I always try with a smile or some encouragement that I am sure it will trigger their interest to start up. I always avoid rigor or [insulting] a student, in any case.

**Gameplay and scoring match.** These teachers did not distinguish the goals of a simple intraclass gameplay and a match with scores performed during the learning process. The goals for these two conditions are for students to apply their knowledge in action, to have fun, and to learn about fair play and teamwork. These teaching activities are also essential for lifelong learning. Participant A2 mentioned, "For me, the most important is to achieve greater socialization, more friendships, to learn about fair play." Moreover, B2 stated,

> Above all, I care about the internal satisfaction they are feeling. I am pleased to realize their happiness when they play a game. The goals for a match [are] to give everyone responsibilities and change play roles. Some will play the role of the referees, another the role of the coach, and so on. I am interested in their behavior. I want them to behave nicely, not to have conflicts.

**School tournaments.** Teachers who created a mastery motivational climate were not interested in victory but in students' participation in moments such as school tournaments. For example, B1 mentioned, "The advice is that we are interested only in participation, we are interested in enjoying the game, and the score comes last." C1 stated,

> Above all, I think it is more important to have an athletic spirit and not to think just about winning. They should respect the opponent and the referees. Above all is to enjoy the game. They should try not to get carried away with sports fanaticism that exists in professional sports which they're watching. Keeping those negative lessons at bay.

## Mastery and Performance Climate

According to teachers' responses to the interview questions, seven PE teachers (A1, A4, B3, B4, B5, C2, and C4) develop both a mastery and performance motivational climate in the teaching process.

**PE teachers' satisfaction.** In this theme, the teachers (A1, A4, B3, B5, C2, and C4) indicated a preference for a mastery motivational climate, noting they are mostly satisfied when they watch their students having fun and participating in class. B5 said, "I am happy when I see that my students enjoy the lesson, they do not get bored and it is shown in their eyes."

In contrast, one PE teacher (B4) aims for performance, because the teacher cares that the students do everything right and succeed as much as possible. Similarly, B4 mentioned, "I am satisfied when students are able to do well whatever you learn them to do, whether it is a dance or sports. It is important what you teach them can also be done."

**Focus on low-skilled students.** Some of the teachers (A1, C2) highlighted that they concentrate on every student during the lesson, but particularly their utmost attention goes to the low-skilled students. A1 asserted, "It is important to give attention to all the students, but particularly with some of them who have particularities, you try even more."

However, some teachers (A4, B4, and C4) focus on the entire class, without any exceptions, and admit that it is not possible during the lesson to pay extra attention to the low-skilled student, because there is not enough time and there is not always the same patience.

Some teachers (A4, B3, B5, and C4) added that to manage the difficulties in a class parted from students' different skill levels, they give the high-skilled students some responsibilities by putting them in a position to help students who have difficulty. A4 reported,

> I teach my lesson the way I should do it, but I cannot personally be much involved in weak students' needs, the good ones then help. I put them in my position and become the teachers to others, by correcting their mistakes and showing them the right way to do something.

Notably, B3 stated,

> I usually help weak students by having the good ones to show them some things upon the lesson. They inevitably do the teachers work because if I devote the time weak students need, I then must spend half the hour and the other students will stay behind.

**Rewarding effort.** In this theme, the majority of the teachers who belong to the mastery and performance climate (A1, A4, B3, B4, B5, C2, and C4) reported that generally, they want to reward and encourage weak students for all their effort and for every improvement students make. For example, B4 reported,

> I encourage those students; I reward them in order to gain confidence little by little and to believe in themselves. I teach them that in physical education, practice, persistence, and effort are necessary for their improvement. I think that the right thing to do is to reward those students and not to disappoint them. If you label them with a negative comment, the kid will not have afterward the mood to get more involved with physical education . . . I teach them that no one knows everything and no one can do everything perfectly. We will make mistakes, and we will learn from them to be better.

**Triggering interest.** To trigger students' interest when they are feeling low, some teachers (A1, A4, B3, B5, C2, and C4) try to create a positive climate. Usually, teachers talk about a subject that students are interested in, lighten the atmosphere with a joke or by playing games, or encourage students by letting them play anything they please at the end of the lesson. B3 said, "I ask them what they want to play after the lesson. So, I give them some minutes, and they choose what is pleasing them the most."

In contrast, one teacher (B4) uses as a prompt the aspect of victory in a game that students will play in the lesson, as the teacher believes that competition always motivates and energizes students. B4 noted,

> You try to give them motivation. That is, to win in a game such as volleyball, basketball, handball. In this way, you can

> awaken them so that they do whatever . . . is possible . . . to win the game. Namely, the joy of victory in a match.

**Gameplay and scoring match.** A4 noted that the goals do not differ between a simple game and a game with scores performed during the learning process. These goals are included in mastery motivational climate. She said,

> With a simple game during the class lesson, we care about teamwork, sociability, cooperation, distribution of play roles. With a match we care about respecting the rules, the opponent, [enjoying] the game, have good teamwork and collaboration. These are two approximate approaches for a PE teacher.

In contrast, some teachers (A1, B3, B4, B5, C2, and C4) mentioned that regarding a scoring match, they become more rigorous. Their teaching role is to direct students' attention toward avoiding making any mistakes. Also, they tend to choose the best players to play so that the students will be well prepared for school competitions. They also think that competition is necessary for students' progress. For example, B3 explained,

> Elementary goal in a game is for us to be sure that the students have improved their abilities. One of the main goals to plan more regular matches in your lessons is for every student to see and realize its capabilities, to pay attention not to make any mistakes and then to prepare the athletes to find out who are the best for the school tournaments.

Moreover, C4 said,

> They have to learn the basics in order to play a simple game either it is volleyball or basketball and then to be able to move on the court with teamwork, to exchange passes, and to play right. As far as a match is concerned, the important thing is for the best one to win and of course to work on competitive skills. The goal is not to have any fights and the best one to win.

**School tournaments.** Some teachers (A4, B5, and C2) create a mastery motivational climate when it comes to school sports competitions. They are not interested in victory but in students' participation in moments like these. For example, A4 affirmed,

> [Students] should follow the rules, have fun, respect the other players, and not underestimate their capabilities. They should always be prepared related to all the medical checkups so that they can have the sports identity. They should take heed of their diet, to be proper and healthy before the competition.

But other teachers (A1, B3, B4, and C4) are interested in performance and winning, elements in the performance motivational climate. For example, B4 stated,

> They should not develop fanaticism and misbehavior. They must obey the referee and of course [focus] on the game. If they manage not to misbehave and not to disrespect the other players, then they have to be able to give 100% of their skills.

C4 reported,

> They should be careful not to get in any trouble, because this will have consequences generally both for their team and for the other teams . . . And of course, then the big goal is victory, but always in a team spirit, because if there's no teamwork in PE classes mainly, they cannot win.

## Performance Motivational Climate

Finally, one PE teacher (A5) prefers to promote performance motivational climate in each one of the following subthemes:

- *Satisfaction*: "I am happy when we succeed the goals of the curriculum and students try their best to achieve as much as possible during lessons."
- *Low-skilled students*: "I definitely have more demands from an A student so that he always has a good performance and generally be good at physical education. From a low-skilled student. most of the times I do not have the same patience to cooperate with him."

- *Rewarding effort*: "I commend my students when I see that they try and then of course when they accomplish well."
- *Gameplay and scoring match:* "In a gameplay, I check if my students can apply correctly the rules and perform the skills I taught them. A match is important for enhancing competition among them, applying the rules . . . I also check which combination of players creates the most effective team."
- *School tournaments*: "I insist they should never forget the rules, they definitely have to try and do their best for their team and avoid making mistakes."
- *Triggering interest:* "I try to get them to be a bit competitive. So, I use competition in a condition like this because that's what motivates students"

## Method: Study 2

### Participants

The sample of this study consisted of 899 students (447 males, 452 females) aged 10 to 17 years old ($M$ = 13.8, $SD$ = 2.3). The participants were randomly selected from a list of schools located in Central Greece. The students attended the fifth and sixth grade of five elementary schools, the seventh to ninth grade of five middle schools, and the tenth to 12th grade of five high schools. Participants were from urban and suburban schools and belonged to different socioeconomic statuses.

### Data Collection

All students completed questionnaires referring to their PE teachers' motivational climate during the PE lessons in spring 2017. The researcher provided students information about the study and was present for every assistance students needed during the completion of the questionnaires. Anonymity of the participants was ensured by coding elementary schools (A1, A2, etc.), middle schools (B1, B2, etc.), and high schools (C1, C2, etc.). Researchers followed the same coding process that was used in Study 1. Students' participation was voluntary and a consent form was signed.

## Instrument

The motivational climate was measured with the short version of the Learning and Performance Orientations in Physical Education Classes Questionnaire (Papaioannou, 1998). The questionnaire consists of two scales referring to perceptions about the motivational climate developed by the instructor. The first seven-item scale measures perceptions of mastery climate (e.g., "My instructor is completely satisfied when every students' skills are improving") and the other six-item scale measures perceptions of performance climate (e.g., "My instructor attends to the best records only"). Participants responded to the items based on a 5-point Likert-type scale ranging from 5 = *strongly agree* to 1 = *strongly disagree*.

## Data Analysis

Prior to analysis, the accuracy of data entry, missing values, and fit between distribution and univariate and multivariate outliers were examined. Normality was checked for each cell of the analysis (Std. skewness/kurtosis > 2.58). Univariate outliers were examined via $z$ scores > ±3.29. Also, multivariate outliers were detected via the Mahalanobis distance method with $p < .001$ (Tabachnick & Fidell, 2007). Data analysis included the use of the Statistical Package for Social Sciences (Version 21.0). Differences in students' perceptions about their PE teachers' motivational climate by gender and school were examined via one-way MANOVA analyses. The level of statistical significance was set at .05.

# Results: Study 2

One case with extremely high z scores was identified as a univariate outlier and was deleted. Three cases through Mahalanobis distance were found to be multivariate outliers and were deleted, leaving 899 cases for the final analyses. Then two new variables were calculated based on the mean score of the items assessing mastery and performance motivational climate. A one-way MANOVA examined differences in mastery and performance motivational climate between genders. The findings showed a statistically significant multivariate effect on gender, Wilks' $\lambda = .99$, $F(2, 896) = 6.35$, $p < .05$. The examination of the univariate effects revealed no significant effect of gender on mastery climate, $F(1, 897) = 2.15$, $p > .05$, $\eta^2 = .00$, or on performance climate, $F(1, 897) = .60$, $p > .05$, $\eta^2 = .00$.

A one-way MANOVA examined differences in mastery climate and performance climate between schools. The findings showed a statistically significant multivariate effect on schools, Wilks' $\lambda = .39$, $F(28, 1766) = 37.44$, $p < .001$. The examination of the univariate effects revealed a significant effect of schools on mastery climate, $F(14, 884) = 42.70$, $p < .001$, $\eta^2 = .40$, and on performance climate, $F(14, 884) = 45.85$, $p < .001$, $\eta^2 = .42$. An examination of the mean scores indicated which schools had a higher score in mastery and in performance climate. Table 1 shows descriptive statistics between schools.

**Table 1**
*Descriptive Statistics Between Schools*

| | **Students** | **Mastery climate** | | **Performance climate** | |
|---|---|---|---|---|---|
| **School** | ***N*** | ***M*** | ***SD*** | ***M*** | ***SD*** |
| A1 | 47 | 4.12 | .56 | 2.12 | .75 |
| A2 | 30 | 4.21 | .46 | 3.06 | .89 |
| A3 | 35 | 4.06 | .48 | 2.92 | .87 |
| A4 | 42 | 3.29 | .44 | 3.75 | .45 |
| A5 | 56 | 2.15 | .69 | 4.15 | .72 |
| B1 | 46 | 4.09 | .34 | 1.90 | .48 |
| B2 | 64 | 3.90 | .72 | 2.08 | .82 |
| B3 | 67 | 3.11 | 1.13 | 2.96 | 1.15 |
| B4 | 76 | 3.57 | .92 | 2.88 | 1.05 |
| B5 | 47 | 3.01 | .99 | 3.26 | 1.22 |
| C1 | 62 | 4.03 | .65 | 2.06 | .78 |
| C2 | 89 | 3.21 | .95 | 2.57 | .99 |
| C3 | 86 | 3.95 | .64 | 2.28 | .76 |
| C4 | 88 | 2.43 | .82 | 3.93 | .90 |
| C5 | 64 | 3.77 | .49 | 1.82 | .53 |

Furthermore, a one-way MANOVA examined differences in mastery climate and performance climate between educational levels. The findings showed a statistically significant multivariate effect on educational level, Wilks' $\lambda = .85$, $F(4, 1790) = 37.90$, $p < .001$. The examination of the univariate effects revealed a significant effect of educational levels on performance climate only, $F(2, 896) = 26.96$, $p < .001$, $\eta^2 = .06$. An examination of the mean scores indicated that the higher score in performance climate was in the elementary schools ($M = 3.26$, $SD = 1.05$). Table 2 shows the descriptive statistics between educational levels.

**Table 2**
*Descriptive Statistics Between Educational Levels*

| | Mastery climate | | Performance climate | |
|---|---|---|---|---|
| **Educational level** | ***M*** | ***SD*** | ***M*** | ***SD*** |
| Elementary schools | 3.43 | 1.00 | 3.26** | 1.05** |
| Middle schools | 3.53 | .96 | 2.64** | 1.11** |
| High schools | 3.42 | .96 | 2.61** | 1.12** |

**$p < .001$.

## Discussion

The first study examined teachers' self-reported motivational climate and the second study examined (a) differences between students' gender, (b) differences between schools, and (c) differences between educational level concerning students' perceptions about the motivational climate in the PE context. Finally, this study used qualitative and quantitative findings to examine the extent to which PE teachers' perceptions about the motivational climate they promote in the PE context align with their students' perceptions about the class motivational climate. The findings of the first study indicate that most teachers, according to their self-reports, orient toward a mastery climate and are interested in students' participation in PE class. These findings align with Solmon's (1996) study, where the teachers' preference for teaching in the mastery climate emerged. The teachers in this study focus on low-skilled students who need most of their attention and think that rewarding and encouraging students' efforts helps students to progress. Several studies have shown that mastery motivational climate plays a key role in students' participation in physical activities (Ames, 1992b; Papaioannou & Kouli, 1999; Roberts et al., 2007) and athletes' exercise (Smoll & Smith, 1989; Zomermaand, 2010). Teachers in this study also believe that a positive climate plays a significant role in students' motivation, as shown in other studies as well (Digelidis et al., 2003). Moreover, the majority of the PE teachers in this study focus on promoting a mastery climate regardless of the lesson content (games with or without scoring and participation in tournaments).

The teachers also reported that their students should have fun while participating in physical activities. This finding is consistent with the findings of Ames (1992a), who suggested that victory is not a panacea and PE teachers should focus on promoting students' satisfaction through participation in physical activities.

Most of the PE teachers reported that they emphasize students' skills rather than victory during school tournaments. Similarly, in Zomermaand's (2010) research, coaches' gave attention to improving their athletes' skills instead of focusing on winning or losing. It is possible that the tendency of these PE teachers to promote a mastery-oriented motivational climate could stem from their participation in seminars/workshops that help PE teachers to promote a mastery climate.

Additionally, the findings reveal that a significant number of PE teachers tend to adopt a mastery and performance motivational climate. Based on the teachers' reports, it can be assumed that they frequently create a mastery motivational climate, but they emphasize their students' performance in other cases. For example, some noted that their students' performance and lesson accomplishments are essential. Those findings are congruent with the findings of several studies that also revealed a focus on competency in the performance climate (Ames, 1992b; Ames & Archer, 1988; Keegan et al., 2010).

Four of the PE teachers stressed that because of a lack of time, they cannot help low-skilled students to confront their learning difficulties. Instead of giving their effort to help low-skilled students, these teachers tend to use high-skilled students to teach low-skilled students. Other studies confirmed indeed that teachers' expectations of their students influence students' perceived ability and their performance (Bibik, 1999; Martinek, 1988; Trouilloud, Sarrazin, Martinek, & Guillet, 2002). Ames (1992b) also stressed that this strategy may lead low-skilled students to undermine their competence. Additionally, Ames (1992b) suggested that by comparing students' skills, PE teachers may create a performance-oriented climate. Consequently, the implementation of this strategy may widen the skills gap (Ames, 1992b) and decrease students' motivation in PE (Papaioannou, 1997).

On the other hand, the implementation of cooperative strategies such as the reciprocal teaching style allows for "social interactions, reciprocation, receiving and giving immediate feedback (guided by specific criteria provided by the teacher)"(Mosston & Ashworth, 2002, p. 116). That is, teachers should play the roles of doer and observer, while the observer should provide feedback based on the criteria established by their teacher. Even in the case that skilled students play the role of mentor in curricula such as the "Sport for Peace," the teacher should teach and create an environment that promotes care and concern for others (Ennis et al., 1999). Furthermore, two of the PE teachers within this category reported that promoting competition among students or creating an environment similar to competitive games may encourage students to actively participate in PE lessons. These PE teachers appear to disregard that such teaching practices enhance withdrawal among students, especially low-skilled students (Ntoumanis, Pensgaard, Martin, & Pipe, 2004).

Quantitative analysis supported the differences in mastery climate and performance climate between schools. More specifically, the findings reveal that the majority of students perceive that their PE teachers emphasize a mastery-oriented motivational climate. This finding is consistent with the findings of previous studies (Digelidis & Papaioannou, 1999; Giannoudis, Digelidis, & Papaioannou, 2009; Kavussanu & Roberts, 1998). However, students perceived that two PE teachers who taught in the elementary school and two in senior and high school promote a performance-oriented climate in the PE lesson. The reports of nine PE teachers who perceived that they promote a mastery motivational climate align with their students' perceptions. However, five PE teachers' reports contrast with their students' perceptions of the motivational climate promoted by teachers. Based on the quotes of two PE teachers, it can be concluded that they promote a mastery-oriented motivational climate. On the contrary, their students perceived that their teachers tend to promote a performance-oriented motivational climate. Moreover, two of the PE teachers' reports reveal that they promote a medium performance and mastery motivational climate, while their students perceived that their teachers promote a performance and mastery motivational climate. Finally, one PE teacher stated that he promotes a performance motivational climate, but his students perceived that he fosters a mastery-oriented climate. The aforementioned findings may imply that both the PE teachers who teach a specific class (Marsh, 1987, 2007; Papaioannou et al., 2004) and the students who are members of this class (Marsh et al., 2008) influence students' perception of classroom motivational climate.

Moreover, the findings reveal that students in elementary school perceive the motivational climate in the PE lesson as more performance-oriented compared to students in middle and high school. This finding contrasts with the findings of previous studies (Barkoukis, Ntoumanis, & Thøgersen-Ntoumani, 2010; Digelidis & Papaioannou, 1999) that suggested a decrease in the mastery-oriented motivational climate in senior high school. Given that PE teachers in elementary schools tend to use traditional competitive games (Konstantinidou, Michalopoulou, Aggelousis, & Kourtesis, 2011), it can be assumed that such games may foster students' perception of the performance-oriented climate in PE lessons. This assumption could be magnified from the fact that two of the elementary PE teachers reported that they emphasize outperforming the opponents and winning the game. The development of a competitive atmosphere in the PE context may encourage students to evaluate their performance based on norm-referenced criteria that in turn could promote a performance motivational climate (Wallhead & Ntoumanis, 2004).

## Conclusion

This study was an initial attempt to examine PE teachers' perceptions of the motivational climate they foster in PE lessons. An additional goal was to examine the association between teachers' and students' reports concerning the motivational climate created in PE classes. Limited research has examined the perceptions about motivational climate between PE teachers and their students. The authenticity of the teachers' self-reports about the promoted motivational climate is established by students' perceptions, which capture the intended motivational climate, verifying subsequently that the mentioned motivational conditions were the same. The majority of teachers promoted a mastery motivational climate. Performance motivational climate was created mostly in elementary schools, compared to middle and high schools.

A limitation of this study was the age of the teachers, who were old enough to have plenty of years of experience, so there is the lack of younger teachers who may had different perceptions. The relatively small number of teacher interviews may reduce the generalizability of the findings for all Greek PE teachers. However, the thorough analyses of the qualitative and quantitative data strengthen the understanding of the phenomena. A future study could use a field observation of the motivational climate created during class, to examine teachers' and students' actions.

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PEDAGOGY

# Effect of a Physical Education Teacher's Age on Middle School Students' Perceptions of Effectiveness and Learning

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## Abstract

*This study examined the effect of a physical education teacher's apparent age on middle school students' learning and perceptions of the teacher. Two hundred seventy-three middle school students were randomly assigned to view one of two virtually identical films of swimming lessons taught by the same teacher. During the young-appearance lesson (YAL), the teacher taught as his usual and relatively young self. During the middle-aged lesson (MAL), he was made to look older by a makeup artist. After viewing their assigned lesson, students completed an examination covering the content of the lesson and a questionnaire about their perceptions of the teacher. Inferential statistical tests revealed that students who watched the YAL learned more from the teacher and perceived the teacher more favorably. These results support a sociological explanation of how and why students respond to and learn from physical education teachers of different ages.*

A small number of sport pedagogy researchers have explored the effect of a teacher's appearance on physical education (PE) students' learning and perceptions of the teacher. Initial studies of this

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nature suggested that teachers' appearance, preference, and clothing influenced students' perceptions of teachers' instructional ability (Chaikin, Gillen, Derlega, Heinen, & Wilson, 1978; Feshbach & Feshbach, 1972; Landers & Landers, 1973; Molloy, 1975). During subsequent studies, researchers explored the effect of the appearance of teachers' body fat on students' perceptions and learning (Dean, Adams, & Comeau, 2005; Melville & Maddalozzo, 1988; Thomson, 1997). For example, in their seminal study within this line of work, Melville and Maddalozzo (1988) randomly assigned high school students to watch one of two identical films of the same PE teacher lecturing on health and fitness. In the first film, the teacher was his usual slim and fit appearance. In the second film, the teacher wore a fat suit that gave him the appearance of being unfit. Having viewed one of the films, students completed a set of questions about their perceptions of the teacher's pedagogical skill and took an examination of the health and fitness content presented by the teacher. In line with the findings of other research (Dean et al., 2005; Thomson, 1997), students who viewed the fat film had a lower perception of the teacher's skill and scored lower in the content exam than those who viewed the fit film. Using a similar design, McKown, Brusseau, Burns, and Galli (2019) discovered that fourth-grade students were more active during lessons taught by a female teacher when she was her usual slim self than when she wore a fat suit. For sixth-grade students, however, the results were reversed.

Also employing a similar design to Melville and Maddalozzo (1988), Bryant and Curtner-Smith (2008, 2009a, 2009b) explored the effect of a PE teacher's disability on students' learning and perceptions of the teacher's ability. In this series of studies, elementary, middle, and high school students were randomly assigned to watch a film of a teacher teaching swimming as able-bodied or from a wheelchair as apparently having a disability. The elementary students learned more from the film in which the teacher appeared in a wheelchair than from the film in which the teacher appeared able-bodied, but had similar perceptions of the teacher's effectiveness regardless of the film watched (Bryant & Curtner-Smith, 2008). At the middle school level, there were no differences in learning or perceptions of the teacher's ability between students who watched the film in which the teacher appeared in a wheelchair and the film in which the teacher appeared able-bodied (Bryant & Curtner-Smith, 2009a). High school students also had similar perceptions of the teacher's skill regardless of the film viewed. However, high school students who viewed the film in which the teacher appeared able-bodied scored significantly higher on the content examination than those who watched the film in which the teacher appeared in a wheelchair (Bryant & Curtner-Smith, 2009b). The authors suggested that, collectively, these results indicate that students are socialized into believing that physical activity, sport, and PE are for and should be taught by persons with fit and able bodies (Bryant & Curtner-Smith, 2008, 2009a, 2009b).

In this study, we aimed to build on past research suggesting that a teacher's appearance influences the results of their instruction and how they are perceived by students. Given that the average age of public school teachers in the United States is 42.5 years and 56% of them are over the age of 40 (Snyder, de Brey, & Dillow, 2016), there is a need to ascertain whether teachers' apparent age mediates students' perceptions of teachers' effectiveness. The purpose of this study, therefore, was to examine the effect of a PE teacher's apparent age on middle school students' learning and perceptions of the teacher.

This study was informed by the same theoretical perspectives originally employed by Bryant and Curtner-Smith (2008, 2009a, 2009b). These authors hypothesized that one of two competing and oppositional perspectives explained why students reacted to and learned from PE teachers in the ways that they did. First, drawing from the work of a number of scholars (Bandura, 1986, 2002; Coakley, 2007; Gergen & Gergen, 2003; Michalko, 2002; Oliver, 1990; Smith & Sparkes, 2005; Thomson, 1997), Bryant and Curtner-Smith (2008) used a sociological perspective, which suggests students' beliefs regarding the ideal appearance of a PE teacher are socially constructed. From this perspective, because high school students have been socialized into the prevailing societal belief that sport, physical activity, and PE are for young people, they will be more likely to perceive older PE teachers negatively and learn less from them, whereas they would view younger physical educators positively and learn more from them. Conversely, the sociological perspective suggests that elementary school students will be less likely to be biased against older teachers and more likely to learn from them, as elementary school students have not yet been subjected to the same degree, intensity, and amount of negative socialization as high school students.

Second, this study reversed the "Pygmalion effect" described by Martinek and his associates (Martinek, 1981; Martinek, Crowe, & Rejeski, 1982), which revealed that more physically attractive students were viewed and treated more positively by teachers than were less attractive students, and found the *psychological/developmental perspective* suggests that high school students will be less likely to be biased against older teachers and learn from them. This is because they are relatively mature and realize that PE teachers of all ages can be effective. By contrast, the psychological/developmental perspective suggests that elementary school students, being relatively immature, will be less likely to accept older teachers, perceive them to be less effective, and so learn less from them.

Middle school is midway between elementary and high school, and Byrant and Curtner-Smith's (2009a) sociological perspective suggests that middle school students will be more biased against older teachers and learn less from them than will elementary school students, but less biased against them and learn more from them than will high school students. In contrast, Bryant and Curtner-Smith's (2009a) psychological perspective suggests that middle school students will regard older physical educators less positively and learn less from them than will high school students, but more positively and learn more from them than will elementary school students.

Pedagogical research on the influence of teachers' age on students' perceptions of teachers' effectiveness outside PE has suggested that the sociological perspective is more accurate than the psychological/developmental perspective. This work has revealed that college, middle school, and elementary school students favor being taught by younger teachers (Arbuckle & Williams, 2003; Goebel & Cashen, 1979; Joye & Wilson, 2015; Peterson, 1980; Sohr-Preston, Boswell, McCaleb, & Robertson, 2016). Further support for the sociological perspective is provided by much of the research on perceptions of age and aging in general. This work has indicated that a bias against older individuals is evident in very young children and becomes stronger as they age (Corbin, Kagan, & Metil-Corbin, 1987; Couper, Donorfio, & Goyer, 1995; Fullmer, 1984; Laney, Wimsatt, Moseley, &

Laney, 1999) and enter adolescence (Carstensen, Mason, & Caldwell, 1982; Kastenbaum & Durkee, 1964; Sum, Emamian, & Sefidchian, 2016). Furthermore, research has also indicated that children, adults, and youth often regard older individuals negatively (Corbin et al., 1987; Laney et al., 1999; Levy, 2003; Saxena & Shukla, 2016) and have a preference for younger looking faces (Burt & Perrett, 1995; Ebner, Riediger, & Lindenberger, 2010; Kiiski, Cullen, Clavin, & Newell, 2016; Langlois et al., 2000; Todorov, Olivola, Dotsch, & Mende-Siedlecki, 2015).

In the one study conducted in PE to date, Pennington, Curtner-Smith, and Wind (2019) found that elementary students were more positive about and learned more from a PE teacher younger in appearance than a PE teacher older in appearance. Without further study of older students, Pennington, Curtner-Smith, and Wind (in press) suggested that these findings could be used to make a case in support of any of Bryant and Curtner-Smith's (2008, 2009a, 2009b) competing theoretical perspectives.

## Method

### Participants

Participants were 273 students from the sixth (ages 12 to 13 years), seventh (ages 13 to 14 years), and eighth (ages 14 to 15 years) grades attending two middle schools in the southern United States. The students came mainly from families of low socioeconomic status. The schools selected were representative of public middle schools in the region. Before the study began, the students and their parents signed assent and consent forms.

Students attending the first school were 64.30% Caucasian, 27.20% African American, 7.30% Hispanic, 0.60% Asian, 0.40% multiple ethnicities, and 0.10% Native American. The two male PE teachers at the school were 42 and 33 years of age, respectively. PE class sizes at the first school ranged from 30 to 45 students. Students at the second school were 4.80% Caucasian, 86.30% African American, 6.50% Hispanic, 1.60 % multiple ethnicities, and 0.80% Asian. The male PE teacher working at the school was aged 33 years. PE class sizes at the second school ranged from 20 to 40 students. The traditional multiactivity curriculum model with a range of traditional and nontraditional sports and physical activities was employed at both schools. Neither of the schools included swimming in their PE curriculum.

## Lessons

From the protocol employed by Bryant and Curtner-Smith (2009a), a 20-min lesson on the techniques and strategies of breaststroke that was appropriate for middle school students was developed. In line with Bryant and Curtner-Smith's (2009a) rationale, swimming was selected as the lesson content because of the likelihood that the students would have had little experience of swimming and swimming instruction and because of its technical nature. Consequently, we believed that the content would be of interest to the students. Components of the lesson were a warm-up; a number of practices and drills aimed at teaching breaststroke leg kick, arm action, body position, breathing, and full stroke; and a closure during which students were asked questions concerning strategies and techniques taught in the lesson. Cues and key phrases used by the teacher were included in the lesson plan.

The first author, a certified water safety and swim instructor, taught the lesson to 10 students twice in the same 25-yd pool. During both lessons, he organized, presented tasks, and provided feedback to the students from the side of the pool. The lessons were identical with one exception. During the young-appearance lesson (YAL), the first author taught as he normally appeared—a relatively young, clean-shaven, 28 year old (see left photograph of Figure 1). In addition, he wore attire normally associated with younger physical educators (i.e., knee-length black shorts, tennis shoes, and a short-sleeved collared shirt). Prior to teaching the middle-aged lesson (MAL), however, the first author was aged by a theatrical makeup artist (see right photograph of Figure 1). The aging process took approximately 60 min. Phase 1 involved the application of a primer layer of foundation, scar wax, and latex to the first author's neck and face, which altered the texture and shape of the bridge of his nose and his jawline. Phase 2 involved crow's-feet being added to the corners of the first author's eyes and shadows created under his cheekbones and eyes. Within Phase 3, fake liver spots were added to the first author's forehead, nose, chin, and cheeks, and blush was added under his cheeks so as to discolor his skin. Additionally, the first author was bearded for the MAL and gray streaks were added to his hair and beard. Finally, during the MAL, the first author wore clothing commonly associated with older physical educators (i.e., full length khaki trousers, tennis shoes, and a long-sleeved collared shirt).

***Figure 1.*** Teacher appearance in the young-appearance lesson (left photograph) and middle-aged lesson (right photograph).

## Lesson Credibility, Quality, and Similarity

Lesson credibility was established by asking the students in the study, who watched either the YAL or MAL, to state what they believed the age of the teacher they observed to be. These data were compared via an independent *t* test. The mean age of the teacher according to the students who watched the YAL was 30.88 years old ($SD = 6.02$), while his mean age according to the students who watched the MAL was 49.05 years old ($SD = 10.29$). The *t* test revealed that these ages differed significantly, $t(271) = -24.73$, $p < 0.001$. Lesson quality was assessed qualitatively by a panel of three sport pedagogy experts, who watched the films of the YAL and MAL and indicated that the teacher had good content knowledge, was pedagogically skilled, and was enthusiastic to the same degree in both films.

The degree to which the YAL and MAL were similar was established via the protocol developed by Bryant and Curtner-Smith (2009a). This involved coding the lessons with three systematic observation instruments. First, the number, type, and duration of instructional tasks in which students engaged in either film were noted. Second, the lessons were coded with the PE teacher assessment instrument (Phillips, Carlisle, Steffen, & Stroot, 1986) to establish the percentage of time in which the students engaged in skill learning and the teacher engaged in five instructional and five managerial behaviors. Third, the YAL and MAL were coded with the instrument for identifying teaching styles (Curtner-Smith, Hasty, & Kerr, 2001), an interval recording instrument that estimates the percentage of time in which teachers use each teaching style originally described by Mosston (1981) or engage in managerial activity.

Table 1 shows the results of this coding. The results indicate that the lessons were virtually identical and the instruction provided was of high quality. Specifically, the teacher spent most of his time instructing and relatively little time managing students and the students were engaged in skill learning for a high percentage of time. In addition, the teacher primarily employed the practice style of teaching, which was appropriate given the focus of the lesson on skill and strategy learning. Finally, the majority of the tasks in which the students engaged were aimed at enhancing that students' breaststroke technique and their understanding of related strategies.

## Procedure

**Lesson observation.** Students were randomly assigned to view the film of either the YAL or MAL. This was accomplished by alternately labeling the students a 1 or a 2 when they returned their assent and their parents' consent forms. Number 1s observed the YAL and number 2s the MAL. Groups of 20 to 40 students assigned to view either film did so simultaneously in separate rooms. Before watching their designated film, students were told that immediately following the viewing, they would be asked to complete a short questionnaire regarding their perceptions of the teacher in the film and a short examination on the content of lesson.

***Content examination.*** Directly after viewing the film of their assigned lesson, students took the same short written examination developed by Bryant and Curtner-Smith (2009a) on the techniques and strategies taught during the lesson (see Appendix A). This examination had previously been evaluated as having high content validity (Bryant & Curtner-Smith, 2009a). The examination included 12 multiple-choice questions with six specific to swimming techniques and six to swimming strategies. The scores recorded from the examinations for each student were (a) the number of correct answers from the six technique questions, (b) the number of correct answers

**Table 1**
*Percentages of Time Spent by the Teacher With His Students in Various Behaviors, Teaching Styles, and Tasks During the Young-Appearance Lesson and Middle-Aged Lesson*

| Instrument | YAL | MAL |
|---|---|---|
| Physical Education Teacher Assessment Instrument | | |
| Planned presentation | 38.89 | 39.88 |
| Response presentation | 7.54 | 7.50 |
| Monitoring | 41.86 | 38.71 |
| Performance feedback | 0.99 | 1.14 |
| Motivational feedback | 3.77 | 2.95 |
| Beginning/ending class | 4.37 | 6.54 |
| Equipment management | 0.00 | 0.00 |
| Organization | 2.58 | 3.28 |
| Behavior management | 0.00 | 0.00 |
| Total instruction | 93.06 | 90.82 |
| Total management | 6.94 | 9.18 |
| Engaged skill learning time | 42.28 | 43.35 |
| Instrument for Identifying Teaching Styles | | |
| *Reproductive Styles* | | |
| Style A (Command) | 0.00 | 0.00 |
| Style B (Practice) | 96.00 | 95.36 |
| Style C (Reciprocal) | 0.00 | 0.00 |
| Style D (Self-Check) | 0.00 | 0.00 |
| Style E (Inclusion) | 0.00 | 0.00 |
| *Productive Styles* | | |
| Style F (Guided Discovery) | 0.00 | 0.00 |
| Style G (Divergent) | 0.00 | 0.00 |
| Style H (Going Beyond) | 0.00 | 0.00 |
| *Management* | 4.00 | 4.64 |
| Task Analysis | | |
| Warm-up | 9.51 | 8.73 |
| Leg kick | 23.54 | 22.45 |
| Arm action | 20.17 | 24.53 |
| Breathing | 28.66 | 27.04 |
| Full stroke | 12.92 | 11.43 |
| Closure | 5.20 | 5.82 |

from the six strategy questions, and (c) the number of correct answers in total.

**Perception questionnaire.** On finishing the content examination, students were required to respond to a six-statement questionnaire concerning their perceptions of the teacher in the film they had watched. The questionnaire was originally developed by Bryant and Curtner-Smith (2009a) with the goal of discovering the extent to which students (a) liked the teacher, (b) believed the teacher was competent, and (c) viewed the teacher as a positive role model (see Appendix B). Again, Bryant and Curtner-Smith (2009a) established that the questionnaire possessed high content validity.

Two statements in the questionnaire were designed to ascertain students' perceptions of the teacher's likability, two regarding their perceptions of the teacher's competence, and two regarding their perceptions of the teacher as a role model. Students responded to each statement on a Likert-type scale and noted whether they strongly agreed (5), agreed (4), were uncertain (3), disagreed (2), or strongly disagreed (1) with each statement. Each of these choices was illustrated with drawings of facial expressions to help the students. The questionnaires were scored by summing the responses to the two statements on likability, competency, and role modeling. Each questionnaire thus produced three scores ranging from 10 to 2.

**Evaluation of reading level.** The degree to which the content examination and perception questionnaire were appropriate for use with middle school students has been assessed by Bryant and Curtner-Smith (2009a). Specifically, both documents were assessed with the Flesch-Kincaid reading level test (Kincaid, Fishburne, Rogers, & Chissom, 1975) and the Flesch Reading Ease test (Flesch, 1951). The former indicates the United States school grade level for which text is appropriate. The latter indicates how easy it is for students to comprehend text on a 100-point scale, a higher score indicating greater ease. For the content examination, these tests produced a Flesch-Kincaid grade level score of 3.2 and a Flesch Reading Ease score of 86.7. For the perception questionnaire, the tests yielded a Flesch-Kincaid grade level score of 5.4 and a Flesch Reading Ease score of 73.6. Therefore, it is assumed that the sixth-, seventh-, and eighth-grade students in this study were able to comprehend the content examination and perception questionnaire.

## Data Analysis

**Content examination.** Descriptive statistics (means and standard deviations) were calculated for all 12 questions in the content examination for each group (i.e., students who watched the YAL and those who watched the MAL). Descriptive statistics were also calculated for each group for the six questions on techniques and the six questions on strategies. Whether students learned more or less about swimming in general and swimming techniques and strategies when viewing the YAL or MAL was ascertained through a 2 × 2 (Teacher Age × Content Area) repeated-measures analysis of variance test with paired-comparison *t* test follow-ups in which the Bonferroni method was used to control for multiple comparisons. As this line of research is in its infancy, following Henkel (1976), the level of significance for this and other statistical tests in the study was $p < .10$.

**Perception questionnaire.** Descriptive data (means and standard deviations) were also calculated for the three categories on the perception questionnaire (i.e., likability, competence, and role modeling) for each group (i.e., students who viewed the YAL and MAL). Whether there were significant differences between the perceptions of students who viewed the YAL and the MAL was determined through independent *t* tests, in which the Bonferroni method was again employed to control for multiple comparisons.

# Results

## Content Examination

Table 2 shows descriptive data for the content examination. Regardless of the film the students watched, their performance over the entire examination and on the two content areas (i.e., techniques and strategies) was of moderate quality. The analysis of variance test revealed a statistically significant, but small, effect for teacher age, $F(1, 271) = 10.39$, $p = 0.01$, $\eta^2 = 0.04$, indicating that students who watched the YAL outperformed those who viewed the MAL over the entire examination. There was no significant effect for content area, $F(1, 271) = .324$, $p = 0.570$, $\eta^2 = 0.001$, or interaction between teacher age and content area, $F(1, 271) = 1.97$, $p = 0.16$, $\eta^2 = 0.07$.

**Table 2**
*Scores on the Content Examination and Perception Questionnaire by Students Who Viewed the Young-Appearance Lesson and Middle-Aged Lesson*

| | YAL | | MAL | |
|---|---|---|---|---|
| **Group** | ***M*** | ***SD*** | ***M*** | ***SD*** |
| Content Examination | | | | |
| Total score[a] | 7.93 | 1.94 | 7.18 | 1.98 |
| Technique score[b] | 3.99 | 1.21 | 3.68 | 1.18 |
| Strategic score[c] | 3.94 | 1.23 | 3.49 | 1.37 |
| Perception Questionnaire | | | | |
| Liking for the teacher | 8.35 | 1.50 | 7.76 | 2.06 |
| Mastery of content | 8.06 | 1.78 | 7.51 | 2.09 |
| Positive role model | 6.77 | 2.66 | 5.89 | 2.79 |

[a]Possible 12 points. [b]Possible 6 points. [c]Possible 6 points. [d]Likert scale (*strongly agree,* 5; *strongly disagree,* 1).

### Perception Questionnaire

Table 2 also shows descriptive data for the perception questionnaire. Both groups of students reported the teacher to be a good role model, liked him, and assessed him as being competent. The independent *t* tests revealed that the students who watched the YAL liked the teacher significantly more than did those who viewed the MAL, $t(271) = 2.65$, $p < 0.01$. In addition, the students who watched the YAL perceived the teacher to be a more positive role model, $t(271) = 2.66$, $p < 0.01$, than did those who saw the MAL. However, the students who watched the YAL did not perceive the teacher to be more competent, $t(271) = 2.29$, $p = 0.023$, than did those who saw the MAL.

## Discussion

The most important findings of this study were that the students who watched the YAL learned more from and had a higher regard for the teacher than did those who watched the MAL. These results are discouraging, as they suggest that the students were adversely influenced by the age of the teacher in the MAL. In addition, the results of this study are similar to those of most of the earlier studies on the influence of a PE teacher's appearance of body fatness (Dean et al., 2005; Melville & Maddalozzo, 1988; Thomson, 1997) and one of the studies on the effect of a PE teacher's appearance of disability (Bryant & Curtner-Smith, 2009b). Recall that these studies showed that students' learning and perceptions of the teacher were adversely affected by teachers who appeared to be overweight or to have a disability.

Coupled with the results of Pennington et al. (2019), who examined the influence of a PE teacher's age on elementary students' learning and perceptions, the results of this study appear to support the sociological explanation of how and why students at different levels of schooling react to teachers of different ages. Recall in the earlier study, elementary students also learned more from and more favorably perceived the younger version of a PE teacher. More encouragingly, a cross-sectional comparison of the results of that earlier study and this study suggests that the bias against older teachers does not grow more extreme by the time students reach middle school. Perhaps this indicates that most of the negative socialization that students encounter happens at a young age, when students are persuaded that sport, physical activity, and PE teaching are for young people. Such a conclusion would be strengthened if a replication of the study, a third time at the high school level, again yielded similar results.

More positively, it may also be that the pattern of responses by students to older PE teachers is not linear or the exclusive result of either sociological influences or psychological development as suggested by Bryant and Curtner-Smith's (2008, 2009a, 2009b) competing theoretical perspectives. Rather, it may be that students are socialized into a bias against older physical educators from elementary through middle school, but as they mature in the high school years they learn to reject their earlier biases. Again, further study at the high school level would help to confirm or refute this hypothesis.

Regardless of how high school students regard older and younger PE teachers and the degree to which they learn from these PE teachers, the main implication of this study is that age is a topic to which middle school students need to be exposed. Specifically, and as also suggested and implied by others (Class & Knott, 1982; Kiiski et al., 2016; Korthase & Trenholme, 1983; Levy, 2003), teachers of all subjects might do more to counter negative connotations and stereotypes of older people in general and those who participate in and teach physical activity in particular.

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# Appendix A
# Content Examination

| Please Circle |
|---|
| Your Sex : M F |
| Your Grade: 7th 8th |
| Your Age : 13 14 15 |

| Please Circle the Correct Answer from the Videotape |
|---|
| 1. The body position in the breaststroke should be?<br>a) Up and down b) On your stomach with legs and feet below the water c) On your back d) On your stomach with legs and feet above the water |
| 2. Breathing during the breaststroke should be done?<br>a) During the glide b) Just before your face goes into the water c) As soon as you face comes out of the water d) Any of the above |
| 3. Most of your power in the breaststroke comes from your?<br>a) Arms b) Legs c) Hands d) Head |
| 4. The leg movement in the breaststroke mirrors what shape?<br>a) Circle b) Square c) Triangle d) Straight line |
| 5. The arm stroke in the breaststroke should be no more than how many inches below the water?<br>a) 10 inches b) 12 inches c) 20 inches d) 30 inches |
| 6. One type of kick used in the breaststroke is?<br>a) Dolphin b) Wedge c) Whip d) B or C |
| 7. When swimming the breaststroke, you can save energy by?<br>a) Gliding through the water b) Pulling hard b) Kicking hard c) Closing your eyes |
| 8. You can swim a longer distance if you?<br>a) Relax with slow arm and leg movement b) Get a good nights sleep c) Kick hard d) Breath more |
| 9. To help you in racing, you can?<br>a) Wear a swim cap b) Relax and take less breaths c) Pull really hard d) Kick really hard |
| 10. Calm breathing patterns in breaststroke will help you?<br>a) Conserve energy b) See both sides of the pool c) Swim further d) a, b, & c |
| 11. Gliding during the breaststroke will help you?<br>a) Have strong strokes b) Stay straight c) Keep your whole body on the surface d) a, b, & c |
| 12. Slow “warm up” swimming before racing will help you?<br>a) Sleep well b) Give you an advantage c) Prevent cramps and injury d) Get noticed by the coach |

# Appendix B
# Perception Questionnaire

| Please Circle |
|---|
| Your Sex : M F |
| Your Grade: $7^{th}$ $8^{th}$ |
| Your Age : 13 14 15 |

| | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
|---|---|---|---|---|---|
| After viewing today's video, please check the most appropriate response. |  |  |  |  |  |
| 1. I liked the PE teacher who taught swimming in the video. | | | | | |
| 2. I liked how the PE teacher in the video taught swimming. | | | | | |
| 3. The PE teacher in the video knows a lot about swimming. | | | | | |
| 4. The PE teacher in the video is a swimming expert. | | | | | |
| 5. The PE teacher in the video makes me feel like swimming. | | | | | |
| 6. The PE teacher in the video makes me want to improve my swimming. | | | | | |

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PEDAGOGY

# Are You Better Than a 12-Year-Old Student? A Pilot Study to Explore Physical Literacy in Preservice Physical Education Teachers

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## Abstract

*Physical educators play a key role in role modeling to students within the school context. Therefore, there is a need to understand whether current physical education teacher education (PETE) provides sufficient knowledge and practice to prepare preservice educators to be successful. Thirty PETE preservice teachers (23 males, 7 females, aged 19–26) participated in this study. Participants performed tests in physical fitness and motor performance and completed an online questionnaire about cognitive factors (e.g., knowledge and understanding). In addition, a 7-day walking step total was recorded as daily activity in accordance with the Canadian Assessment of Physical Literacy*

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*testing battery. Each participant's performance was compared with the achievement level of a 12-year-old child. Participants had significantly better performance in muscular strength (measured as handgrip test) and flexibility (measured as sit-and-reach test) than a 12-year-old. However, participants had significantly poorer performance in aerobic fitness (measured as PACER), motor performance (measured as obstacle course test), and muscular endurance (measured as plank test) than a 12-year-old. In addition, participants had significantly lower knowledge and understanding of health and physical activity than a 12-year-old. A positive relationship between physical competence (i.e., overall performance in physical fitness and motor performance) and cognitive factor was shown among participants. Growth and maturation may explain participants' better performance in muscular strength and flexibility. Excessive weight status and low level of knowledge may have contributed to their poor performance in the physical competence domain. The positive relationship may indicate that cognitive factors are a strong predictor of the performance of physical fitness and motor performance. Therefore, for physical educators to promote a healthy lifestyle in education settings, the current PETE curriculum needs to be reviewed and relevant information delivered to promote physical literacy in PETE preservice teachers.*

Traditionally, school physical education has been thought of as the setting where students are taught to play sports and where potential elite athletes can be found (Rink, Hall, & Williams, 2010). However, a great number of studies have demonstrated that physical activities in the early years are beneficial for different levels of health and well-being in later life, such as cardiovascular and musculoskeletal systems, social functioning, and mental health (Acosta et al., 2015; Dohle & Wansink, 2013; Savina, Garrity, Kenny, & Doerr, 2016; Zahl, Steinsbekk, & Wichstrøm, 2017). Thus, in addition to physical health and functioning, more and more studies suggest physical education should promote motivation, confidence, physical competence, knowledge, and understanding in the pursuit of a physical and meaningful lifestyle (Kirk, 2013). The Society of Health and Physical Educators (2014) included this concept of multiple levels of health and well-being and adopted the term *physically literate person* in its latest national physical education K–12 content standards. Specifically, the physically literate persons should (1) learn the skills necessary to participate in physical activities, (2) know the implications and the benefits of involvement in physical activities, (3) participate regularly in physical activity, (4) be physically fit, and (5) value physical activity and its contributions to a healthy lifestyle (Society of Health and Physical Educators, 2014). Hence, the purpose of physical education seems to pertain to not only a state of being physical but also states of being sociable, knowledgeable, and psychological that are interacted within various environment.

Research has proposed several pedagogical strategies that can alter students' physical literacy. Teachers and coaches have been cited as role models more frequently than family members among schoolchildren (Gilmer, Speck, Bradley, Harrell, & Belyea 1996). For example, Whent, Martinez, Gomez-Camacho, and de la Torre (2016) found that classroom teachers' weekly minutes in physical activity was a significant predictor of students' physical activity time in school. Hence, it is important for classroom teachers to be active and for physical educators to be fit role models for their messages to be effective. In particular, the role modeling of physical educators has been recommended as an important factor (Cardinal, 2001). Several studies have demonstrated the potential effect of physical activity and physical fitness of educators on teaching effectiveness and student learning outcomes. First, Melville and Maddalozzo (1998) indicated that elementary school students who scored low on the physical fitness knowledge examination displayed less intent to exercise and rated the physical educator less appropriate as a role model when they perceived the physical educator as "overweight." Further, Dean, Adams, and Comeau (2005) noted that physical educator's appearance of body fatness was related to high school students' performance on a cognitive-based health-related fitness test. Therefore, it is imperative that physical educators understand their effect on students. Whether they are making a conscious effort or not, physical educators are modeling a lifestyle that promotes fitness and physical activity to reinforce the concept of physical literacy among students.

Because physical literacy is listed in the national physical education standards and has become the ultimate goal of physical education, it is important to know if the general public understands the concept and appreciates the importance of physical literacy. Surprisingly, a Canadian survey indicated that only 17% of Canadians were aware of physical literacy (Decima Research, 2008). This poor awareness may be due to the lack of a well-defined and measurable concept that can better position physical literacy effectively in changing public perceptions. Tremblay and Lloyd (2010) considered physical literacy to have four interrelated core domains: (a) physical fitness (cardiorespiratory, muscular strength, and flexibility), (b) motor performance (fundamental motor skill proficiency), (c) physical activity behaviors (directly measured daily activity), and (d) cognitive factors (attitudes, knowledge, and feelings). To promote this new concept to the public, it is important that physical educators are role models of physically literate persons. However, it seems that preservice teacher education programs currently do not emphasize the four interrelated core domains as suggested by Tremblay and Lloyd (2010). For example, Kamla, Snyder, Tanner, and Wash (2012) found that preservice physical educators were not significantly fit compared to non–physical education majors based on several fitness assessments with the exception of the 1-mile run. Further, Petersen, Byrne, and Cruz (2003) surveyed health-related physical fitness knowledge of preservice physical educators who had completed all coursework and student teaching. The mean score for these teachers was 75.18%, which was not better than the mean score of high school students. Both studies demonstrate that preservice physical educators may not be good role models as physically literate persons because of their low physical activity and physical fitness levels and poor knowledge. Chen, Liu, and Schaben (2017) suggested that level of knowledge was a strong predictor of time spent in physical activity. Yet, to our knowledge, no study has systematically examined the physical literacy status among physical educators. This study also adds to the limited literature on physical activity habits and health-related fitness knowledge of preservice physical education teachers.

Based on the concept of Tremblay and Lloyd (2010), this study applied subjective ratings (i.e., knowledge and understanding of physical activity questionnaire) and objective measures (i.e., physical fitness, motor performance, and daily physical activity levels) to examine physical literacy in preservice physical education teachers. The primary purpose of this study was to measure four core domains of physical literacy: physical fitness, motor performance, daily physical activity levels, and cognitive factors (i.e., knowledge and understanding of physical activity). The Canadian Assessment of

Physical Literacy (CAPL) was adopted in this study because it is the first national protocol to evaluate physical literacy (Longmuir et al., 2015). The second edition launched in October 2017. Thus, the adopted assessments during the data collection period were from the first edition. In addition, CAPL was designed for Canadian children aged 8 to 12 years. We hypothesized that in regard to being a role model, the preservice physical education teachers would have better performance in all four core domains of physical literacy compared to a 12-year-old child based on the CAPL. Consistent with Chen et al. (2017), we also hypothesized knowledge and understanding of physical activity was one factor that contributes to physical fitness and motor performance in preservice physical education teachers. A positive association might be evident in this study.

## Method

### Participants

Thirty-seven preservice physical educators (29 males, 8 females, aged 19–26), including sophomores through seniors at a southeastern 4-year university, were recruited for this study. Before testing, interested participants completed the informed consent form. Then the Physical Activity Readiness Questionnaire (PAR-Q) was used to determine the safety of exercising for participants. It is a self-screening tool that asks several questions regarding heart trouble, chest pain, high blood pressure, dizzy spells, joint problems, and other problems that may be exacerbated by aerobic exercise. If participants answered yes to one or more questions, they were not included in the study. After taking the PAR-Q, seven participants were excluded because of their orthopedic problems or mobility limitations. Thirty participants signed the consent forms and performed the physical literacy assessments. All protocols were approved by the university human subjects institutional review board.

### Measurement

Three components of the CAPL were applied: physical competence, daily behavior, and knowledge and understanding. Moreover, the CAPL combines physical fitness and motor performance in the physical competence domain. Therefore, to determine physical literacy in preservice physical educators, this study measured four core domains of physical literacy—physical fitness, motor performance, daily physical activity level, and cognitive factors—as recommended by Tremblay and Lloyd (2010).

**Physical fitness.** Physical fitness refers to physical ability to engage in physical activities. Assessment of physical fitness consists of several components that measure body composition, aerobic capacity, musculoskeletal fitness, and flexibility.

***Body composition.*** Body composition was assessed through measurements of body mass index (BMI) and waist circumference (WC). BMI was computed as weight divided by the square of height ($kg/m^2$). According to the Centers for Disease Control and Prevention (CDC, 2009), BMI between 18.9 and 24.5 is considered normal status for adults. WC measurements were taken at the top of the iliac crest. Thus, the measuring tape was placed parallel to the floor and above the upper hip bone. The CDC suggests the criterion of WC is 101.6 cm (40 in.) for men and 88.9 cm (25 in.) for women. Based on the CAPL grading system, the possible maximum score converted from BMI and WC is 17.

***Aerobic capacity.*** Aerobic capacity was assessed via a 20-m Progressive Aerobic Cardiovascular Endurance Run (PACER). Participants were required to run across the 20-m distance at a pace that increased with the beep sounds. The time between recorded beeps decreased as the level increased. The score is the number of laps reached before the participant was unable to keep up with the recording for two consecutive beeps. Based on the grading system, the possible maximum score converted from PACER performance is 42.

***Musculoskeletal fitness.*** Muscular strength was assessed by grip strength, which indicates upper body strength, and muscular endurance was assessed by plank, which indicates core strength or torso strength. Participants stood in an upright position and held the dynamometer with arm straight and in line with the forearm at the level of the thigh. While hearing the word *squeeze*, participants gripped the dynamometer with maximal force. Two trials with each hand were done and the combination of maximum score for each hand represented the total score. Based on the grading system, the possible maximum converted score for grip strength is 17. The plank test was used as an indicator of muscular endurance. During the test, participants held the correct position as long as possible and that time was recorded. Based on the grading system, the maximum score converted from plank performance is 17.

***Flexibility.*** The sit-and-reach test was used to indicate flexibility of the lower back and hamstring muscles. Participants removed their shoes and sat on the floor with legs straight ahead and parallel to the floor. They placed the soles of their feet flat against the sit-and-reach box. They placed their hands on top of each other with the palms facing down while reaching forward along the measuring line as far as possible. The testers ensured participants' hands remained level throughout the assessment. Participants held the position for 2 s while the distance was recorded. The performance in sit-and-reach test was recorded as the best of two trials. Based on the grading system, the maximum converted score from actual performance for flexibility is 17.

**Motor performance**. Motor performance was measured through performance of the CAPL obstacle course. Participants performed two-foot jumping, sliding, catching, throwing, and skipping and one-foot hopping and kicking. The performance of the participants was assessed based on time to complete the course and criterion-referenced assessment of skill levels. The more physically literate participant would be able to perform optimal balance between speed and accuracy. Based on the grading system, the maximum score converted from performance is 42.

**Daily physical activity level.** Participants wore research-grade accelerometers (ActiGraph GT3X+, Pensacola, FL, USA) for the assessment of step counts. Participants wore the accelerometer for 7 days, including weekend days, on the right hip and maintained their routine daily schedule as close as possible. For an accurate reflection of participant physical activity levels, data were collected to detect noncompliance with a minimum required wear time of 8 hr/day. If this criterion was not met, that day was excluded from data analysis. Participants who were missing more than 2 weekdays or 1 weekend day were given the monitor a second time to obtain data from the missing days. Data from any participant with more than 2 missing weekdays or 1 missing weekend day were not included in analyses.

**Cognitive factors.** Cognitive factors included 10 questions that assess participants' knowledge regarding physical activity and sedentary behavior, physical fitness, and safety during physical activity (see Appendix A). Participants were asked to complete this questionnaire online outside the testing setting, which reduced distractions. The score of these 10 questions was summed for a possible maximum score of 18 for cognitive factors.

## Experimental Procedure

Informed consent for each participant was obtained before the beginning of testing. Testing of participants was completed by the professor of PE 3133 Adapted Physical Education and PE 4173 Test and Measurement in Health and Physical Education. All testing administrators in this study had undergraduate degrees in kinesiology and received practical training sessions. The administrators demonstrated each protocol and each participant was partnered with another and was tasked with recording measurements on the Fitness Assessment Record Sheet (see Appendix B). The administrators observed the protocols being performed and reported performance results and corrections as required.

Upon arriving in the testing field, participants completed a demographic measures questionnaire (e.g., height, weight, WC, behavior checklist, medical history) and the PAR-Q. The demographic questionnaire and PAR-Q screened for health issues that may be exacerbated by aerobic exercise. Seven participants were excluded from the study because of their physical or mobile limitations. In addition, participants went through handgrip, sit-and-reach, and PACER tests.

A week later, participants completed plank and obstacle course tests. After the completion of all the tests, participants were provided a Web link to carry out an online questionnaire about knowledge and understanding of interests toward physical activity and health during their own free time. Moreover, to record their daily walking steps, participants wore an accelerometer at right hip level from the following day for 7 days. The accelerometers were initialized at a sampling rate of 30 Hz. The data for daily walking steps were analyzed at 10-s epochs via Kinesoft v. 3.3.75 software.

## Data Analysis

Statistical analysis was performed in SPSS 25.0. A single-sample *t* test determined if there was a statistically significant difference between different domains of physical literacy (physical fitness, motor performance, daily physical activity level, and cognitive factors) between the study sample and the achievement level of a 12-year-old student in CAPL. Because the data followed a normal distribution, a Pearson product–moment correlation coefficient (two-tailed) was used to evaluate the relationship between the physical fitness, motor performance, daily physical activity level, and cognitive factors. The significance level was set at .05.

# Results

## Physical Fitness

As Table 1 shows, participants had significantly better flexibility, $M_{male} = 31.51 \pm 8.64$, $M_{female} = 39.99 \pm 5.69$, compared with a 12-year-old student, $M_{boys} = 24.8$, $t(26) = 3.72$, $p < .001$, for males, $M_{girls} = 33.1$, $t(6) = 3.27$, $p = .018$, for females. However, only male participants significantly had better performance in muscular strength ($M_{male} = 99.15 \pm 16.84$) compared with a 12-year-old student, $M_{boys} = 45$, $t(26) = 15.42$, $p < .001$. Further, mean BMI of participants was high (27.63 $kg/m^2$) and categorized as overweight. Participants' WC did not exceed the criteria of the CDC. On the other hand, participants had significantly poorer performance in aerobic capacity, $M_{male} = 33.78 \pm 16.64$, $M_{female} = 19.29 \pm 5.44$, $M_{boys} = 45$, $t(26) = -2.95$, $p = .007$, for males, $M_{girls} = 44$, $t(6) = -11.54$, $p < .001$, for females, and in muscular endurance, measured as plank test, $M = 102.01 \pm 16.64$, compared with a 12-year-old student, $M = 127$, $t(29) = -3.39$, $p = .002$.

## Motor Performance

As Table 1 shows, participants performed significantly poorer in motor performance, measured via obstacle course test, $M = 23.93 \pm 2.15$) compared with a 12-year-old student, $M = 27$, $t(29) = -7.82$, $p < .001$.

**Table 1**
*Participants' Performance in Physical Literacy*

| Assessment | PETE students *M* ± *SD* | 12-year-old students | *t* | *p* |
|---|---|---|---|---|
| Physical fitness | | | | |
| BMI | 27.6 ± 5.02 | 24.8+ | 2.98 | .006* |
| WC (cm) | | | | |
| Males | 88.88 ± 13.58 | 101.6+ | −4.64 | < .001* |
| Females | 80.29 ± 8.37 | 88.9+ | −2.44 | .051 |
| PACER (lap) | | | | |
| Males | 33.78 ± 16.64 | 44 | −2.95 | .007* |
| Females | 19.29 ± 5.44 | 43 | −11.54 | < .001* |
| Handgrip (kg) | | | | |
| Males | 99.15 ± 16.84 | 45 | 15.42 | < .001* |
| Females | 64.50 ± 24.59 | 44 | 2.205 | .070* |
| Plank (s) | 102.01 ± 40.29 | 127 | −3.39 | .002* |
| Sit-and-Reach (cm) | | | | |
| Males | 31.51 ± 8.64 | 24.8 | 3.72 | < .001* |
| Females | 39.99 ± 5.69 | 33.1 | 3.27 | .018* |
| Motor Performance | | | | |
| Obstacle Course | 23.93 ± 2.15 | 27 | −7.82 | < .001* |
| Daily Physical Activity (step) | 14587.98 ± 5160.96 | 15000 | −.44 | .667 |
| Cognitive Factor (point) | 13.94 ± 2.02 | 14.8 | −2.34 | 0.26 |

*Note*. BMI = body mass index; WC = waist circumference; PACER = Progressive Aerobic Cardiovascular Endurance Run.

*$p < .05$. +criteria for adults.

## Daily Physical Activity Level

Participants did not perform significantly more daily walking steps, M = 14587.98 ± 5160.96, compared with a 12-year-old student, $M = 15000$, $t(29) = -.44$, $p = .667$, as indicated in Table 1.

## Cognitive Factors

As Table 1 shows, participants had higher knowledge and understanding of physical activity and sedentary behavior, physical fitness, and safety steps, $M = 13.94 \pm 2.02$, than did a 12-year-old student, $M = 14.8$, $t(29) = -2.34$, $p = .26$.

## Relationship Among Three Domains of Physical Literacy

Since CAPL combines physical fitness and motor performance as the physical competence component, the summed scores in the performance of physical fitness test and motor performance assessment can be converted with a maximum of score of 32. As Figure 1 shows, a significantly positive relationship was found between overall performance in the physical competence component and cognitive factors among participants ($r = .52$, $p = .003$). However, as Figure 2 indicates, no relationship between daily physical activity level and cognitive factor was reported ($r = -.03$, $p = .876$).

# Discussion

The importance of the physical education teacher's role, particularly for effective and credible teaching of physical education, has been highlighted in the literature. Physical educators are expected to be role models to students through their acts, behaviors, and bodies (Silverman & Mercier, 2015). Thus, the Society of Health and Physical Educators (2014) suggested physical education teachers need to be physically literate persons. Tremblay and Lloyd (2010) defined physical fitness, motor performance, physical activity behaviors, and cognitive factors as important areas for physical literacy. However, there has been a noticeable dearth of research regarding how preservice physical educators learn and practice physical literacy. Because physical education teachers play an important role in helping students to be physically literate individuals, the primary purpose of this study was to examine physical literacy among preservice physical educators compared with the Canadian national standard for a 12-year-old elementary student. CAPL was adopted

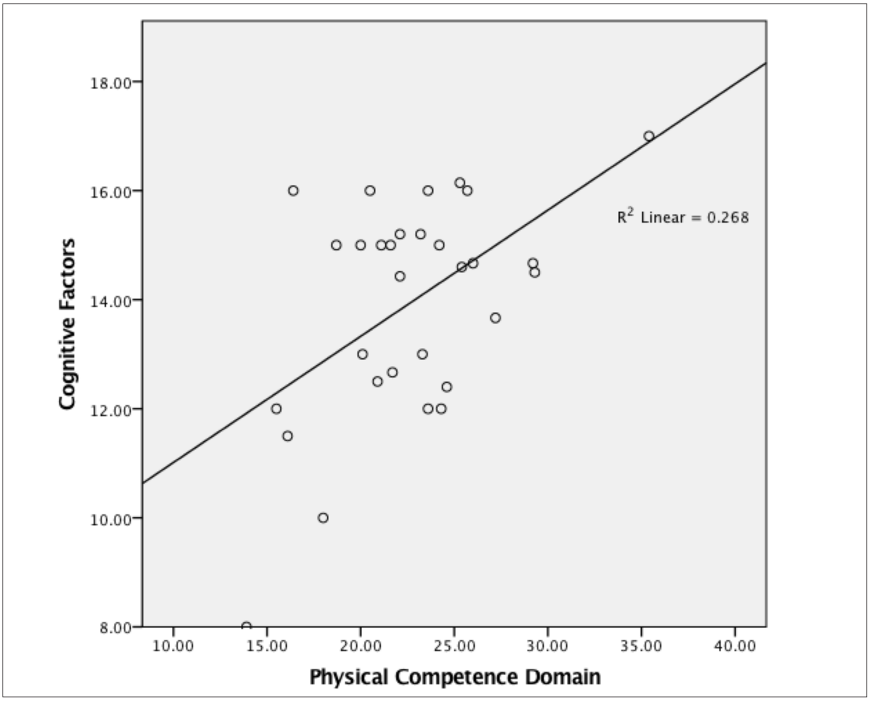


***Figure 1.*** The relationship between cognitive factor and performance in physical competence in physical education teacher education students.

because it is the first comprehensive protocol that accurately and reliably assesses a broad spectrum of abilities that contribute to physical literacy. The preservice physical education teachers in this study performed poor in terms of aerobic capacity, muscular endurance, and motor performance. Further, preservice physical education teachers demonstrated poor cognitive factors, such as knowledge and understanding with regard to physical fitness and physical activity. Moreover, preservice physical education teachers performed similar daily walking steps as a Canadian 12-year-old elementary student. An association between cognitive factors and physical competence (i.e., the combination of physical fitness and motor performance) was evident but not seen in the connection with daily walking steps among preservice physical education teachers.

Preservice physical educators in this study performed better than a 12-year-old Canadian 12-year-old elementary student in the tests for muscular strength and flexibility, which is consistent

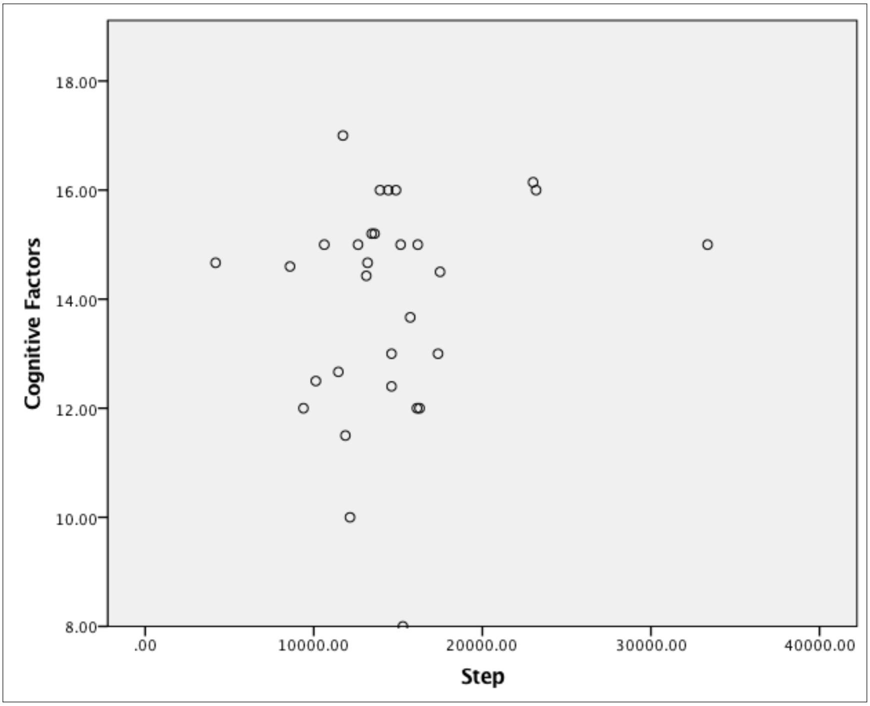


***Figure 2.*** The relationship between cognitive factors and daily physical activity in physical education teacher education students.

with findings by Ervin, Fryar, Wang, Miller, and Ogden (2014) and Nikolaidis, Calleja-González, and Padulo (2014), which indicate older groups performed better in grip strength test and sit-and-reach test than young age groups. This corroborating evidence likely suggests a significant positive trend with age for muscular strength and flexibility. Because there was no difference in physical activity levels (i.e., steps), sex hormones (i.e., testosterone and estrogen) may play a vital role in muscle size and flexibility. The growth and maturation in body function (e.g., increased lean muscle mass) may lead to advanced performance in handgrip and sit-and-reach tests among preservice physical educators. Hence, young children should not be regarded as miniature young adults regarding to their physical characteristics.

Furthermore, physical education teacher education (PETE) students showed poor performance in aerobic endurance and muscular endurance in this study. One reason for this might be their body composition. The average BMI was 27.62, which is categorized as overweight based on the definition from the Centers for Disease Control and Prevention (2009). Power, Ullrich-French, Steele, Daratha, and Bindler (2011) demonstrated a negative association between obesity status and PACER performance in adolescents. Similarly, Ervin et al. (2014) showed the length of time the plank was held decreased as weight status increased for youth. Thus, overweight status in the current study seems to have a negative effect with measures that involved lifting the body. Overweight among preservice physical education teachers may pose a significant physical problem during the performance of physically demanding tasks in the future.

Additionally, in this study, the knowledge and understanding domain of physical literacy was low and an inverse association was found between cognitive factors and physical competence domain, including physical fitness and motor performance among PETE preservice physical educators. Hence, the insufficient level of relevant knowledge and understanding of physical fitness might explain the poor performance in the physical competence domain. Keating, Silverman, and Kulinna (2002) pointed out that PETE students had only slightly positive attitudes toward physical fitness tests and did not believe strongly that physical fitness tests were important or useful. Castelli and Williams (2007) found that physical education teachers were very confident in their knowledge of health-related physical fitness; however, their test scores did not meet the standard of achievement expected of a ninth-grade student. A physical educator is supposed to be a credible and reliable resource who provides information regarding the importance of health-related knowledge for students. However, consistent with previous findings, the findings in this study show a deficiency in health-related knowledge among PETE students. This issue is particularly important because of the growing prevalence of pediatric obesity and low levels of physical activity. PETE programs may need to prepare PETE preservice physical educators to enhance their personal health to effectively influence their effectiveness as future physical education teachers.

Surprisingly, participants performed similar daily walking steps as a 12-year-old student. However, light physical activity, such as walking steps, may not be sufficient enough to maintain and promote physical fitness and motor behavior. Moderate-to-vigorous physical activity (MVPA) appears more important than light physical activity for muscular fitness and many motor behaviors, such as bone mineral density, lower limb muscle strength, functional mobility, and balance (Wu et al., 2017). Barnett, Lubans, Salmon, Timperio, and Ridgers (2017) demonstrated that the level of physical activity may predict motor performance in young adults. Specifically, they found that a high level of total physical activity was able to predict low target deviation in an unpracticed bimanual coordination task. Further, Gutin, Yin, Humphries, and Barbeau (2005) indicated that vigorous physical activity explained more variance in cardiovascular fitness and the percentage of body fat after controlling for age, sex, and race. Thus, it seems as if the amount of MVPA may be pivotal to improving aerobic capacity, muscular fitness, body composition, and motor behavior. On the other hand, there was no relationship between cognitive factors and daily physical activity level in this study, even though Chen et al. (2017) suggested that level of knowledge is a strong predictor of the time spent in physical activity. Future studies should include a measure to assess the time spent in MVPA and its effect on other domains of physical literacy.

This study acknowledges some limitations and that future studies will be needed. First, this study had a small sample size. All of the participants came from the same PETE program and their learning in the program may have affected the results, although the differences were evident with moderate to strong effect sizes. This preliminary result is promising but needs to be replicated with a larger sample to reduce bias and errors. Furthermore, the concept of physical literacy was adopted from Tremblay and Lloyd (2010) and included partial measures from the CAPL. Thus, the current findings may not truly capture overall levels of physical literacy among participants. In addition, steps in this study may not differentiate levels of physical activity that are associated with physical fitness and motor performance (Wu et al., 2017). Hence, it is recommended that future studies include other physical activity measures, such as MVPA time, to identify whether they can sustain physical competence.

In summary, the findings of this study indicate preservice physical educators demonstrate a low level of physical literacy compared to a 12-year-old Canadian student. In particular, consistent with previous studies (Disch, Santiago, & Morales, 2012; Miller & Housner, 1998), preservice physical educators in this study scored poorly on the knowledge instrument. This is the first study that has explored physical literacy in physical educators. Therefore, these findings will be useful for teachers and policymakers to review current teacher education curriculum and emphasize the health-related interactions and life experiences of future physical educators. Further studies are needed to replicate the findings of this study through a large sample size and more physiological measures to enhance understanding of the level of physical literacy and physical activity and knowledge status in physical educators.

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# Appendix A

## Online Questionnaire for Knowledge and Understanding

In this project, when we talk about physical activity, we mean when you are moving around, playing, or exercising. Physical activity is any activity that makes your heart beat faster or makes you get out of breath some of the time. Why are we asking you these questions? We want to know what teacher candidates like you think about physical activity, sports, and exercise.

Please remember:

- There are no right or wrong answers. We only want to know what you think.
- If you do not know an answer, please write your best guess.
- There is no time limit, so please take all the time you need.

1. **What grade are you in: (please select one)**
   - ○ Freshman
   - ○ Sophmore
   - ○ Junior
   - ○ Senior
2. **Are you a: (please select one)**
   - ○ Male
   - ○ Female
3. **Please enter your birthday**
   MM /DD/YYYY
4. **How many minutes each day should children do physical activities that make their heart beat faster and make them breathe faster, like walking fast or running? Count the time they should be active at school and also the time they should be active at home or in their neighborhood.**
   - ○ 10 minutes
   - ○ 20 minutes
   - ○ 30 minutes
   - ○ 30 minutes to 1 hour

5. **Sometimes children watch television, play video games, or play on the computer or on a smartphone. What is the most time that children should look at a screen each day? Do not count the time that they have to look at a screen to do homework.**
   - ○ 30 minutes
   - ○ 30 minutes to 1 hour
   - ○ 2 hours
   - ○ 4 hours
6. **There are many different kinds of fitness. One type is called endurance fitness, aerobic fitness, or cardiorespiratory fitness. Cardiorespiratory fitness means…**
   - ○ How well muscles can push, pull, or stretch
   - ○ How well the heart can pump blood and the lungs can provide oxygen
   - ○ Having a healthy weight for our height
   - ○ Our ability to do sports we like
7. **Muscular strength or muscular endurance means...**
   - ○ How well the muscles can push, pull, or stretch
   - ○ How well the heart can pump blood and the lungs can provide oxygen
   - ○ Having a healthy weight for our height
   - ○ Our ability to do the sports we like
8. **Select all that apply to what you feel describes what healthy means**
   - ☐ Being skinny
   - ☐ Eating well
   - ☐ Not being sick
   - ☐ Looking good
   - ☐ Feeling good

9. **This story about Sally is missing some words. Fill in the missing words below. Each word can only be used to fill one blank space in the story.**

   **Word Bank: Fun, Endurance, Good, Pulse, Strength**

   **Sally tries to be active every day. Running every day is good for her heart and lungs. Sally thinks that physical activity is ____________and is also ____________ for her. At her sport team's practice she does more running to improve her ________________. The team also does exercises like push-ups and sit-ups that increase her ________________. After exercising, she checks her heart rate which is also called a ______________.**

   First blank ________________________________________
   Second blank ______________________________________
   Third blank ________________________________________
   Fourth blank ______________________________________
   Fifth blank ________________________________________

10. **Select which activities you always or almost always wear safety gear (like helmet or shin pads) when you do the activity.**
    - ☐ Hunting
    - ☐ Monkey Bars
    - ☐ Skateboarding
    - ☐ Swinging
    - ☐ Skipping
    - ☐ Biking
    - ☐ Baseball
    - ☐ Swimming
    - ☐ Running
    - ☐ Waterskiing
    - ☐ Inline Skating

**11. If you wanted to GET BETTER AT A SPORT SKILL like kicking and catching a ball, what would be the best thing to do?**

- ○ Read a book about kicking and catching a ball
- ○ Wait until you get older
- ○ Try exercising or being active a lot more
- ○ Watch a video, take a lesson, or have a coach teach you how to kick and catch

**12. If you wanted to IMPROVE YOUR FITNESS, what would be the best thing to do?**

- ○ Read a book about improving your fitness
- ○ Wait until you get older
- ○ Try exercising or being active a lot more
- ○ Watch a video, take a lesson, or have a coach teach you how to improve your fitness

**13. If you were allowed to pick what you do after school, which activity would you pick?**

- ○ Play video/computer games
- ○ Go to my sports team's practice
- ○ Read
- ○ Walk my dog
- ○ Do homework
- ○ Chat with friends online
- ○ Play outside with my friends
- ○ Watch television

## Thank You

**Thank you for taking the time to complete this survey.**

# Appendix B

## Physical Fitness and Motor Performance Data Collection Sheet

**Participant:** ________________________________________
**Test Date:** ____ /_____ /_____
**Examiner(s):** ______________________________________

| | | | |
|---|---|---|---|
| **Age of Participant** ___ | **Gender** Male/Female (Circle) | | |
| **Body Weight** _______ **(kg)** _______ **(kg)** | **Waist Circumference** _______ **(cm)** _______ **(cm)** | **Height** _______ **(cm)** | **Percentage of Body Fat** _______ **(%)** |
| **Pacer Laps (20 m)** _____ | | | |
| **Left Handgrip 1** _________ **(kg)** | **Left Handgrip 2** _________ **(kg)** | **Right Handgrip 1** _________ **(kg)** | **Right Handgrip 2** _________ **(kg)** |
| **Plank Time** _______ **(s)** | | | |
| **Obstacle Course Time 1** __________ **(s)** | **Obstacle Course Score 1** ___________ | **Obstacle Course Time 2** __________ **(s)** | **Obstacle Course Score 2** ___________ |

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PHYSICAL FITNESS

# The Relationship of Sport Involvement and Gender to Physical Fitness, Self-Efficacy, and Self-Concept in Middle School Students

*Kristina Clevinger, Trent Petrie, Scott Martin, Christy Greenleaf*

## Abstract

*Sport involvement may offer physical and psychological benefits to early adolescents beyond those accrued through physical activity (PA). Those benefits, though, may be moderated by gender. The purpose of this study was to examine these potential benefits in a middle school population. The sample consisted of 629 sixth graders enrolled in a physical education (PE) course. Students completed self-report measures on sport involvement, PA self-efficacy, and physical self-concept. During PE, students completed FitnessGram testing, which provided measurements of cardiorespiratory fitness (CRF), muscular strength and flexibility, and body composition. MANCOVA analyses were used to examine the interaction between sport involvement and gender in relation to the psychological and physical outcomes. Multivariate analyses demonstrated no Sport × Gender interactions for any outcome; sport involvement, however, was related significantly to improvements in CRF, muscular strength, PA self-efficacy, and physical self-concept (aerobic endurance and muscular strength). The findings suggest that*

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*sport involvement, above what may be attained through standardized, school-based PE experiences, uniquely provides physical and psychological benefits for early adolescents.*

For many children and adolescents, physical activity (PA) often occurs during their school physical education (PE) classes (Jago et al., 2009; Sallis et al., 2012). Despite that many U.S. students aged 6 to 14 years are required to participate in PE, fewer than half meet current guidelines of at least 60 min of moderate to vigorous PA (MVPA) daily (Fakhouri et al., 2014; Troiano et al., 2008). Further, a recent meta-analysis reported that students are spending just 43% of their PE class time in MVPA (Lonsdale et al., 2013). Thus, to achieve recommended daily PA levels and accrue associated health and fitness benefits, students must be active through other venues, such as sport participation. The extent to which sport participation provides to students health and fitness benefits that are independent of those resulting from involvement in mandatory PE experiences, however, remains unclear (Barr-Anderson et al., 2007; Renfrow, Caputo, Otto, Farley, & Eveland-Sayers, 2011).

The importance of PA in children's and adolescents' health and well-being is clear, often leading to improvements in cardiorespiratory fitness (CRF), body composition, and muscular strength (Aires et al., 2010; Faigenbaum et al., 2002; Nader, Bradley, Houts, McRitchie, & O'Brien, 2008), and to increases in PA self-efficacy and physical self-concept (Dunton, Schneider, Graham, & Cooper, 2006; Strauss, Rodzilsky, Burack, & Colin, 2001). Self-concept, in particular, also has been associated with beneficial outcomes, including improved fitness and overall self-esteem (Dunton et al., 2006; Greenleaf, Petrie, & Martin, 2014). Both PA self-efficacy and physical self-concept appear to have a bidirectional relationship with PA (McAuley & Blissmer, 2000; Weiss, 2000), which may help children maintain, and even increase, their PA levels. Further, many health risk factors originate in childhood and adolescence, and improved fitness during this time is associated with continued PA, development of protective factors against the risk of health concerns (e.g., improved metabolic profile to protect against cardiovascular disease), and improved physical health in adulthood (Landry & Driscoll, 2012; Ortega, Ruiz, Castillo, & Sjostrom, 2008).

Sport is another modality through which children can be physically active and may accrue physical and psychological health benefits. Sport participation has been found to result in up to an additional 20 min of MVPA each day and a fifteenfold increase in the odds of children reaching recommended daily activity levels (Hebert, Moller, Andersen, & Wedderkopp, 2015), as well as students being able to meet an increasing number of physical fitness health standards (Renfrow et al., 2011). Relatedly, middle school students' participation in any sport (compared to no sports) was associated with a reduction in BMI and a significant decrease in the likelihood of being classified as overweight or obese (Romani, 2011). These studies do not address the extent to which such improvements in fitness extend beyond what is accrued through involvement in PE classes. Further, children and adolescents who participate in sport are more likely to be involved in PA as adults (Perkins, Jacobs, Barber, & Eccles, 2004), yet there is a minimal relationship between childhood total PA or leisure activity and adult fitness activities (Cleland, Dwyer, & Venn, 2012). Thus, youth sport participation may be the primary factor determining engagement in future PA and predicting health benefits in adulthood.

Sport participation also appears to have positive effects on PA self-efficacy and physical self-concept (Barr-Anderson et al., 2007; Klomsten, Skaalvik, & Espnes, 2004). Researchers have found that structured forms of PA (e.g., sport and PE) are related to higher scores on PA self-efficacy and several domains of physical self-concept (Barr-Anderson et al., 2007; Dishman et al., 2006; Klomsten et al., 2004); these studies, however, often have not examined the effects of sport involvement separate from other forms of PA or how increased sport involvement may provide additional benefits. Thus, more research is needed to delineate the relationship between sport and self-perception variables independent of school-based PE requirements.

In a study of sport participation and the associated fitness outcomes, potential gender effects should be considered. Although current recommendations are that boys and girls engage in similar levels of PA (U.S. Department of Health and Human Services, 2008), girls participate in less daily PA than boys (Belcher et al., 2010; Nader et al., 2008). Further, boys are more likely than girls to reach recommended PA levels and meet an increased number of health standards when they engage in sport (Marques, Ekelund, & Sardinha, 2016; Renfrow et al., 2011). Gender differences also have been found with self-concept, and such differences typically follow gender stereotypes (Klomsten et al., 2004; Marsh, 1989). For example, boys scored significantly higher on all concept dimensions related to physical ability with the exception of flexibility, which is typically characterized as feminine (Klomsten et al., 2004; Marsh, 1989). In terms of PA self-efficacy, boys tend to score significantly higher than girls, which may explain higher overall PA levels; however, PA self-efficacy is a stronger correlate of PA in girls (Trost et al., 1996; Spence et al., 2010). Thus, PA self-efficacy may be particularly important for girls, though no studies have examined the interaction of gender and sport involvement in relation to these outcomes.

Expanding from previous research (e.g., Klomsten et al., 2004; Renfrow et al., 2011), we examined the interaction of sport participation and gender in relation to objective measures of physical fitness (CRF, muscular strength, flexibility, and body composition), and self-reported PA self-efficacy and physical self-concept (strength, aerobic endurance, flexibility). We controlled for the students' level of school-based PA by including only students who were enrolled in standardized PE classes. We hypothesized that (a) more involvement in organized sport would be related to better fitness levels, higher PA self-efficacy, and stronger physical self-concept and (b) boys would score better on all fitness measures except flexibility and higher on all dimensions of physical self-concept (except flexibility) and PA self-efficacy. Our tests of interaction effects were exploratory; thus, no specific hypotheses were made regarding the extent to which gender might moderate the aforementioned relationships between sport participation and our outcomes.

## Method

### Participants

Male ($n$ = 261) and female ($n$ = 368) sixth graders from a school district located in a large suburban area in the South Central United States participated. The school district provided data on participants' gender, age, race/ethnicity, and meal status. Mean age was 11.39 years ($SD$ = .51). The majority were White/non-Hispanic (58.5%, *n* = 368), followed by Hispanic/Latino (21.8%, *n* = 137), Black (8.7%, *n* = 55), Asian American (3.8%, *n* = 24), American Indian/Alaska Native (0.8%, *n* = 5), and biracial (0.8%, *n* = 5); 5.6% (*n* = 35) were not classified. One hundred seventy (27.0%) received either free or reduced-price lunch through the school district. Regarding participation on organized sport teams, students answered the question, "During the last year (12 months), on how many different sports or sport teams did you play (Include any teams run by your community or private clubs/academies);" 27.0% (*n* = 170) played on 0, 44.5% (*n* = 280) on 1 or 2, and 28.5% (*n* = 179) on 3 or more. Within this school district, sixth-grade students were required to participate in PE classes that had a standardized curriculum; they were not, however, allowed to play any in-school sports. Thus, all students were exposed to the same school-based PA through their PE classes; sport participation occurred outside of school.

## Instruments

**Cardiorespiratory fitness.** CRF was measured by the Progressive Aerobic Cardiovascular Endurance Run (PACER; Plowman & Meredith, 2013), which is part of the FitnessGram protocol. The PACER involves completion of a 20-m shuttle run within specified time intervals that become progressively shorter each minute, requiring participants to increase their pace to complete each lap within the allotted time span. The total score is the number of 20-m laps completed in compliance with FitnessGram testing guidelines. Intraclass reliability coefficients have ranged from .64 to .93, and concurrent validity was established through correlations with $VO_2$ max (Plowman & Meredith, 2013).

**Physical strength.** Physical strength was represented by three tests from the FitnessGram protocol: curl-ups (abdominal strength and endurance), push-ups (strength and endurance of the upper arms and shoulder girdle), and trunk lift (trunk extensor strength and flexibility). Total scores for the curl-up and push-up tests were represented by the total number completed based on FitnessGram testing guidelines. For the trunk lift test, the total score was the highest of the three measurements, which could not exceed 12 in. The reliabilities and validities of these tests are well-established (Meredith & Welk, 2013; Plowman & Meredith, 2013).

**Flexibility.** Hamstring flexibility in each leg was assessed via the FitnessGram back-saver sit and reach (Meredith & Welk, 2013). Total score for each leg can range from 0 to 12 in. Interrater reliabilities have ranged from .93 to .99 across a broad range of ages (6 to 41 years). Criterion tests of hamstring flexibility utilizing flexometer, goniometer, and inclinometer measurements in comparison with the sit and reach and other flexibility measurements show moderate to high correlations, ranging from .39 to .89 (Plowman & Meredith, 2013).

**Body composition.** Body mass index (BMI) percentile was used to represent body composition, which is an acceptable approach in large-scale field testing (Plowman & Meredith, 2013). Height was recorded to the nearest half inch and weight was obtained using a Seca digital scale and recorded to the nearest 0.1 lb. BMI was calculated via the FitnessGram computer program (Meredith & Welk, 2013) and then converted to a percentile based on sex and age (Centers for Disease Control and Prevention, 2015). Laurson, Eisenmann, and Welk (2011) found that approximately 90% of children aged 5 to 18 years were correctly classified into their percentage body fat group via BMI.

**Physical activity self-efficacy.** The eight-item Physical Activity Self-Efficacy Scale (PASES; Motl et al., 2000) measures the extent to which children believe they are able to be physically active across a range of situations. On items such as "on most days, I can be physically active even if it is very hot or cold outside," students responded from 1 (*disagree a lot*) to 5 (*agree a lot*). Total score is the mean and can range from 1 (*low efficacy*) to 5 (*high efficacy*). In a sample of fourth and fifth graders, Bartholomew, Loukas, Jowers, and Allua (2006) reported Cronbach's alphas that ranged from .74 to .88; the alpha for our study was .85. Through confirmatory factor analyses, the PASES has demonstrated factorial validity and factorial invariance (Motl et al., 2000).

**Physical self-concept.** We used three items from the Physical Self-Description Questionnaire (PSDQ; Marsh, Richards, Johnson, Roche, & Tremayne, 1994) to measure students' beliefs about their strength ("I am a physically strong person"), flexibility ("My body is flexible"), and aerobic endurance ("I can run a long way without stopping"). Each item was rated on a 6-point scale from 1 (*false*) to

6 (*true*). Among high school students, Marsh (1996) reported internal consistency reliabilities of above .90 for the scales that included these items. Specific to the items chosen for our study, all had factor loadings that exceeded .79 on their original scales (Marsh et al., 1994). We selected these three items because of their high factor loadings, their face validity, their significant relationships with the physical fitness outcomes assessed in this study (Greenleaf et al., 2014), and the need to work within class time limits.

**Pubertal development.** The five-item Pubertal Development Scale (PDS; Peterson, Crockett, Richards, & Boxer, 1988) measures physical development in children and adolescents. For each question, such as "Would you say your growth in height . . .," participants responded by indicating the extent to which this change was complete, ranging from 1 (*not yet started*) to 4 (*seems complete*). Although total scores for each gender are based on five items, boys and girls share only three (i.e., changes in body hair, skin, and growth spurt); each have two that are unique (boys—voice, facial hair; girls—breasts, menarche). Total scores are the mean of each gender's items and can range from 1 (*no development*) to 4 (*development already past*). Cronbach's alphas have ranged from .68 to .83 for adolescents (Peterson et al., 1988); alphas from this study were .75 (boys) and .73 (girls). Bond et al. (2006) recommended that the PDS be used in research studies with adolescents because it provides the most valid measure.

## Procedure

We obtained approval for the study through the university's institutional review board, school district administrators, and the middle school principals. Students were provided parental consent and child assent forms through their PE classes; only students who returned the completed consents (and assents) participated. As part of state-mandated fitness testing, we administered the FitnessGram tests during regularly scheduled PE classes. Students also completed questionnaires during the FitnessGram testing period; questionnaires were coded with the students' district identification number so data could be matched from different sources. At each school, participants were entered into a random drawing to win $10.00 cash prizes.

## Data Analysis

First, we examined all PDS, PASES, and physical self-concept items; values were missing completely at random and ranged from 0.70% to 6.00% ($M$ = 2.04%). We used expectation maximization to impute values. We then examined the distribution of each measure; skewness and kurtosis were within acceptable limits and no significant outliers existed. To examine the primary research question, which was the relationship of sport participation (i.e., none, 1–2, or 3+) and gender (boys vs. girls) to cardiorespiratory and physical fitness, body composition, physical self-concept, and PA self-efficacy, we used a series of multivariate analyses of covariance (MANCOVA). The dependent variables were grouped into physical fitness measures (i.e., BMI, PACER, curl-up, push-up, trunk lift, and sit and reach) and self-perception measures (i.e., PASES and the aerobic endurance, flexibility, and strength scores from the PSDQ). PDS was used as a covariate in the analyses to control for any effects pubertal development might have had on the outcomes in the study (Greenleaf et al., 2014).

# Results

## Physical Fitness Measures

The Gender × Sport Involvement interaction was not significant, Pillai's trace = .023, $F(14, 1234) = 1.033$, $p = .417$, partial $\eta^2 = .012$. However, both sport involvement, Pillai's trace = .094, $F(14, 1234) = 4.335$, $p < .0001$, partial $\eta^2 = .047$, and gender, Pillai's trace = .264, $F(7, 616) = 31.581$, $p < .0001$, partial $\eta^2 = .264$, as well as the covariate PDS, Pillai's trace = .061, $F(7, 616) = 5.693$, $p < .0001$, partial $\eta^2 = .061$, were significant.

**Sport involvement.** Students, regardless of gender, who participated in sports at any frequency (i.e., 1–2 or 3+ sports) scored significantly higher than those who did not on the number of push-ups completed (1–2 sports: Cohen's $d$ =.19; 3+ sports: Cohen's $d$ =.34) and on their trunk lift (1–2 sports: Cohen's $d$ = .30; 3+ sports: Cohen's $d$ = .35). Additionally, students who participated in 3+ sports scored significantly higher on the number of curl-ups completed (Cohen's $d$ = .38) and had significantly higher BMI levels (Cohen's $d$ = .25) than the sixth graders who did not participate in any sports; students who participated in 1–2 sports were not significantly different from either group on these two outcomes. For the PACER, the students who participated in 3+ sports ran more laps than those who took part in 1–2 sports (Cohen's $d = .24$) and those who were not involved in sport (Cohen's $d = .64$); students in 1–2 sports scored significantly higher than those in no sports (Cohen's $d = .39$). There were no significant differences across the three sport groups for hamstring flexibility on either leg. See Table 1.

**Table 1**
*Adjusted Means, Standard Error, and F Values for Outcome Variables by Sport Level*

| | 0 sport teams ($n$ = 170) | | 1–2 sport teams ($n$ = 282) | | 3+ sport teams ($n$ = 179) | | |
|---|---|---|---|---|---|---|---|
| **Test** | ***M*** | ***SD*** | ***M*** | ***SD*** | ***M*** | ***SD*** | ***F*** |
| PACER | $25.65_{a}$ | 1.14 | $30.95_{b}$ | .91 | $34.34_{c}$ | 1.10 | 15.24*** |
| Curl-Up | $40.71_{a}$ | 1.72 | $44.92_{a,b}$ | 1.37 | $48.09_{b}$ | 1.65 | 4.80** |
| Push-Up | $14.79_{a}$ | .69 | $16.71_{b}$ | .55 | $17.27_{b}$ | .67 | 3.69* |
| Trunk Lift | $8.86_{a}$ | .15 | $9.41_{b}$ | .12 | $9.65_{b}$ | .15 | 7.18*** |
| Back Saver S & R - Left | 9.95 | .14 | 10.28 | .11 | 10.17 | .13 | 1.72 |
| Back Saver S & R - Right | 10.00 | .15 | 10.30 | .12 | 10.24 | .14 | 1.32 |
| BMI Percentile | $55.83_{a}$ | 2.34 | $60.53_{a,b}$ | 1.87 | $64.84_{b}$ | 2.25 | 3.85* |
| PA Self-Efficacy | $3.17_{a}$ | .06 | $3.46_{b}$ | .05 | $3.74_{c}$ | .06 | 20.45*** |
| Strength Self-Concept | $4.26_{a}$ | .10 | $4.81_{b}$ | .08 | $5.00_{b}$ | .09 | 16.15*** |
| Flexibility Self-Concept | 4.19 | .11 | 4.22 | .09 | 4.19 | .11 | .03 |
| Aerobic Endurance Self-Concept | $3.63_{a}$ | .11 | $4.05_{b}$ | .09 | $4.31_{b}$ | .11 | 9.34*** |

*Note*. Means that do not share common subscripts are significantly different at $p < .05$. PACER (Progressive Aerobic Cardiovascular Endurance Run; 0, *low,* to 85, *high*); Curl-Up (0, *low,* to 75, *high*); Push-Up (0, *low*, to unlimited high score); Trunk Lift (0 in., *low,* to 12 in., *high*); Right and Left Back-Saver Sit and Reach (0 in., *low*, to 12 in., *high*); BMI (kg/m2); PA Self-Efficacy (Physical Activity Self-Efficacy Scale; 1, *low efficacy*, to 5, *high efficacy*); Strength, Flexibility, and Aerobic Endurance Self-Concept (Physical Self-Description Questionnaire; 1, *low self-concept,* to 6, *high self-concept*).

*$p < .05$. **$p < .01$. ***$p \le .001$.

**Gender.** Girls were significantly more flexible in terms of their hamstrings (left: Cohen's *d* = .93; right: Cohen's *d* = .86) and performed better on the trunk lift (Cohen's *d* = .46) than the boys. Boys, on the other hand, did more PACER laps (Cohen's *d* = .38), push-ups (Cohen's *d* = .51), and curl-ups (Cohen's *d* = .32) than the girls. There were no significant differences on BMI. See Table 2.

**Table 2**
*Adjusted Means, Standard Error, and F Values for Outcome Variables by Gender*

| | **Male ($n$ = 261)** | | **Female ($n$ = 370)** | | |
|---|---|---|---|---|---|
| **Test** | ***M*** | ***SD*** | ***M*** | ***SD*** | ***F*** |
| PACER | $32.90_a$ | .94 | $27.75_b$ | .81 | 16.68*** |
| Curl-Up | $47.81_a$ | 1.41 | $41.32_b$ | 1.22 | 11.79*** |
| Push-Up | $18.42_a$ | .57 | $14.09_b$ | .49 | 32.31*** |
| Trunk Lift | $8.83_a$ | .13 | $9.78_b$ | .11 | 31.81*** |
| Back Saver S & R - Left | $9.25_a$ | .12 | $11.01_b$ | .10 | 131.57*** |
| Back Saver S & R - Right | $9.33_a$ | .12 | $11.04_b$ | .11 | 108.46*** |
| BMI Percentile | 61.05 | 1.92 | 59.75 | 1.66 | .25 |
| PA Self-Efficacy | 3.40 | .05 | 3.51 | .05 | 2.23 |
| Strength Self-Concept | 4.68 | .08 | 4.69 | .07 | .005 |
| Flexibility Self-Concept | $4.04_a$ | .09 | $4.37_b$ | .08 | 7.12** |
| Aerobic Endurance Self-Concept | $4.15_a$ | .09 | $3.84_b$ | .08 | 6.23* |

*Note*. Means that do not share a common subscript are significantly different at $p < .05$. PACER (Progressive Aerobic Cardiovascular Endurance Run; 0, *low,* to 85, *high*); Curl-Up (0, *low,* to 75, *high*); Push-Up (0, *low*, to unlimited high score); Trunk Lift (0 in., *low,* to 12 in., *high*); Right and Left Back-Saver Sit and Reach (0 in., *low*, to 12 in., *high*); BMI (kg/m2); PA Self-Efficacy (Physical Activity Self-Efficacy Scale; 1, *low efficacy*, to 5, *high efficacy*); Strength, Flexibility, and Aerobic Endurance Self-Concept (Physical Self-Description Questionnaire; 1, *low self-concept,* to 6, *high self-concept*).

*$p < .05$. **$p < .01$. ***$p \leq .001$.

### Self-Perception Measures

Neither the PDS covariate, Wilks' Lambda = .991, $F(4, 619) = 1.479$, $p = .207$, partial $\eta^2 = .009$, nor the Gender × Sport Involvement interaction, Wilks' Lambda = .986, $F(8, 1238) = 1.110$, $p = .353$, partial $\eta^2 = .007$, were significant. The main effects for sport involvement, Wilks' Lambda = .899, $F(8, 1238) = 8.503$, $p < .0001$, partial $\eta^2 = .052$, and gender, Wilks' Lambda = .960, $F(4, 619) = 6.490$, $p < .0001$, partial $\eta^2 = .040$, were significant.

**Sport involvement.** Students, regardless of gender, who participated in sport at any frequency (i.e., 1–2 or 3+ sports) scored significantly higher than those who did not participate on strength (1–2 sports: Cohen's $d = .39$; 3+ sports: Cohen's $d = .55$) and aerobic endurance (1–2 sports: Cohen's $d = .29$; 3+ sports: Cohen's $d = .47$) self-concepts; there were no differences on their flexibility self-ratings. PA self-efficacy was highest among students who participated in 3+ sports compared to 1–2 sports (Cohen's $d = .35$) or no sports (Cohen's $d = .67$); students who played 1–2 sports (Cohen's $d = .33$) scored significantly higher than the no sport participants. See Table 1.

**Gender.** Girls scored significantly higher on their flexibility (Cohen's $d = .19$) and boys significantly higher on their aerobic endurance (Cohen's $d = .22$) self-concept. There were no significant differences for strength self-concept and PA self-efficacy. See Table 2.

## Discussion

Our findings, which are consistent with findings in previous research (e.g., Barr-Anderson et al., 2007; Hebert et al., 2015; U.S. Department of Health and Human Services, 2008; Marsh, Gerlach, Trautwein, Lüdtke, & Brettschneider, 2007; Marques et al., 2016; Renfrow et al., 2011), indicate that being more involved in sport is associated with higher levels of fitness (i.e., cardiorespiratory, strength, and endurance) and of PA self-efficacy and aerobic endurance and strength self-concepts. These findings existed even after controlling for school-based PA opportunities and pubertal development. Playing sports appears to provide students with additional opportunities to engage in PA and, as a result, improve their physical fitness across multiple domains. Sport participation also may contribute to increases in PA self-efficacy beliefs when children and adolescents learn that sport affords them some control over their ability to be physically active. Further, as the students improved their fitness levels, they likely experienced development in their self-concept across parallel domains (Marsh et al., 2007). Thus, it follows that because no significant differences were found in the students' flexibility levels, this self-concept would not be significantly different based on sport involvement either.

Although BMI is an appropriate and acceptable proxy for body composition, particularly in large, field-based studies (Centers for Disease Control and Prevention, n.d.), it does not differentiate well between fat and fat-free mass. Though our findings were inconsistent with previous research that has shown sport involvement to be associated with a reduction in BMI (Romani, 2011), this lack of differentiation may explain why the sixth graders who participated in 3+ sports had the highest BMI percentile. Given these students were stronger and had higher levels of CRF than those engaged in fewer sports, their larger BMI level may have represented the presence of more fat-free mass (muscle) as opposed to body fat. Future research could use more sensitive measures of body composition (e.g., skinfold measurements; Meredith & Welk, 2013) to examine this possibility more directly.

Consistent with past research (Marques et al., 2016; Renfrow et al., 2011), the girls had lower levels of CRF and muscular strength than the boys but demonstrated better flexibility; the boys' and girls' physical self-concept closely mirrored their physical fitness. One possible explanation is that, even if not consciously aware of the influences of gender socialization (Plaza, Boiche, Brunel, & Ruchaud, 2017), the boys and girls in our study may have chosen to engage in gender-stereotypical physical activities (e.g., strength-based sports such as football for boys) outside of school. If so, they likely would have been more advanced in comparable areas of physical fitness, such as muscular strength for boys and flexibility for girls, which is what we found in our study. No significant differences emerged for strength self-concept despite boys performing better on physical strength tests. Strength self-concept, however, may trail gender differences in actual tests of muscular strength and be more strongly related to pubertal development and increases in muscularity (Klomsten et al., 2004). In our study, the boys rated their pubertal development as just beginning, indicating that they had not experienced large increases in muscle mass yet, which thus potentially tempered their perceptions of themselves as strong.

There were no gender differences on PA self-efficacy and given boys and girls had similar rates of PA and sport involvement, this finding is not surprising. In our study, 73% of the boys and 73% of the girls engaged in sport, which provided relatively equal, and additional, opportunities to be physically active. This equal level of participation may partially explain why gender did not moderate the relationship between sport participation and any of the outcomes in our study despite evidence that girls have tended to engage in less daily PA than boys (Belcher et al., 2010; Nader et al., 2008). It is heartening that equal percentages of girls and boys participated in sport, given that sport experiences afford opportunities for increased PA, which may lead to increases in physical fitness and improvements in future physical and psychological health (e.g., Aires et al., 2010; Faigenbaum et al., 2002; Hebert et al., 2015; Nader et al., 2008; Dunton et al., 2006; Strauss et al., 2001).

There are limitations that deserve discussion. First, although this approach has been taken in past research (e.g., Barr-Anderson et al., 2007; Dunton et al., 2006; Klomsten et al., 2004; Renfrow et al., 2011; Strauss et al., 2001), we only used self-report measures to determine students' sport involvement and self-perceptions, which may introduce social desirability bias. However, the significant associations with the objective measures of physical fitness (e.g., higher levels of CRF were associated with stronger aerobic endurance self-concept) suggest that the self-perception questions were valid. Second, the study was cross-sectional and thus determinations of the temporal relationships among the variables cannot be made. For example, it is possible that because of their higher levels of CRF and strength, fit students choose to participate in more sports, which in turn, can lead to even more improvements in fitness levels. Longitudinal studies are needed to determine if sport participation, over time, does indeed lead to expected improvements in fitness and self-perceptions. Finally, we did not assess for each student's level of PA, but rather controlled for PA by only including students enrolled in standardized school-based PE. Given our large-scale field testing, such individualized measurement of students' PA levels was not feasible. However, our findings now provide support for future studies where researchers take a more controlled approach to assessing individual levels of PA and sport involvement in smaller samples of students. Such an approach would allow researchers to determine the extent to which sport predicts higher levels of PA and the subsequent development of physical fitness.

Overall, our findings suggest that sport participation during early adolescence may play an important role in the development of physical fitness and positive physical self-perceptions, even beyond the benefits accrued through required, school-based PE classes. Sport provides a unique avenue through which early adolescents can develop their physical fitness during a time when many are not otherwise meeting recommended PA guidelines (Fakhouri et al., 2014; Troiano et al., 2008). Future research utilizing longitudinal data could provide more specific information about how sport contributes to early adolescents' overall health and fitness.

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YOU AND THE LAW

# Private Citizen Versus Public Official: A Case Analysis of Coaches' Freedom of Religion

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*Joseph A. Kennedy v. Bremerton School District*
United States Court of Appeals for the Ninth Circuit
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## Abstract

*When does the establishment clause end and the free exercise clause begin for public school coaches? As public officials, sport coaches are subject to constitutional restrictions prohibiting the endorsement of religion, which may in turn infringe upon their rights as private citizens. In the case of Joseph A. Kennedy v. Bremerton School District (2017), Coach Kennedy was restricted from praying on the 50-yard line immediately after football games in view of students and parents and subsequently filed a lawsuit claiming violation of his freedom of religion. The purpose of this law review is to analyze the aforementioned case and provide implications for schools and coaches to protect individual civil liberties and mitigate legal liability.*

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## Facts of the Case

Joseph Kennedy was a high school football coach employed by Bremerton High School (BHS) in Kitsap County, Washington, from 2008 to 2015. While acting as a football coach, Kennedy often led students and other coaches in a locker room prayer before games, participated in team prayers after games, and could be observed kneeling in private prayer at the 50-yard line immediately following games. Over time, Kennedy's midfield prayer evolved into a larger demonstration as players from both BHS and the opposing team gathered around Kennedy, took a knee, and listened to motivational speeches containing religious content delivered by Kennedy. In September 2015, the school district became aware of Kennedy's involvement in these religious activities and sent him a letter notifying him of potential legal issues regarding the activities. The school advised Kennedy that he was "free to engage in religious activity, including prayer… [but] such activity must be physically separate from any student activity, and students may not be allowed to join such activity."

In response to the letter from Bremerton School District (BSD) Superintendent Aaron Leavell, Kennedy suspended his practice of leading an on-field prayer immediately following games; he instead waited for the field to clear before kneeling and praying by himself. After several weeks of complying in this manner, Kennedy wrote a letter to the school asking for a religious accommodation under the Civil Rights Act of 1964. In his request, Kennedy claimed that his postgame speeches occurred during "non-instructional hours" and did not endorse any single religion and he therefore planned to resume this practice. Kennedy's intention to resume his prayers at the October 16 game received large media attention, including media appearances by Kennedy. Following this game, Kennedy knelt and closed his eyes in prayer on the field; he was joined on the field by coaches and players from both teams and by members of the general public and media. After these events occurred, BSD made arrangements to restrict access and secure the field after games.

Following the October 16 demonstration, Leavell sent two more letters to Kennedy explaining the district felt his actions were not in compliance with BSD's policies. The school expressed concerns that Kennedy's actions interfered with his ability to perform his job, which included the supervision of students immediately after games. Additionally, the school expressed concern that Kennedy, who was wearing school attire and on school grounds during his prayer, could be viewed by a reasonable observer as representing the school while endorsing his religious beliefs. The district informed him that any religious activities he engaged in going forward should not be readily observable by students or the attending public. The district offered to accommodate Kennedy's religious beliefs by offering a private area to pray or allowing him to return to the field after students and fans had cleared the stadium.

After receiving these additional notices from the school, Kennedy continued his practice of praying on the field immediately after games, against the direction of the school. He was subsequently put on administrative leave. While on leave, Kennedy attended a game as a member of the public, wearing his school attire, and drew considerable media attention by performing his postgame prayer from the bleachers. After the football season ended, the athletic director recommended that Kennedy not be rehired and the school did not offer Kennedy a new contract after his expired.

## Case History

Kennedy's suit was filed in the Western District of Washington on August 9, 2016, on the grounds that his rights under the First Amendment were violated. In his complaint, Kennedy moved for a preliminary injunction requesting BSD to (1) cease discrimination against him that is in violation of the First Amendment, (2) reinstate Kennedy as the BHS football coach, and (3) allow him to kneel and pray on the 50-yard line immediately after BHS football games. To succeed in seeking a preliminary injunction, a plaintiff must establish (1) they are likely to succeed on the merits of their claim, (2) they are likely to suffer irreparable harm in the absence of preliminary relief, (3) the balance of equities tips in their favor, and (4) an injunction is in the public interest (*Sanders Cty. Republican Cent. Comm. v. Bullock*, 2012).

In review of the preliminary injunction request, the district court applied the five-step framework laid out in *Eng v. Cooley* (2009) to determine the likelihood to prevail. Within this framework, the plaintiff bears the burden of showing (1) their speech addressed an issue of public concern, (2) the speech was spoken in the capacity of a private citizen and not that as a public employee, and (3) the state "took adverse employment action" and that the speech was a "substantial or motivating" factor in the adverse action. Assuming the previous three steps have been met, the burden shifts to the government entity to show (4) there was adequate justification for treating the employee differently from any other member of the general public and (5) it would have taken the same actions in the absence of protected conduct.

Within the context of this framework, the district court denied the requested preliminary injunction, finding Kennedy was unlikely to prevail on the merits of his First Amendment retaliation claim. The court observed that Kennedy had been "dressed in school colors," chose a time and event that "is a big deal," and subsequently "used that opportunity to convey his religious views" while still being "responsible for the conduct of his students." Additionally, the court noted that Kennedy's prayer resulted in "subtle coercion," since athletes are "impressionable" and keen to "please" their coach to seek more playing time. As such, Kennedy would be seen as acting in the capacity of a public employee, not a private citizen. Furthermore, the court concluded that any reasonable observer would have concluded that Kennedy, as a coach, was leading an "orchestrated session of faith." Therefore, BSD was justified by their need to avoid violating the Establishment Clause. Kennedy filed for appeal.

## Case Analysis

On appeal, Kennedy argued the district court erred in their decision that he was unlikely to succeed on the merits of his legal complaint that BSD retaliated against him for exercising his right to free speech protected under the First Amendment. To evaluate Kennedy's First Amendment retaliation claim, the United States Court of Appeals for the Ninth Circuit utilized the First Amendment Retaliation Test in *Eng v. Cooley* (2009) as a guiding framework (see Case History). As the parties did not contest factors one, three, or five of the First Amendment Retaliation Test, the court of appeals focused on factors two and four in their deliberation.

### Private Citizen or Public Employee

To determine whether Kennedy's speech was spoken as a private citizen or public employee, the court of appeals utilized precedent, including *Pickering v. Board of Ed. Township High Sch. Dist.* (1968), *Garcetti v. Ceballos* (2006), *Johnson v. Poway Unified Sch. Dist.* (2011), and *Coomes v. Edmonds Sch. Dist. No. 15* (2016). As outlined in *Garcetti v. Ceballos* (2006), the court must first make a factual determination of Kennedy's job responsibilities and second determine the constitutional significance of Kennedy's job responsibilities, to discern whether his speech was spoken as a private citizen or public employee. The court of appeals' analysis was limited to relevant "speech at issue," involving Kennedy kneeling and praying on the 50-yard line *immediately* after football games *in view* of students and parents.

Among a number of job duties, the court of appeals found BSD required Kennedy to "be a coach, mentor, and role model for the student athletes," "exhibit sportsmanlike conduct at all times," "communicate effectively" with parents, "maintain positive media relations," acknowledge that he was "constantly being observed by others," "[o]bey all the Rules of Conduct before players and the public," "use proper conduct before the public and players," and endeavor to "create good athletes" and "good human beings" (*Kennedy v. Bremerton Sch. Dist.*, 2017). The evidence suggests Kennedy's speech at issue after games in view of students and parents was pursuant to his responsibilities to serve as a role model and moral exemplar. However, his rejection of BSD's accommodations and off-field conduct (i.e., media appearances, praying publicly in BHS apparel) suggests demonstrative communication intended to send a message. Moreover, Kennedy's acknowledgment that he was "constantly being observed by others" and insistence that his speech at issue occur in view of students and parents suggests his speech was not solely directed to God but also directed in part to the surrounding spectators. According to *Pickering v. Board of Ed. Township High Sch. Dist.* (1968) and *Johnson v. Poway Unified Sch. Dist.* (2011), school officials' conduct falls within the ordinary scope of their professional responsibilities when at a school function, in the presence of students, or when acting in a capacity perceived as official. As communication to students, parents, and spectators was found within the scope of Kennedy's duties, the demonstrative speech at issue was determined to occur while he acted in his official capacity as a football coach.

Kennedy's job as a football coach was deemed akin to being a teacher, "clothed with the mantle of one who imparts knowledge and wisdom" (*Johnson v. Poway Unified Sch. Dist.*, 2011). Further, Kennedy's expressions were considered to carry great weight, for it was observed that in Kennedy's absence, players elected to not pray on the field after games. As Kennedy's prayer celebrated sportsmanship—aligning with his job duty to "exhibit sportsmanlike conduct"—the speech at issue was considered to fall within the scope of his professional responsibilities and was thus subject to regulation. BSD's "Religious-Related Activities and Practices" policy does not prohibit prayer by employees while on the job, but rather stipulates that religious exercise must not interfere with an employee's job responsibilities or lead to a perception of BSD endorsing religion, per the Establishment Clause of the First Amendment. Not only did Kennedy's conduct violate this policy, but also per *Johnson v. Poway Unified Sch. Dist.* (2011), he "took advantage of his position to press his particular views upon the impressionable and captive minds before him" (followed by *Coomes v. Edmonds Sch. Dist. No. 15*, 2016). More specifically, Kennedy utilized his special access to the field as a football coach to pray on the 50-yard line immediately after games.

As Kennedy was not able to demonstrate the first three factors of the First Amendment Retaliation Test (*Eng v. Cooley,* 2009), the inquiry did not need to proceed to factor four. Therefore, the court of appeals affirmed the district court's judgment denying Kennedy's motion for preliminary injunction. Ultimately, the court of appeals recognized the important role of public worship for many communities, however, distinguished that such activities risk alienating community members and promoting disunity in a public environment intended to be inclusive and welcoming to all, thus justifying the preservation of religious practice for the private domain.

## Implications

As demonstrated in the case, there can be tension between the Establishment Clause and Free Exercise Clause of the First Amendment for public school officials seeking to observe their religious beliefs or practices while working in their official capacity. The following implications reflect strategies to mitigate legal liability while promoting religious freedoms:

1. **Accommodation:** The First Amendment of the U.S. Constitution and Title VII of the Civil Rights Act of 1964 require employers to accommodate the religious practices of employees, as long as the accommodation does not impose undue hardship on the employer (U.S. Equal Employment Opportunity Commission, n.d.). It would not be acceptable to simply bar a coach or school official from discussing their religion or use of their faith to inform guiding moral principles. Religious accommodations may include provision of private space for religious practice, exceptions to dress code policies, schedule changes, or excused leave. Sport administrators and coaches should also recognize their religious freedoms as private citizens and advocate for reasonable accommodation from their senior leadership to enable their observance of religious beliefs or practices. Similarly, schools should proactively develop policies that accommodate the varied religious practices of employees to create an inclusive environment, free of discrimination.
2. **Tradition:** While prayer may be traced across the history of sport traditions and rituals, tradition does not justify practices deemed unconstitutional, regardless of intent. When a school officials' conduct infringes upon the legally protected rights of others, such conduct becomes subject to institutional regulation. For example, though school sport initiation rituals may arguably enhance group cohesion, they may also be destructive to sport participants—such as hazing—and thus should be regulated by the school (Levinson-King, 2019). Sport administrators and coaches may allow the tradition of prayer before or after sport events to continue only if in appropriate contexts where school officials do not endorse religion nor infringe upon students' free exercise of religion.
3. **Media:** The activities of school administrators and coaches often garner public interest. Coaches may be interviewed or conduct postgame press conferences while still in their team's apparel. These appearances are often broadcast to innumerable viewers and may delve into the personal faith and philosophies of the coach and how those influence the team composition and results on the field. Addressing the media

is considered well within the scope of a coach's job responsibilities but could infringe upon the division of church and state. To help coaches successfully navigate media attention, schools should (1) Have a well-defined employee handbook that defines coach's job duties pertaining to engaging the public in their official capacity; (2) train coaches on how to appropriately communicate with the media; (3) provide supplemental training on managing issues likely to draw media scrutiny; (4) consult with public relations professionals before making public statements to the media; (5) draw clear distinctions about when an employee can make a media appearance in their school-branded attire, to help avoid the public–private confusion; and (6) adopt a proactive mindset to help conflicting situations from catching fire in the media—strong initial statements will make the school's position and actions clear.

4. **Chaplain:** The Freedom From Religion Foundation has notably filed complaints with public institutions based upon program inclusions of religion beyond moral, principle-based guidelines (e.g., Marcello, 2015). In response, many public institutions have designated chaplains to conduct faith-based activities. The sport chaplain role is typically an "unpaid, appointed position that allows the chaplain to remain neutral while serving administrators, coaches, and parents" (Waller, Dzikus, & Hardin, 2008, p. 108). Public schools interested in utilizing the services of a sport chaplain should examine chaplains' training and credentials to ensure they provide appropriate counsel equivalent to their certifications and do not expose the school to legal liability. The *FCA Chaplain Training Manual* is a resource that may aid schools navigating sport chaplaincy (Fellowship of Christian Athletes, 2007).

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