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PEDAGOGY

The Evaluation of Physical Literacy of Preservice Physical Educators

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Abstract

The term "physical literacy" has been integrated into national physical education standards. This study was designed to better understand how preservice physical educators put physical literacy into practice and prepare to be role models within the school context. Sixty preservice physical educators (46 males, 14 females, aged 19 to 25) participated and performed multiple tests in accordance with the second edition of the Canadian Assessment of Physical Literacy testing battery, as well a questionnaire about their perceived physical competence. Participants had significantly poorer performance than the standard for a 12-year-old child in cardiorespiratory endurance, motor performance, and overall physical activity level. In addition, waist circumference was significantly negatively related to physical competence and physical activity level. A significant positive relationship was found between perceived physical competence and physical activity level among participants. Waist circumference size and low cardiorespiratory endurance were the areas of greatest difficulty and concern for preservice teachers. Also, there was not a significant relationship between actual competence and perceived competence. Our findings suggest a need for a review of the current teacher education curriculum to draw attention to the benefits of physical fitness and motor skills competence for physical education teachers as possible role models.

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The concept of physical literacy was developed in 2001 (Whitehead, 2001) and has been broadly defined as a person having the capacity, confidence, and desire to move as part of a physically active lifestyle for life (Delaney et al., 2008; Marsden & Weston, 2007; Physical and Health Education Canada, 2014; Whitehead, 2010). SHAPE America came out with their third version of their *National Standards and Grade-Level Outcomes for K–12 Physical Education* in 2014. One major change was the adoption of the term "physical literacy" rather than "physically educated," and this definition: "Physical literacy is the ability to move with competence and confidence in a wide variety of physical activities in multiple environments that benefit the healthy development of the whole person" (SHAPE America, 2014). Based on this definition, physical literacy could have three core domains: (a) actual physical competence, (b) perceived physical competence (confidence), and (c) physical activity level. It is a more comprehensive term that parallels terminology in other education fields such as health literacy and math literacy. Physical literacy is important for all individuals to develop and it may be important at very young ages. One study showed that 39% of the variance of preschool children's MVPA during their free play activities could be predicted by their fundamental motor skill competencies and perceived physical competence (Tsuda et al., 2020). Physical literacy may be particularly important for physical education teachers who are supporting others toward physical literacy and serving as role models of physically literature individuals.

Physical Educators as Role Models

Physical education and health education teachers are in a unique position to serve as role models. According to Cardinal (2001), physical educators are role models of good health because they have an exceptional opportunity to have a positive effect on student learning and physical activity during the school day. Alongside the rapid growth of interest and research work on physical literacy, it is expected that physical educators need to have high levels of physical literacy to deliver this concept to school students in physical education programs. Many adults, however, may not be aware of the importance of physical and health literacy and other health-related concepts and guidelines. For example, the federal Physical Activity Guidelines for Americans was launched in 2008 and most U.S. adults lack sufficient

awareness and knowledge of it. A lack of awareness of the guidelines puts U.S. adults at risk for failure to meet the recommendations (Kay et al., 2014). Therefore, there is a need to better understand whether physical educators are physically literate role models and adequately prepared to address physical literacy development in schools.

Physical Fitness and Appearance of Fitness of Physical Education Teachers

Teachers' physical activity and fitness can play an important role in teaching decisions. For example, Whent et al. (2016) found the classroom teachers' personal weekly minutes in physical activity was a significant predictor of how much time they spent teaching physical education (in schools without physical education specialists) and students' physical activity.

The physical appearance of physical educators also seems to be related to students' performance on cognitive health-related physical fitness tests. Melville and Maddalozzo (1988) used the physical appearance of one male physical education teacher to determine its effect on student learning. During a physical education lesson, students were taught by the same instructor either wearing a fit or a fat suit. Melville and Maddalozzo found students performed lower on the exam with an overweight-appearance teacher. Thomson (1996) also compared the differences between a fit-appearing teacher and an unfit-appearing teacher on students' success with a 15-item quiz on health-related fitness knowledge. Students performed significantly higher on the quiz with a fit-appearing teacher. Similar findings were shown in a study of a female secondary physical education teacher's physical appearance and student attitude and learning outcomes related to health-related fitness knowledge (Dean et al., 2005). Yager et al. (2020) studied perceptions of educators (across all content areas) related to physical educators maintaining the appearance of being fit and healthy. The pressure for health and physical educators to meet the expectations for appearance and role modeling was reported. Gendered attitudes were reported since this pressure appeared to be coming more from men, specifically male teachers who were not physical educators. Taken together, these studies suggest that physical education teachers may be viewed as role models and that demonstrating teacher physical literacy may promote improved student learning outcomes.

Conceptual Frameworks Physical Literacy and Preservice Teacher Standards Framework

Promoting physical literacy for everyone or the ability to move confidently in many activities in many environments to develop the whole person (SHAPE America, 2014) provides the framework for this study, along with the National Standards for Initial Physical Education Teacher Education (SHAPE America, 2017). The standards identify what preservice physical education teachers should know and be able to do when they leave to teach physical education as a beginning teacher. The six standards run the gamut from content knowledge to professional behaviors. Informing this study, Standard 2 indicates that the preservice physical education teachers should demonstrate skillful performance and health-enhancing levels of fitness. In particular, they will (a) "demonstrate competency in all fundamental motor skills, as well as skillful performance in a minimum of four physical education content areas (e.g., games and sports, aquatics, dance and rhythmic activities, fitness activities, outdoor pursuits, individual-performance activities)" and (b) "achieve and maintain a health-enhancing level of fitness throughout the program." Thus, core domains of physical literacy, physical competence, perceived physical competence, and physical activity level may be appropriate measures that explain whether preservice physical education teachers are physically literate candidates and meet the national standards.

Preservice Physical Educators

Preservice Teachers, Physical Competence, and Perceived Physical Competence

Despite that physical competence is important in the profession, little research to substantiate what preservice physical educator do with it has been done. Petersen et al. (2003) conducted Fitnessgram assessments to test 76 physical education majors in 1-mile run, push-ups, curl-ups, and sit and reach, as well as the body mass index (BMI) assessments. The 20th percentile in the Fitnessgram was set as the pass grade on each test, and positive findings were reported with 82% of participants (n = 62) passing all of the tests. However, the 20th percentile may be too low of a criteria for preservice physical educators. Baghurst et al. (2016) used the healthy fitness zone criteria

of the FitnessGram to test the Progressive Aerobic Cardiovascular Endurance Run (PACER) and BMI with 25 preservice physical educators. They found 5% of participants (n = 6) had BMI in the healthy zone and 72% (n = 18) met the healthy zone criteria in PACER. In a similar study, Blackshear et al. (2019) adopted the American College of Sports Medicine (2014) fitness testing manual protocol to measure body fat percentiles, 12-min run, push-ups, curl-ups, and sit and reach in 116 preservice physical educators. The average standards in the manual were set as the passing criteria, with only 21% of participants (n = 25) passing all five tests. For enhanced qualifications of the professionals as physically literature, such findings address a call to help preservice physical educators to achieve and maintain physical competency and a health-enhancing level of fitness based on SHAPE America's standards.

Preservice Teachers and Physical Activity Participation

Few studies have measured preservice physical educators' healthy behavior adoption specifically. Baghurst et al. (2016) recorded steps with 25 preservice physical educators for 14 days and reported an average of 12,944 daily steps. Baghurst et al. (2018) conducted another study to record 26 preservice physical educators' physical activity for 7 days and reported 15,563 daily steps. Moreover, Baghurst et al. (2019) recorded daily steps of 89 students from college departments of physical education (n = 20), accounting (n = 27), hotel and restaurant administration (n = 15), secondary education (n = 10), and psychology (n = 17). They found that college students averaged 10,013 daily steps. The most active major was hotel and restaurant administration, although no significant difference among majors was evident. In another study, LaVine and Ray (2006) recorded 17 preservice educators physical activity participation for 30 days and found average daily steps of only 8,972. Although these studies provide some novel findings, such large discrepancies, especially the less active PETE students with the LaVine and Ray study, may be due to small sample sizes.

Thus, to learn more about preservice teachers' physical literacy, this study focuses on the performance outcomes of preservice physical educators. Specifically, measures of (a) physical competence, (b) perceptions of physical competence (i.e., perceptions of stamina

and fitness, level of physical condition, confidence in an exercise and fitness setting, and ability to maintain exercise), and (c) physical activity participation.

In summary, this study aimed to fill important gaps in the literature. Relatively little attention has been paid to the study of preservice teachers' actual and perceived physical competence related to their motor skill performance and their health and fitness as well as their daily physical activity patterns. To understand whether preservice teachers were physically competent and demonstrated health-related fitness, we conducted the second edition of the Canadian Assessment of Physical Literacy (CAPL-2), a national comprehensive assessment protocol for Canadian children aged 8 to 12 years, in this study because there is no national assessment in the United States. It was assumed that the preservice physical educators would demonstrate better physical competence performance and higher physical activity levels compared to the guidelines for 12-year-old children (oldest children) in the Canadian national standards. This study also investigated if perceived physical competence among preservice physical educators was related to their actual physical competence and current physical activity levels.

Method

Participants

Sixty preservice physical educators (46 males, 14 females, aged 19 to 25), including sophomores through seniors prior to student teaching at a southeastern 4-year university, agreed to participate in this study. Before each interested participant undertook exercise activity, we gave them the Physical Activity Readiness Questionnaire (PAR-Q) to screen them for cardiovascular and musculoskeletal conditions, such as heart trouble, chest pain, high blood pressure, dizzy spells, or joint problems. Participants were excluded if they answered yes to one or more questions on the PAR-Q. No participants were excluded after the PAR-Q screening. However, five participants (4 males, 1 female) had missing and/or insufficient accelerometer data during the study. The university human subjects institutional review board approved all protocols, and participants provided informed consent.

Instruments/Measurements

The assessments were conducted during two class sessions of a Motor Development and Test and Measurement class with the participating preservice teachers. We were present to administer the assessments.

Height, Weight, and Body Composition

Weight was measured with participants wearing light clothing and no shoes and socks, on a portable digital scale with weight measured to the nearest 0.1 kg. Height was measured to the nearest 0.1 cm on a portable stadiometer. Body composition was assessed via (a) BMI and (b) waist circumference (WC) in centimeters. BMI was computed through division of weight by the square of height (kg/m^2). WC was taken at the top of the iliac crest with the measuring tape parallel to the floor.

Physical Competence

Numerous measures from the CAPL-2 were selected to measure physical competence and physical activity levels of preservice teachers. The Physical Competence domain of the CAPL-2 was assessed with three indicators (i.e., CAMSA, plank test, PACER test). First, the Canadian Agility and Movement Skill Assessment (CAMSA) assesses three main categories of fundamental motor skills—object control, locomotor skills, and stability skills—through a variety of movement skills (sliding, catching, jumping, throwing, skipping, kicking, hopping). Intrarater reliability was moderate (ICC = 0.52) to excellent (ICC = 0.99) (Longmuir et al., 2017). Second, muscular endurance was assessed with the unlimited timed plank isometric hold in seconds. The plank test has been theorized as functional performance because it provides an assessment of endurance requiring simultaneous activation of recruit anterior core musculature that is important for prevention of injury and improved athletic performance (Aggarwal et al., 2010; Watkins et al., 1996). Third, cardiorespiratory endurance was assessed with the PACER assessment in number of laps completed. The literature has provided evidence of the validity and reliability of scores in a similar population for the PACER (Mayorga-Vega et al., 2015). VO_2 max was estimated from the number of laps completed (r = .82; Plowman & Yan-Shu Liu, 1999). The norms for the CAPL-2 have been developed. The manual notes the

criteria for each assessment that administrators can use to label each performance into beginning, progressing, achieving, and excelling categories. Beginning and Progressing mean participants have not yet achieved the optimal level. Excelling scores demonstrate the highest level.

Physical Activity Level

Physical activity level was assessed with two indicators from the daily behavior domain of the CAPL-2. Physical activity participation was assessed directly with accelerometer activity recordings, which include the number of steps taken for four valid wear days, and self-reported physical activity was assessed by preservice teachers reporting the number of days during the past seven they engaged in at least 60 min of physical activity with a moderate to vigorous intensity. Similarly, the numerical score on each indicator and overall physical activity level was assigned to Beginning, Progressing, Achieving, and Excelling categories. Beginning and Progressing mean participants have not yet achieved the optimal level. Excelling scores demonstrate the highest level.

Perceived Physical Competence

The physical condition subscale of the Physical Self-Perception Profile (Fox & Corbin, 1989) measured perceived physical competence. Physical condition refers to the perceptions of stamina and fitness, level of physical condition, confidence in an exercise and fitness setting, and ability to maintain exercise. The physical condition subscale included six questions. Each question had two alternative statements or descriptions of people presented, from which the participants could choose which best represented themselves, with answers from *sort of true* to *really true*. Each item was then scored from 1 to 4. The higher score represented higher levels of perceived physical competence. The internal consistency scores have typically ranged from 0.81 to 0.92 on this instrument (Fox & Corbin, 1989).

Accelerometry

Each participant wore an Actigraph wGTX-3 accelerometer for 7 consecutive days. To record the actual physical activity levels, we used the accelerometer so that participant could not see any output. The accelerometer, an axis-based motion detection system, was placed on an individual's right hip to record three axes in real time.

Since the number of walking steps is one of the assessments in the CAPL-2, the supporting software only calculates movement into steps per day. Research has shown the Actigraph wGTX-3 to be reliable for activities of daily living recording in healthy adults (Ozemek et al., 2014).

Procedures

First, we asked participants to complete and be cleared for the PAR-Q. Next, participants gathered in the testing room for demographic measures (e.g., height, weight, waist circumference, behavior checklist, medical history). We used the demographic measures and PAR-Q to screen for health issues that may be exacerbated by physical activity. In the physical assessment phase, participants completed the PACER (cardiorespiratory), plank (muscular endurance), and CAMSA (motor skills) tests. We demonstrated each protocol and asked each participant to pair up with another one so they could record each other's performance on the assessment. We observed all testing and officially recorded the performance results.

After the physical assessments, participants were provided a web link to complete the online questionnaires, including the perceived physical competence questions from the physical condition subscale of the Physical Self-Perception Profile (Fox & Corbin, 1989) and the number of days they engaged in MVPA over the past week. During the same week of testing, each participant was requested to wear an accelerometer at the right hip level to record their daily steps 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 26.0. Descriptive statistics were conducted for all variables. A single-sample *t* test was used in the determination of a statistically significant difference between the study sample and the excellent achievement level of a 12-year-old student in physical competence and physical activity level of the CAPL-2 (since this is the highest grade with normative scores on

the CAPL-2). In addition, a Pearson product–moment correlation coefficient was used in the evaluation of the relationship between physical competence, physical activity level, and perceived physical competence (two-tailed). The significance level was set at .05.

Results

Demographic Measures

Table 1 presents BMI results. According to the Centers for Disease Control and Prevention (CDC, 2020), BMI between 18.5 and below 25 can be considered as normal body composition status for adults. However, the mean BMI in males was high (29.04 kg/m^2) and within the overweight range, between 25 and 30. The CDC also suggests that the criteria for higher risk of developing obesity-related conditions in WC is 102 cm (40 inches) for men and 88 cm (35 in.) for women. Male and female participants did not exceed the CDC's criteria for a healthy WC.

Table 1
Demographic Measures Among Participants

Measure	Sex	*M* ± *SD*
Age (years)	Male	21.41 ± 1.29
	Female	21.71 ± 1.27
Height (cm)	Male	179.19 ± 5.97
	Female	160.58 ± 6.08
Weight (kg)	Male	93.98 ± 18.58
	Female	63.94 ± 11.63
BMI (kg/m^2)	Male	29.04 ± 5.40
	Female	24.75 ± 4.00
WC (cm)	Male	93.29 ± 14.89
	Female	82.03 ± 11.72
Perceived Physical Competence	Male	18.13 ± 4.23
	Female	17.86 ± 6.10

Note. BMI = body mass index; WC = waist circumference.

Physical Competence

As Table 2 indicates, participants had significantly lower levels of cardiorespiratory endurance, measured through the PACER, Males = 33.91, $t(45) = -6.12$, $p < .001$, and Females = 17.93, $t(13) = -14.196$, $p < .001$, than the Excellent category of a 12-year-old student in the CAPL-2 (Boys ≥ 48; Girls ≥ 36). Male and female preservice teachers achieved the Progressing category. In addition, preservice teacher participants had significantly lower levels of motor skill performance, measured via CAMSA, Males = 24.17, $t(45) = -5.671$, $p < .001$, and Females = 22.71, $t(13) = -2.598$, $p = .022$, than the Excellent category of a 12-year-old student in the CAPL-2 (Boys ≥ 26; Girls ≥ 25). Male and female preservice teacher participants achieved the Progressing category.

Although the preservice teacher participants had lower levels of muscular endurance, measured with the Plank test, Males = 104.60, $t(45) = -1.435$, $p = .158$, and Females = 89.43, $t(13) = -1.1345$, $p = .202$, the differences did not achieve a significant level compared to the the Excellent category of a 12-year-old student in the CAPL-2 (Boys ≥ 112.4; Girls ≥ 101.2). Male and female participants attained the Achieving category for muscular endurance. Overall, participants had significantly lower levels of physical competence, Males = 24.17, $t(45) = -5.671$, $p < .001$, and Females = 22.71, $t(13) = -2.598$, $p = .022$, than the Excellent category of a 12-year-old student in CAPL-2 (Boys ≥ 26; Girls ≥ 25). Male preservice teacher participants attained the Achieving category and female participants achieved the Progressing category for physical competence.

Physical Activity Levels

As Table 2 indicates, participants had significantly fewer average daily steps, measured via accelerometer, Males = 10587.31, $t(41) = -5.44$, $p < .001$, and Females = 9916.39, $t(12) = -2.745$, $p = .018$, than the Excellent category of a 12-year-old student in the CAPL-2 (Boys ≥ 16059; Girls ≥ 13742). Male and female preservice teacher participants achieved the Progressing category in daily steps. In addition, participants spent significantly fewer days (out of 7) in self-reported physical activity with moderate to vigorous intensity in a week, Males = 3.62, $t(41) = -7.165$, $p < .001$, and Females = 2.08,

Table 2
Participants' Performance in Physical Competence and Physical Activity Level

Test	Sex	Actual performance	Category	Excellent score	*t*	*p*	Cohen's *d*
Physical competence							
PACER (lap)	Male	33.91 ± 15.60	Progressing	> 48	-6.12	< .001*	1.824
	Female	17.93 ± 4.76	Progressing	> 36	-14.196	<.001*	7.875
Plank (s)	Male	104.60 ± 36.86	Achieving	> 112.4	-1.435	.158	0.427
	Female	89.43 ± 32.75	Achieving	> 101.2	-1.345	.202	0.746
CAMSA	Male	24.17 ± 2.18	Progressing	> 26	-5.671	<.001*	1.691
	Female	22.71 ± 3.29	Progressing	> 25	-2.598	.022*	1.441
Physical competence scores	Male	22.70 ± 4.12	Achieving	> 24.5	-2.965	.005*	0.883
	Female	18.40 ± 3.46	Progressing	> 23.3	-5.303	<.001*	2.952
Physical activity level							
Average daily step	Male	10587.31 ± 6517.91	Progressing	> 16059	-5.44	< .001*	1.622
	Female	9916.39 ± 5018.37	Progressing	> 13742	-2.749	.018*	1.525
MVPA (days/week)	Male	3.62 ± 1.99	Progressing	> 6	-7.765	< .001*	2.32
	Female	2.08 ± 1.75	Beginning	> 6	-8.064	< .001*	4.473
Physical activity level scores	Male	14.90 ± 9.80	Progressing	> 26.9	-7.945	< .001*	2.369
	Female	13.46 ± 9.29	Progressing	> 24.7	-4.363	.001*	2.420

Note. PACER = Progressive Aerobic Cardiovascular Endurance Run; CAMSA= Canadian Agility and Movement Skill Assessment; MVPA= moderate to vigorous physical activity.
* $p < .05$.

$t(12) = -8.064$, $p < .001$, than the Excellent category of a 12-year-old student in the CAPL-2 (Boys ≥ 6; Girls ≥ 6). Male participants achieved the Achieving category and female participants achieved the Beginning category. Overall, participants had significantly lower scores for self-reported physical activity levels across 7 days, Males = 14.90, $t(41) = -7.945$, $p < .001$, and Females = 13.96, $t(12) = -4.363$, $p = .00$, than the Excellent category of a 12-year-old student in the CAPL-2 (Boys ≥ 26.9; Girls ≥ 24.7). Male and female preservice teacher participants achieved the Progressing category.

Relationship Between Physical Activity Level, Perceived Physical Competence, and Actual Physical Competence

As Table 3 shows, significantly negative relationships were evident between WC and the performance in PACER ($r = -.272$, $p = .035$), plank test ($r = -.339$, $p = .008$), and self-reported MVPA in a week ($r = -.275$, $p = .042$). Also, perceived physical competence was significantly positively related to average daily steps ($r = .350$, $p = .009$) and self-reported MVPA in a week ($r = .354$, $p = .008$). A positive relationship between the average daily steps and self-reported MVPA was noted ($r = .573$, $p < .001$).

Discussion

Physical educators are considered important role models to facilitate physical literacy for their students in schools. Thus, physical education teacher education programs have a major responsibility for preparing preservice physical educators with the necessary knowledge and skills. Even though preservice educators with and without a health and physical education major believed physical educators should maintain a slim and athletic body type that makes them appear as though they are fit and healthy, especially males (Yager et al., 2020), and there is a great deal of support for physical education teachers to demonstrate physical literacy (especially among students), there has been a noticeable dearth of research studies regarding how preservice physical educators become role models and practice physical literacy. Hence, the primary purpose of this study was to examine physical competence and physical activity levels among preservice physical educators compared to the Achieving category for a 12-year-old student in the CAPL-2. In this study, preservice physical educators had significantly lower levels of perfor-

Table 3
The Relationships among Physical Activity Level, Perceived Physical Competence, and Actual Physical Competence Indicators

Measure	BMI (kg/m^2)	WC (cm)	PACER (lap)	Plank (sec)	CAMSA	Steps	MVPA (day)	Perceived physical competence
BMI (kg/m^2)	-	.804*	-.247	-.241	.007	-.015	-.064	.062
WC (cm)		-	-.272*	-.339*	-.014	-.215	-.275*	-.170
PACER (lap)			-	.186	.278*	-.035	.095	-.001
Plank (sec)				-	.279*	.183	.302*	.081
CAMSA					-	.100	.285*	.048
Steps						-	.573*	.350*
MVPA (day)							-	.354*
Perceived physical competence								-

Note. BMI = body mass index; WC = waist circumference; PACER = Progressive Aerobic Cardiovascular Endurance Run; CAMSA= Canadian Agility and Movement Skill Assessment; MVPA= moderate to vigorous physical activity.
* $p < .05$.

mance in terms of cardiorespiratory endurance, motor performance and physical activity level compared to the achieving category for a 12-year-old student. Further, preservice physical educators demonstrated lower physical activity levels with regard to average daily steps and self-reported MVPA. Last, WC exerted a negative impact on the preservice teacher performance in the PACER, plank test, and self-reported MVPA. Perceived physical competence had a positive association with average daily steps and self-reported MVPA.

It is believed preservice physical educators who promote a physically healthy lifestyle in schools should engage in daily physical activity and possess adequate levels of fitness. Consistent with Blackshear et al. (2019), this study found that cardiorespiratory endurance seems to be the area of greatest difficulty and concern, especially in male preservice teacher participants. Blackshear et al. indicated 24.4% of male participants met the targeted criteria in the 12-min run. In our study, only 17.3% (n = 8) of male preservice physical education participants achieved the Excellent category in the PACER. As for female participants, none achieved the Excellent category in the PACER. Thirty-seven male participants had a BMI in either the overweight range or the obese range. Heart disease has become the number one cause of death in the United States (Benjamin et al., 2019). Most of the male preservice teacher participants were at increased risk of diabetes, high blood pressure, and other obesity-related illnesses due to overweight status and low cardiorespiratory fitness. In addition, consistent with Luz et al. (2017), this study showed in children and adolescents a positive relationship between cardiovascular endurance (i.e., PACER) and motor skills (i.e., CAMSA). Thus, cardiorespiratory physical activities might work synergistically with other fundamental motor skills. SHAPE America standards for beginning teachers note that physical educators should demonstrate competency in all fundamental motor skills and achieve health-enhancing level of fitness through the program (i.e., Standard 2a and 2b). Given the low cardiorespiratory fitness and high BMI levels as well as lower motor skill performance for our sample of preservice physical education teachers, various types of fitness activity and motor skills development activities (content knowledge) are recommended for emphasis in physical education teacher education programs, along with content knowledge, peda-

gogical knowledge, and pedagogical content knowledge, to address deficiencies of preservice teachers and prepare them across all three of these important areas leading to physical literacy and perhaps effectiveness as teachers.

Male and female participants did, however, perform nearly 10,000 average daily steps. This is higher than general U.S. adults steps (Bassett et al., 2010). This physical activity level may not be enough to maintain or improve cardiorespiratory endurance. A negative correlation coefficient was found between WC and self-reported MVPA. Hence, these results might suggest that participants with higher WC and lower cardiovascular endurance and muscular endurance may participate in less intense physical activity rather than being more sedentary or less physically active.

This study suggests perceived physical competence is a predictor of physical activity level in daily steps and self-reported MVPA, which is consistent with the positive associations found for children, adolescents, and young adults (Babic et al., 2014; Jekauc et al., 2017). It would be logical to assume that perceived physical competence may exert its impact on the participants' effort and persistence in daily physical activity participation. However, the performance for female participants in actual physical competence seemed to be fairly low. In line with Yager et al. (2020), this study found that females educators, compared with male educators, did not have as strong of beliefs that physical educators should maintain physical fitness and health. Additionally, since no indicators of actual physical competence were related to perceived physical competence, our findings of preservice physical education teachers are inconsistent with those in studies of children (e.g., Raudsepp & Liblik, 2002). Our data supports concerns regarding preservice physical educators' physical competence levels, and this lends some support to claims that a focus on physical activity as the leading mechanism for increasing health and wellness may be overemphasized. Kim et al.(2015) analyzed the content of 26 preservice teacher programs and found that a lot of common movement content knowledge was not significantly focused on in the teacher education programs. Thus, kinesiology and physical education teacher programs can increase the emphasis on physical fitness and motor skills development relevant to physical

competence in their curriculum and physical activity requirements leading to physical literacy.

This study acknowledges some limitations and that future studies are needed. First, using a convenience sample was not reflective of all preservice physical educators. The potential sampling errors and biases may cause the findings to be less generalizable. Despite having five assessment administrators in the assessment settings to ensure accuracy, human errors in the assessments may still be present. In addition, five preservice teacher participants had missing or insufficient data from 7-day physical activity recording and were not included. Further, participants seemed to achieve the minimum required daily steps but did not indicate moderate to vigorous intensity was performed in MVPA reporting. Future analysis could be recorded in metabolic equivalents or time in MVPA. Last, motivation and effort may have been low across the 7 days of physical activity data collection for preservice teachers even though they had received extra credit for completion of activity data.

In summary, teachers play an important role in transmitting knowledge and shaping student behavior. However, this study found that preservice physical educators had a lower level of physical competence and physical activity participation across 7 days compared to the Achieving category of a 12-year-old student in the CAPL-2. The findings both support and challenge current policy initiatives to address teacher development in physical education teacher programs. It seems the initial perceptions associated with promoting physical literacy in school physical education programs might be different from what preservice physical educators experienced during their training (Harris, 2014). Hence, future studies could examine if other possible factors, such as physical fitness knowledge, exercise motivation, self-concept, teaching self-efficacy, and task orientation might influence preservice teachers' physical literacy development. Exploration of these related factors is essential for adequate preparation of future physical educators to become physically literate individuals prepared to promote physical literacy to school children.

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