

PEDAGOGY**Elementary Physical Education
Teachers' Content Knowledge
of Physical Activity and
Health-Related Fitness**

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Abstract

The purpose of this study was to examine elementary physical education teachers' content knowledge of physical activity and health-related fitness. Sixty-four female and 24 male teachers completed the Appropriate Physical Activity and Health-Related Fitness test. Descriptive statistics results indicated that the mean percentage score for the test was 57.6%. Results from the ANOVA indicated gender and level of education were unrelated to content knowledge of physical activity and health-related fitness. Years of teaching experience was found to significantly influence content knowledge of physical activity and health-related fitness. It is recommended that ongoing professional development activities be provided to improve the teaching of physical activity and health-related fitness in schools.

The increasing prevalence of childhood obesity in the United States is a major public health concern. According to the American Heart Association (2011) the prevalence of childhood obesity has

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tripled over the last 30 years. Based on national data from the Centers for Disease Control and Prevention (2011), the prevalence of obesity has increased from 5% to 13.9% for children 2 to 5 years of age; 6.5% to 18.8% for those 6 to 11 years of age; and 5.0% to 17.4% for those 12 to 19 years of age. School-based physical education has been identified as part of the solution for addressing the childhood obesity epidemic (Payne & Morrow, 2009) and as one of the primary means responsible for promoting the adoption of active lifestyles in children (Sallis & McKenzie, 1991). The ultimate goal of a quality physical education program is to help students gain the knowledge, skills, and attitudes to be physically active for a lifetime (National Association for Sport and Physical Education [NASPE], 2004).

The teacher education literature suggests that a strong knowledge of the subject matter taught is a prerequisite to be a competent and effective teacher (Baumert et al., 2010; Belfort & Guimaraes, 2002; Mewborn, 2000; Shulman, 1986, 1987). Teachers' content knowledge affects their pedagogical content knowledge, enters into their teaching processes, and influences their confidence about teaching the subject matter (Kallery & Psillos, 2001). Content knowledge supports lesson structure and acts as a resource in the selection of examples, in the formulation of explanations, and in demonstrations (Leinhardt & Smith, 1985). Physical education researchers (Chen & Ennis, 1995; Hastie & Vlaisavljevic, 1999; Schempp, Manross, Tan, & Fincher, 1998; Siedentop, 2002; Siedentop & Eldar, 1989; Ward, 2009) have recognized the important role that teachers' content knowledge plays in the development and practice of teachers. Scholars point out that physical education teachers with strong subject matter knowledge have a tendency to recognize problems in student learning, accommodate for individuals' skill differences and abilities, exhibit confidence and enthusiasm for teaching, use more learning tasks per lesson, and hold students accountable for quality of performance (Hastie & Vlaisavljevic, 1999; Shempp et al., 1998). Moreover, physical education teachers with strong subject matter expertise included a high level of detail in planning and organizing instruction, designing activities that were more likely to stimulate their students' interest, motivation, and participation, thus decreasing the incidence of off-task behavior (McKenzie, Sallis, Faucette, Roby, & Kolody, 1993; Placek & Randall, 1986).

The NASPE (2004) content standards (e.g., standards 3 and 4) suggest that instruction in physical education should provide students with an understanding of how to achieve and maintain a health-enhancing level of physical fitness as well as create an attitude encouraging regular participation in physical activity. Researchers have found that to become physically fit, promote positive attitudes toward fitness, and place more value in the health benefits of exercise, a person must possess the knowledge to make informed decisions about physical activity (Adams & Brynteson, 1992), mainly because this knowledge is positively associated to physical activity levels (Kulinna & Silverman, 2000). Furthermore, research supports the notion that increased knowledge of fitness concepts will result in increased activity (Dale & Corbin, 2000; Dale, Corbin, & Dale, 2000). As a result, school physical education programs are placing emphasis on health-related fitness in an attempt to teach students the necessary knowledge, skills, and attitudes to become physically active for a lifetime (Dale & Corbin, 2000). For these reasons, physical education teachers need to be knowledgeable in their own content knowledge of physical activity and health-related fitness to provide high quality and effective instruction to their students.

Limited research has been conducted on the content knowledge of teachers in the area of physical activity and health-related fitness. Research findings have suggested that physical educators' health-related fitness content knowledge is unsatisfactory for teaching in physical education (Castelli & Williams, 2007; Miller & Housner, 1998). Therefore, there is a need to investigate the physical activity and health-related fitness content knowledge of in-service physical education teachers. An investigation of what in-service physical education teachers know about physical activity and health-related fitness will help to provide guidance for future staff development opportunities as well as to identify areas of weakness in physical education teacher education (PETE) programs in postsecondary institutions.

Therefore the purpose of this study was to examine elementary in-service physical education teachers' content knowledge of physical activity and health-related fitness. Specifically, the following research questions were investigated: (a) What do elementary in-service physical education teachers know about physical activity and health-related fitness? and (b) What teacher characteristics (e.g., gender, years of teaching experience, level of education) are related to physical activity and health-related fitness content knowledge?

Method

Participants

A total of 97 in-service physical education teachers returned the test of which 89 were usable for data analysis. The participants (64 female, 24 male) ranged in age from 22 to 64 years ($M = 43.4$, $SD = 11.5$). One of the participants did not report gender. The participants were self-identified racially as 23.6% ($n = 21$) Black or African Americans, 70.8% ($n = 63$) White, and 3.4% ($n = 3$) Hispanic origin. Two of the participants did not report race. Seventy-seven (89.5%) of the participants reported having a physical education teaching certificate. In addition, 67.4% ($n = 60$) of the participants reported belonging to at least one professional organization related to the field of physical education. With regard to years of teaching experience, 29.2% ($n = 26$) of the participants had less than 6 years, 31.5% ($n = 28$) 6 to 19 years, and 37.1% ($n = 33$) greater than 19 years. Two of the participants did not report years of teaching experience. Approximately 71.9% ($n = 64$) of the participants reported having a baccalaureate degree and 27.0% ($n = 24$) a master's degree. One of the participants did not report level of education.

Instrumentation

The Appropriate Physical Activity and Health-Related Fitness (APAHRF) knowledge test was designed and validated to assess physical activity and health-related fitness knowledge (Santiago, Morales, Disch, & Gaus, 2011). Content validity was established by a panel of six physical education content experts in the areas of measurement, pedagogy, biomechanics, motor learning, and exercise physiology through a review, revision, and review process. All content experts were currently working in tenure track professional positions in higher education. An objection by any reviewer to an item required modifying it and then resubmitting the item for another review. Validity of the test was also determined empirically by analysis of the table of specifications following the procedures outlined by Morrow, Jackson, Disch, and Mood (2011). The test consisted of 41 multiple choice test items with five possible answers, one correct and four distracters. Questions were divided into two categories: (a) physical activity and (b) health-related fitness, each including items such as concepts, facts, definitions, assessments, and guidelines. Sample questions from the APAHRF test are presented in Table 1.

Table 1

Appropriate Physical Activity and Health-Related Fitness Test Sample Questions

Which of the following indicates the minimum amount of minutes that a student should engage in daily physical activity?

- A) 20 minutes
- B) 30 minutes
- C) 60 minutes
- D) 40 minutes
- E) 45 minutes

Which of the following defines lifetime activities?

- A) Physical activities done especially for the purpose of becoming physically fit
- B) Physical activities that can be used throughout life
- C) Physical activities that are intense enough to cause the heart to beat faster
- D) Physical activities that can be performed for relatively long period of time without fatigue
- E) Physical activities done in short, fast bursts

Which of the following defines cool down?

- A) Exercise designed to build muscular strength and endurance
- B) Exercise designed to get you ready for physical activity
- C) Exercise designed to build flexibility
- D) Exercise designed to help you recover after physical activity
- E) Exercise designed to improve cardiovascular fitness

Muscular strength, muscular endurance, and flexibility are considered components of:

- A) Sport-related fitness
- B) Health-related fitness
- C) Performance-related fitness
- D) Skill-related fitness
- E) Motor-related fitness

What do we call the ability of the heart and lungs to supply oxygen to the working muscles for an extended period of time?

- A) Muscular endurance
- B) Cardiorespiratory endurance
- C) Speed
- D) Power
- E) Muscular strength

Reliability of the 41 multiple choice APAHRF test was estimated using the K-R 20 method following the procedures outlined by Baumgartner, Jackson, Mahar, and Rowe (2007). The K-R 20 method provides a reliability estimate reflecting the average of the correlations of all possible pairings of split halves of the test. The test was found to have a K-R 20 reliability coefficient of 0.67, which is commonly considered an acceptable level of internal consistency.

Procedures

Two methods were used to recruit participants: (a) recruitment from an urban school district in southeast Texas and (b) solicitations to members of the state professional organization via the Internet. The school district's human subjects committee approved the study prior to data collection. Survey Monkey, a Web-based survey design tool, was used for the administration of the APAHRF test and for data collection purposes. All prospective respondents were given an explanation of the purpose of the study, instructions on how to complete the test, and a link to the test embedded within an e-mail. Anonymity and confidentiality were emphasized. All test responses were submitted into Survey Monkey and subsequently downloaded into SPSS Version 8 (SPSS Inc., Chicago IL, 1998). Demographic information including years teaching experience, level of education, and gender of the participants was also collected. Years of teaching experience was grouped into the following three categories: (a) less than 6 years, (b) 6 to 19 years, and (c) greater than 19 years. The rationale for dividing years of teaching into these categories was because it is generally believed that teachers with less than 5 years of teaching experience are considered to be novice teachers, whereas teachers with more than 5 years of teaching experience are considered experts in their field (Chen & Rovegno, 2000; Ferguson, Keating, Bridges, Guan, & Chen, 2007). Level of education was divided into the following two categories: (a) baccalaureate and (b) master's.

Data Analysis

Teacher scores were computed for the overall APAHRF content knowledge test performance and expressed as percentages. Means, standard deviations, minimum, and maximum were computed for the entire group by gender, number of years teaching experience, and level of education. Because of the widely divergent number of subjects in each cell, a series of one-way ANOVAs were conducted

on the independent variables to determine if significant differences existed in gender, years of teaching experience, and level of education on physical activity and health-related fitness content knowledge. A Scheffé post hoc test was performed when significant differences were found on the Omnibus F test. The SPSS Version 8.0 computer software was used to conduct all the statistical analysis. The alpha level was set at the 0.01 level of significance because of the number of ANOVAs conducted.

Results

Teacher scores were computed for the overall APAHRF test performance. The mean score for the APAHRF test was 57.6% ($M = 23.6, SD = 4.5$). Results revealed that female teachers scored slightly higher on the APAHRF test than male teachers. The female average was 58.2% ($M = 23.8, SD = 4.7$), whereas the male was 56.3% ($M = 23.0, SD = 4.4$). However, one-way ANOVA results revealed no significant, $F(1,86) = .50, p = .477$, differences for gender. Table 2 presents the means, standard deviations, minimum, and maximum for the APAHRF test performance scores as related to gender.

Table 2

Means, SD, Minimum, and Maximum Performance Scores of Physical Education Teachers on the APAHRF Test Relative to Gender

Variable	Mean Raw Score	SD	Minimum	Maximum
Gender				
Female ($n = 64$)	23.8 (58.2%)	4.7	10.0 (24.3%)	34.0 (82.9%)
Male ($n = 24$)	23.0 (56.3%)	4.4	13.0 (31.7%)	29.0 (70.7%)
Total ($N = 88$)	23.6 (57.6%)	4.5	10.0 (24.3%)	34.0 (82.9%)

Note. Percentage scores are shown in parentheses.

Years of teaching experience included the following three categories: (a) less than 6 years, (b) 6 to 19 years, and (c) greater than 19 years. Teachers with 6 to 19 years scored slightly higher than teachers with less than 6 years of teaching experience. Teachers with

less than 6 years of experience scored slightly higher than teachers with greater than 19 years of teaching experience. The results from one-way ANOVA revealed significant, $F(2,84) = 5.17, p = .008$, differences for years of teaching experience. A Scheffé post hoc analysis was used to determine exactly which of the three categories of years of teaching experience was significantly different. The analysis revealed that those physical education teachers with 6 to 19 years scored significantly ($p = .008$) higher than those teachers with greater than 19 years of teaching experience. Table 3 presents the means, standard deviations, minimum, and maximum for the APAHRF test performance scores as related to years of teaching experience.

Table 3

Means, SD, Minimum, and Maximum Performance Scores of Physical Education Teachers on the APAHRF Test Relative to Years of Teaching Experience

Variable	Mean Raw Score	SD	Minimum	Maximum
Years of Teaching Experience				
less than 6 ($n = 26$)	23.4 (57.2%)	4.3	10.0 (24.3%)	33.0 (80.4%)
6 to 19 ($n = 28$)	*25.6 (62.5%)	3.8	16.0 (39.0%)	34.0 (82.9%)
greater than 19 ($n = 33$)	22.0 (53.6%)	4.8	13.0 (31.7%)	34.0 (82.9%)
Total ($N = 87$)	23.6 (57.6%)	4.5	10.0 (24.3%)	34.0 (82.9%)

Note. Percentage scores are shown in parentheses.

* $p < .01$

Level of education was divided into the following two categories: (a) baccalaureate and (b) master's. Teachers who reported having a master's degree scored slightly higher on the APAHRF test than teachers reporting having a baccalaureate degree. Teachers with a master's degree had an average score of 58.2% ($M = 23.8, SD = 4.6$),

whereas teachers with a baccalaureate degree had an average score of 57.3% ($M = 23.5$, $SD = 4.6$). The results from one-way ANOVA revealed that no significant, $F(1,86) = .11$, $p = .735$, differences for level of education. Table 4 presents the means, standard deviations, minimum, and maximum for the APAHRF test performance scores as related to level of education.

Table 4

Means, SD, Minimum, and Maximum Performance Scores of Physical Education Teachers on the APAHRF Test Relative to Highest Degree Attained

Variable	Mean Raw Score	SD	Minimum	Maximum
Level of Education				
Baccalaureate ($n = 64$)	23.5 (57.3%)	4.6	10.0 (24.3%)	34.0 (82.9%)
Masters ($n = 24$)	23.8 (58.2%)	4.6	14.0 (34.1%)	34.0 (82.9%)
Total ($N = 88$)	23.6 (57.6%)	4.5	10.0 (24.3%)	34.0 (82.9%)

Note. Percentage scores are shown in parentheses.

Discussion

This study examined physical activity and health-related fitness content knowledge of in-service physical education teachers using the APAHRF test. The APAHRF test includes many of the concepts of physical activity and health-related fitness that physical education teachers will be expected to teach their students. Participants in this study exhibited a mean total score of 57.6%. Based on previous research studies (Miller & Housner, 1998; Petersen, Byrne, & Cruz, 2003), the overall mean score of 57.6% for the APAHRF test indicates deficiencies in physical activity and health-related fitness content knowledge.

These deficiencies in physical activity and health-related fitness content knowledge among in-service physical education teachers are consistent with the findings of Castelli and Williams (2007) who also found poor performance scores for health-related fitness content knowledge of in-service middle school physical education teachers.

The lack of knowledge in the areas of physical activity and health-related fitness raises concerns because research has shown that students' learning can be limited if they are taught by teachers with limited knowledge of the content being taught. Siedentop (2002) stated that teachers with poor command of the content they need to teach will fail because they do not have the ability to take their students beyond that introductory unit that seemingly gets taught again and again. Hastie and Vlasisavljevic's (1999) findings revealed that physical education teachers with higher subject matter expertise used significantly more tasks per lesson than those with lower subject matter expertise. Furthermore, physical education teachers with higher subject matter expertise held students accountable predominately for the quality of the performance, whereas physical education teachers with lower subject matter expertise held students accountable for only a degree of participation or effort.

Several reasons might have contributed to the poor performance of in-service physical education teachers on the APAHRF test. It could be speculated that the poor performance is due to knowledge obsolescence. Only two studies have been conducted in the area of knowledge obsolescence in physical education (Kelley & Lindsay, 1977, 1980). In 1977, Kelley and Lindsay stated that "today's professionals are faced with the real danger of becoming obsolete, because present skills and knowledge will not enable them to operate effectively in tomorrow's professional world" (p. 463). Kelley and Lindsay (1977, 1980) found evidence of knowledge obsolescence in physical education teachers, specifically in the areas of curriculum, teaching methodology, and exercise physiology. In-service physical education teachers must continue to grow, obtain new knowledge, and remain abreast of new developments in the field to provide high quality instruction to their students. Staff development, continuing education units, graduate coursework, and professional organizations are some of the venues that physical education teachers may use to acquire new knowledge and remain abreast of new developments. According to Castelli and Williams (2007), the effectiveness of professional development is compromised by the amount of teacher responsibilities as well as the accelerating pace of physical activity knowledge, thus making it extremely difficult for physical education teachers to keep abreast of new developments.

The poor performance on the APAHRF test may be attributable to contextual factors such as workplace environment, school settings, teachers' beliefs and attitudes, status of physical education, class

size, and availability of resources. The majority of the participants ($n = 50$) in this study were recruited from an urban school district. According to Ingersoll (2001), urban schools present a unique teaching and learning context. Urban school districts often hire more uncertified teachers and teachers who are working outside of their specialization. In addition, urban school districts are more likely to have inexperienced teachers (Prince, 2002). In this study, 10.5% of the in-service physical education teachers reported not having a physical education certificate, which may have contributed to the overall poor performance of the group on the APAHRF test. Generally, urban school districts serve a substantial amount of students; therefore, class sizes tend to be large. Physical education teachers with large class sizes possibly feel restricted to teach physical activity and health-related fitness instruction, preventing them from using this content. For example, Ferguson et al. (2007) found that class size significantly influences the attitudes of physical education teachers toward using and implementing health-related fitness assessments.

Another possible explanation for the poor performance on the APAHRF test may be the low status of physical education in the schools. Stevens-Smith, Fisk, Keels-Williams, and Barton (2006) investigated principals' perceptions of academic importance and accountability in physical education. Results of the study revealed that 64% of the principals ranked physical education last out of all academic subjects identified and that 31% did not view it as an academic area. Because physical education is typically not part of a student's academic profile, it is becoming marginalized and a victim of curriculum reduction (Stevens-Smith et al., 2006). Martin (2003) indicated that the lack of facilities, time, and resources allocated to physical education lead to teacher isolation, and being isolated may contribute to feelings of marginality.

Physical education teachers' beliefs, attitudes, and values may have also contributed to the low scores performance on the APAHRF test. According to Schubert (1990), teachers make decisions based on their tacit, personal values. These decisions may include judgments about what content to teach, how much practice time to provide, and how rigorous to set performance criteria (Ennis & Chen, 1995). Ennis (1994) concluded that physical education teachers typically made decisions on instructional methods and curricular approaches based on their beliefs and knowledge. Ennis and Chen (1995) studied physical educators' value orientations for

curricular decision making in urban and rural teaching settings. An interesting finding of this study was that urban physical education teachers placed a higher priority on affective curriculum goals associated with cooperation, respect for others, self-efficacy, and self-concept. Conversely, rural physical education teachers placed more emphasis on knowledge-based goals with the development of skills and fitness content.

Kulinna and Silverman (2000) investigated the physical education teachers' attitudes toward teaching physical activity and fitness. Results indicated that physical education teachers demonstrated their strongest attitudes toward the physical activity and fitness domain, followed by self-actualization, motor skill development, and social development domains, respectively. Significant differences in attitude were found between elementary, middle, junior high, and high school physical education teachers. Follow-up tests indicated that elementary, middle, and junior high school physical education teachers placed significantly higher priority on motor skill development and social development than high school teachers. Differences were also found for years of teaching experience. The physical activity and fitness domain was found to be significantly more important to physical education teachers with more than 3 years of teaching experience.

The teacher characteristics of gender, years of teaching experience, and level of education were examined in this study. Results demonstrated that gender did not influence physical activity and health-related fitness content knowledge of in-service elementary physical education teachers. These findings are consistent with those of Castelli and Williams (2007) who found no significant gender differences on health-related fitness content knowledge. Results indicated that significant differences were found between years of teaching experience. A follow-up post hoc test indicated that physical education teachers with 6 to 19 years of teaching experience scored significantly higher than those physical education teachers with greater than 19 years of teaching experience. According to Chen and Rovegno (2000), physical education teachers with more than 5 years of teaching experience are considered experts in their field. In this study, deficiencies were noticed on the overall APAHRF test performance; however, teacher content knowledge of physical activity and health-related fitness was significantly influenced by the years of teaching experience. This result accentuates the need for designing effective and ongoing professional development in

the district for physical education teachers, specifically for those teachers with greater than 19 years of teaching experience. Moreover, this result suggests the need to reevaluate the physical activity and health-related fitness content of PETE programs. “In those PETE programs where HRF content instruction is provided but pragmatic application of HRF knowledge is absent, the attainment of content knowledge remains at an informational level; it is memorized but not applied by the preservice teacher” (Castelli & Williams, 2007, p. 14).

With regard to level of education, no significant difference was found on the APAHRF test scores between physical education teachers with baccalaureate degrees and physical education teachers with master’s degrees. This result indicates that the teacher’s degree level did not impact content knowledge of physical activity and health-related fitness. Research is limited on the influence of level of education on teachers’ content knowledge in physical education. Goldhaber and Brewer (1996) examined the impact of teacher degrees on student performance in the subject areas of mathematics, science, English, and history. Results of this study revealed that teachers with master’s degrees did not have a significant influence on student performance. However, teachers with bachelor’s or master’s in mathematics and science in addition to a subject-specific degree were found to have a significant impact on student academic achievement. This was not the case for English and history teachers. The authors concluded that student achievement in technical subjects can be improved by requiring in-subject teaching.

There are several limitations to consider when interpreting the results of this study. Notably, this study was limited to a small sample size of elementary physical educators. Future research studies should include middle and high school physical educators. Another possible limitation of the study was that physical activity and health-related fitness knowledge was only assessed by a multiple choice test developed and validated by the investigators. Other forms of assessments (e.g., direct observation, performance-based) should be used in future studies to assess teacher content knowledge.

Conclusion

The results of this study warrant further investigation into physical activity and health-related fitness content knowledge of physical educators to identify areas of weakness in PETE programs in postsecondary institutions in order to improve the teaching of

physical activity and health-related fitness in schools. Exercise physiology and measurement and evaluation are courses where preservice physical education teachers may obtain physical activity and health-related fitness knowledge. It is also critical that PETE programs develop meaningful opportunities so that this knowledge obtained from these courses can then be applied in real-life contexts (e.g., activity courses, field-based experiences, service learning). In addition, it is imperative that school administrators provide meaningful and relevant staff development to physical educators to improve the delivery of instruction of physical activity and health-related fitness content in schools. Further research is needed to evaluate contextual factors such as work environment, class size, scheduling, and available resources to determine if content knowledge of physical activity and health-related fitness is affected.

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