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The Reality of Fitness for Pre-Service Teachers: What Physical Education Majors "Know and Can Do"

by Susan Petersen, Heidi Byrne and Luz Cruz

Abstract

Despite the fact that fitness looms large in the profession, and the fact that there are many issues associated with teaching and testing it, little research has been done to substantiate what in-service or pre -service teachers actually know and do related to fitness. The purpose of this article is to describe the results of two types of fitness assessments on physical education majors. The results of the Fitnessgram test on all physical education majors revealed a fairly high overall rate of passing (82% of students passed all test items); higher passing rates were apparent for specific tests. BMI was the area of greatest difficulty and concern. In addition, majors in the teacher education concentration who had completed all coursework and student teaching were given a cognitive test called FitSmart, which is a National Health-Related Fitness Knowledge Test designed for high school students. Results indicated that although the pre-service teachers scored in the 99th percentile for high school students, their mean score was 75.18%. Results of both these assessments raise concerns for colleges and universities as fitness plays an increasingly larger role in physical education.

Standards-based reform efforts emphasize what students should be able to "know and do" in relation to subject matter content. Although physical fitness has been espoused as a cornerstone of physical education for many years, it is only recently, for solid research-based reasons, that health-related fitness is being recognized as a legitimate part of the key content for physical education (Surgeon General's Report, 1996, National Center for Chronic Disease Prevention and Health Promotion, 2000). Part of being a "physically educated person "includes being physically fit and knowing the benefits of a physically active lifestyle. National standards include an 'understanding of movement concepts and principles' (such as those that apply to physical activity and fitness) as well as being 'physically fit' and 'participating in regular physical activity'. Also, state learning standards often include fitness and knowledge of its concepts. New programs, such as Physical Best, are sponsored by AAHPERD in an effort to promote fitness education for K-12 students and help fulfill motor, cognitive, and affective fitness-oriented standards. Clearly, health-related fitness is part of our professional agenda and helps to define what school-aged children should know and be able to do.

There are many reasons why fitness is such an important part of physical education today. Physical activity is recognized as an important component of a healthy lifestyle. In 1992, The American Heart Association added physical inactivity as a primary risk factor for coronary heart disease. During 1994 and 1995, The Center for Disease Control, The American College of Sports Medicine, and The National Institute of Health published official statements on the importance of physical activity for cardiovascular health. In 1996, The Surgeon General of the United States officially recommended regular exercise as a part of a healthy lifestyle. Clearly, the message from the Surgeon General, the Center for Disease Control, and research is that physical activity is a key factor in longevity and quality of life. Despite

this increased knowledge and recognition of the importance of physical activity, physical education requirements have decreased nationwide over the past decade, children are less fit and have an increased incidence of obesity (Barovik, 2000; National Center for Chronic Disease Prevention and Health Promotion, 2000, NASPE, 2001) when compared to a decade ago. As a result, there has been a renewed interest in health-related physical fitness and the role of physical education in promoting physical fitness among children and adolescents.

Despite the fact that physical activity and fitness should occupy an important place in K-12 physical education programs, there is some controversy over what physical education teachers and physical education majors should actually be expected to do in relation to fitness. For example, there has been discussion in several journals over the past few years regarding issues such as: should physical education teachers be fit (Hinson, 1998; Issues, 1992)?; should fitness be a factor in hiring a physical education teacher (Melville & Cardinal, 1997)?; should fitness testing be a requirement for graduation at the university level (Issues, 2001)?. There has also been concern over what teachers believe and know about fitness and fitness testing (Kulinna, Silverman & Keating, 2000; Miller & Housner, 1998) and about the relevance of disciplinary courses like exercise physiology (Bulger, Mohr, Carson, Robert & Wiegand, 2000).

Yet, although fitness looms large in the profession, and the fact that there are many issues associated with teaching and testing it, little research has been done to substantiate what in-service or pre-service teachers actually know and do related to fitness. Given the fact that demographics indicate large numbers of imminent retirees, it is the newest teachers who will carry a substantial portion of the responsibility for teaching fitness and fulfilling the new standards.

The issue of what newly trained physical educators know and can do in relation to fitness is an important one for the profession as a whole and also for the colleges and universities that train future teachers. Certainly, colleges want to prepare teachers who are good role models and who can teach relevant information effectively. With the emphasis on program assessment and accountability in colleges today, it becomes important to determine the extent to which colleges are actually fulfilling their missions. As indicated earlier, fitness is a difficult and controversial area, one that faculty members at many schools and universities have debated. It becomes important to have actual data to help the profession determine the extent to which we can reasonably hold students accountable for what they "know and do" related to fitness.

The purpose of this paper is to describe what a group of physical education majors know and can do in relation to fitness via their Fitnessgram (1999) fitness test results and performance on a cognitive health-related fitness test called *FitSmart* (1999). Additional data describe students' background in physical activity, their beliefs regarding the importance of fitness in a K-12 setting, their perceived comfort levels in teaching fitness concepts and activities, and other relevant information.

Methods

Sample

All students in this study were physical education majors at a medium-sized college in central-western upstate New York. The College has a population of approximately 8,000 undergraduates; physical education is the largest major on campus with 700-800 students. Approximately 75% of the physical education majors are in the teacher certification concentration. The department places 60-80 student teachers every semester.

It may be important to note that the college in which data was collected for this study is grounded in the tradition of physical education as an academic discipline, i.e. all students must have a major in physical education before pursuing a

professional concentration. The mission of the department includes developing a "physically educated person", part of which involves being physically fit. Therefore, all physical education majors, regardless of concentration (teacher certification, exercise physiology, athletic training, sport management) must pass a physical fitness test in order to graduate.

Two types of data were collected for this study, performance data, based on a fitness test, and cognitive data, based on a written test of fitness concepts. Data collected for the physical fitness test was obtained from 76 students in three sections of a required course for all majors, called Fitness for Healthful Living. Twenty-five percent (n=19) of those tested were female, 75% (n=57) were male. These were students at various levels of the program, from sophmores to seniors. Students in teacher certification must pass the course prior to their last semester in order to be placed for student teaching. Passing the fitness test is a requirement for passing the course.

The cognitive test of fitness concepts was administered to 63 student teachers during their first student teaching seminar in the fall. Fifty-three percent (n=33) of the student teachers were male and 47% (n=30) were female. Seventy-three percent (n=46) were between the ages of 20-25; 17.5% (n=11) were between 26-30; approximately 10% (n=6) were over 30 years old. We chose student teachers because they would be currently trained (thereby mitigating the idea of obsolescence of knowledge as a factor) and they had completed all the required coursework.

Data Collection/Instruments

This study included collection of two types of data. First, data was gathered regarding fitness levels. As indicated earlier, all physical education majors in the department, regardless of concentration (teacher certification, exercise physiology, athletic training, sport management) must pass a physical fitness test. The test administered is the Fitnessgram and all students must meet the minimum requirements (i.e. 20th percentile on the Fitnessgram) in order to graduate.

Fitnessgram (1999) is the test used in all sections of the course because it is endorsed by AAHPERD and the departmental curriculum committee. The test consists of the one mile run, push-ups, curl-ups, sit and reach test, as well as the Body Mass Index (BMI). Skinfold measurements or hydrostatic weighing were done as a check if students did not initially meet the BMI requirement, perhaps due to muscle mass. Students pass the individual test by being in the criterion-referenced healthy fitness zone which is set at approximately the 20th percentile. Criteria are based on national health related fitness standards.

FitSmart: The National Health-Related Physical Fitness Knowledge Test (1999) was used to derive the second type of data. FitSmart is designed to be a cognitive assessment intended for high school seniors to determine the extent to which they possess the fitness knowledge acquired from involvement in physical education classes. Assessing knowledge of fitness concepts has been increasingly recognized as an important part of a good physical education program. Research indicates that people who are educated about fitness are more likely to be active and fit. The rationale for conducting this test with student teachers was that if our graduates in teacher education are expected to teach fitness concepts to public school students, it is important to see what level of understanding the teachers themselves have.

FitSmart is a 50-item multiple-choice test designed to measure knowledge of health-related fitness concepts. Questions are divided into six categories: Concepts of Fitness (includes items such as definitions, relationship of fitness to physical activity, relationship of fitness to health); Scientific Principles of Exercise (includes acute, chronic, physiological and psychological responses to exercise); Components of Physical Fitness (includes cardiorespiratory function, muscular strength & endurance, flexibility, body

composition); Effects of Exercise on Chronic Disease Risk Factors, Exercise Prescription (includes concepts such as frequency, intensity, duration, mode, self-evaluation, and adherence to exercise); and Nutrition, Injury Prevention and Consumer Issues (FitSmart, 1999, p.5). The test may be taken on-line or it can be printed and results entered into the computer for analysis. There are two versions of the test; Form 2 was used for this study.

FitSmart was chosen as the most appropriate test of Fitness knowledge because, as mentioned earlier, these are basic concepts and principles that pre-service teachers will be expected to communicate to high school students. The test has undergone rigorous validity and reliability trials and multiple pilot tests (Zhu, Safrit, & Cohen, 1999).

Procedures

Fitness testing was done as part of a course called *Fitness for Healthful Living* which students can take at any point in their college career, although they are encouraged to take it as early as possible. Students are permitted to request incompletes in the course in order to successfully complete any parts of the test that they might have had difficulty passing. Students are also counseled, through academic advising, to take the course when they are reasonably sure they can pass the test items. Students in teacher certification must pass all components of the fitness test prior to student teaching.

Instructors from the *Fitness for Healthful Living* course provided anonymous data for each category of the Fitnessgram test. Separate tests were conducted on several days during the semester and students could be re-tested if they did not pass on a given day. Final passing grades were based on end of the semester scores.

The cognitive test, *FitSmart*, was done with 63 student teachers. Since this was a relatively large group, students were divided into three smaller groups of 21 each and were given the written test. Results were then entered into the computer, printed and summarized for each exam as a whole and by category.

In addition, at the time of the cognitive test, students were asked to complete a questionnaire providing information regarding their background in fitness. This included questions such as number of courses in fitness and exercise science, grades received, self-perceptions of fitness and comfort levels in teaching fitness concepts/activities to various levels of students, etc. Prior to administering the test and questionnaire, approval was requested from and granted by the University's Institutional Review Board; students signed an informed consent.

Data Analysis

Data for the fitness test, *Fitnessgram*, were put on a spread sheet for each student in each test category. Cumulative passing percentages, by gender, were compiled based on a passing score at the 20th percentile, as set by *Fitnessgram*.

Data from the *FitSmart* cognitive test was entered into the *FitSmart* computer program and analyzed by the computer. FitSmart results are presented in both a norm-referenced and a criterion-referenced manner. Norms indicate the percentile into which students' scores fall. Norms were originally determined as a result of administering the test to over 4,000 high school students. The criterion reference indicates whether student knowledge in each of the six categories is adequate (scores fall into a healthy fitness zone, with distinctions between "good" and "better' within the healthy fitness zone) or inadequate (scores fall into a "needs improvement" zone). Results are further presented to students in a bar graph format by category of questions. Categories include: Concepts of Fitness, Scientific Principles of Exercise, Components of Physical Fitness, Effects of Exercise on Chronic Disease Risk Factors, Exercise Prescription, and Nutrition, Injury Prevention and Consumer issues. Normally, scores are reported on a standard score scale from 20-80, but in this study, both overall scores as

well as scores in each category were converted to percentages for ease of explanation.

In addition to the analysis of the two tests described above, data from the questionnaires were summarized and expressed as percentages for each question. A two-tailed bivariate correlation was conducted regarding how students rated their knowledge of fitness activities and their comfort levels when teaching various grades.

Results

Fitnessgram results (Performance Test)

Seventy-six undergraduate students (57 males, 19 females) from three sections of the Fitness for Healthful Living course were assessed as part of the course requirement. As can be seen in Table 1, students passed most tests at a fairly high rate. The passing rate for students who passed all tests was 82% (n=62). Of those, 73.68% (n=14) of females passed all tests and 85% (n=48) of males passed all tests.

Table 1

Numbers and Percentages of Students Meeting Fitnessgram Standards

M=males
F=females

Test	#F passed	% F passed	#M passed	%M passed	Total % passed
1 mile run	18/19	94.74	55/57	96.49	96.00
BMI	16/19	84.21	51/57	89.47	88.00
Sit & Reach	19/19	100.00	56/57	98.25	98.68
Curlups	19/19	100.00	53/57	92.98	94.74
Pushups	18/19	94.74	56/57	98.25	97.37

FitSmart Test Results (Knowledge Test)

Table 2

FitSmart Knowledge Test Scores

Test Component	Percentage Correct
Exercise Prescription	92.07 ± 2.24
Concepts of Fitness	82.54 ± 20.25
Effects of Exercise on Chronic Disease Risk Factors	77.25 ± 23.06
Nutrition, Injury Prevention, and Consumer Issues	70.02 ± 20.89
Components of Physical Fitness	67.77 ± 25.67
Scientific Principles of Exercise	67.73 ± 37.32

(Data is presented as percentages ± standard deviation with correct answer in each category)

The mean score out of the possible 50 points was 37.59 ± 3.43 (SD), or 75.2 ± 6.86%. The highest score obtained on the test was 90.0%, while the low score was 62.0%. As can be seen on Table 2 , students performed best on the Exercise Prescription component of the test. The students' greatest weaknesses were in the areas of Scientific Principles of Exercise and Components of Physical Fitness. According to the FitSmart Test, student knowledge in all categories placed them in the "Healthy Fitness Zone", although the categories of Scientific Principles of Exercise and Components of Physical Fitness scores averaged at the lower end of the zone ("good" vs. "better").

In addition, data was collected from the students to determine their background and experience in sports and fitness, their perceptions regarding the importance of fitness in the curriculum, perceived comfort levels with fitness knowledge, fitness concepts, and teaching ideas for fitness activities (see Appendix 1). Ninety-five percent of the students reported that they had participated in high school interscholastic sports, while 58.73% reported participation in intercollegiate sports. Less than 5% of students reported earning a grade of "A" in Exercise Physiology, 30% earned a "B", 41% earned a "C", 8% earned a "D", and 14% did not remember their grade. Forty percent of students rated their knowledge of fitness concepts as "average", while 53.97% reported an "above average" rating. Similarly, 30.16% rated their knowledge of fitness activities as "average", while 58.73% reported an "above average" ranking. Only 1.59% and 7.94% ranked their knowledge of fitness concepts and fitness activities, respectively, as "excellent". Students also self-reported comfort levels about teaching fitness concepts/activities to elementary, middle school, high school, and college age individuals. Ninety-two percent reported either a "comfortable" or "very comfortable" rating when teaching either elementary or middle school children. Only 87.3% reported levels of "comfortable" or "very comfortable" for teaching high school age students and 73.01% felt comfortable or very comfortable teaching college age or older students. Eighty-four percent rated their fitness levels as either "average" or "above average". Over 90% of respondents felt that fitness was either a "very important" or "the most important" component of a K-12 physical education curriculum.

Discussion

Fitnessgram (Performance) Test

University students need certain types of skill and knowledge to be effective teachers and they should be tested on whether they have adequately acquired the necessary skills and knowledge. There also seems to be agreement that physical educators need to be active and fit in order to serve as role models for children (*Issues*, 1992). NASPE (1994) advocates that physical educators have a professional responsibility to be good role models for physical activity and fitness. Yet, when it comes down to actually testing students' fitness, there seems to be concern and controversy (*Issues*, 2001). In fact, 69% of physical education departments do not require physical education majors to take fitness tests (Staffo & Stier, 2000). Although many reasons are provided for why this is true, little data exists to describe the extent to which majors are actually fit and the areas of strengths and weaknesses.

This study examined fitness knowledge and health-related fitness levels in college students. Data here clearly indicate that most students from this sample population did quite well on the Fitnessgram tests and most students (82%) passed all the tests with little difficulty. Scores on the mile run, sit and reach, curl-ups, and push-ups included a passing rate of approximately 95% or better for each test. In fact, 100% of the females passed the sit and reach and curl-ups tests. Some students needed to re-take one or more tests and were afforded more time in the form of a grade of incomplete to do so. This was especially true for the mile run and BMI.

While the results can be considered a good indication of the fitness levels of these majors, it may be important to note that the results may reflect the fact that the course in which testing occurs has clearly posted expectations for passing, students know the criteria for the tests well ahead of registering for the course, and they can self-test to determine whether or not to register. Passing rates may, therefore. reflect good advising as much as actual fitness levels at any given time.

Although there is much controversy about fitness testing at the university level, it's interesting to note that at this college, the majority of students did pass the test. In this case, fitness is part of the departmental mission statement and is reflected in the learning outcomes for all majors. This meant that the department had to "walk the talk" and demonstrate that students were actually accomplishing the student learning outcomes (SLOs), as guided by the mission statement. One is left to speculate as to what the results of a "random" fitness test would be if the department had not made fitness part of the mission and SLOs. As a result of the departmental commitment to fitness, a course was established (Fitness for Healthy Living) in which students are taught and tested in the area of fitness. Care is taken in advising students before registering for the course; course requirements and fitness standards are clearly posted and "advertised"; and, remedial opportunities for students who do not pass the test(s) on the first try are provided, including the possibility of an "Incomplete" grade. These have been important safeguards to the system. Fitness has thus far, been a successful part of the program and helps "define" the majors at this institution. These may be important ideas for other universities to consider, given the controversial nature of this topic.

What was not evident from the data collected was the percentile at which students were passing the tests. The high overall passing rate could also reflect a need for an increased standard. The passing standard for the Fitnessgram is set at the 20th percentile, so although the passing rate was very high, this brings into question the students' levels of fitness — e.g. is being in the 20th percentile fit enough to be a PE teacher?; how many students would continue to pass the tests at the 50th percentile?. Since part of the departmental mission and student learning outcomes is to produce students who are physically fit, does the current standard really accomplish this? Further research might explore the level at which college students are actually passing fitness tests.

The weakest area of student health-related fitness was body composition. 84.2% of females (n=16/19) and 89.5% (n=51-57) of males passed the BMI standards. In our department, those who don't pass BMI are tested for percent body fat (using skin folds or hydrostatic weighing) and must fall below the criteria of 25% for men and 32% for women. The issue of body composition is very controversial and debates continue as to whether or not body composition should be used as criteria for qualification as a physical educator. In other words, if a senior student can pass the other Fitnessgram criteria but does not meet the body composition criteria, should this person be prevented from passing the course and potentially delaying student teaching and graduating from college? Given the shortcomings of body composition measurements and the complexity of obesity, this is a difficult question to answer. Our department has decided that, in fact, the student must pass the body composition requirement in order to student teach, but that procedures need to be put into place to help ensure student success. For example, body composition measures need to be taken far enough in advance so that the student has time to work on changing percent body fat before being post-tested at the end of the PES fitness course.

The concern over body composition raised in this study corroborates Cardinal's study (2001). Cardinal surveyed both in-service and pre-service teachers who were members of a state professional organization and had an average age

of 40.2 years. He found 39.2% of HPERD participants to have an "unhealthy percentage of body fat" (p.87). In our study only 12% of the students tested did not pass the body composition test. This may, in part, be reflective of the age difference between (primarily) in-service teachers and pre-service students. Cardinal reports... "while a substantial number of HPERD professionals and pre-professionals . . . had high BMI values, the average participant was of acceptable weight and the prevalence of being overweight and obese were less than those observed within the general U.S. adult population" (p.87). Thus, body composition is clearly an issue warranting further attention for pre-service teachers, in-service teachers, and the population at large.

Body composition may also be a self-limiting factor for physical education majors since research indicates that overweight physical educators are at a disadvantage in the hiring process (Melville and Cardinal, 1997). Public school personnel would choose a fit-looking candidate who was less academically qualified over another candidate who was 20 pounds overweight. Based on this finding, a body composition requirement would appear to be helpful to our students in terms of post-graduation job acquisition. However, concerns of students' rights and the question of whether or not a person who does not meet the body composition standard can still be an effective physical educator and role model are still debated.

Overall, fitness testing seems to be a difficult issue. Yet, given the importance of role modeling and the significance of fitness in our professional agenda, it is an important one as well. Although there are some concerns about certain test items (e.g. student's rights, safety, etc.) data collected for the purpose of this study indicate that most of the students in the sample met reasonable standards on the test used and that's a positive sign for the profession. Future research might include evidence from other institutions in which fitness testing is a requirement to determine whether these results are representative.

It should be noted that much of the fitness testing data were gathered in an effort to systematically assess the mission and learning outcomes for the department. As such, it is useful in that it will help to revise and improve the curriculum. As Staffo & Stier (2000) point out, there are numerous inconsistencies among university department chairs regarding fitness testing of undergraduates. Although 76% of chairpersons believe fitness testing is important, very few departments actually do the testing. If departments want students to be fit and knowledgeable, to represent their vision of a "good", qualified physical educator, it is important to clearly define that image and periodically assess the extent to which students are actually embodying it. It may he time for physical education to make some difficult decisions regarding assessment if we are to show evidence that we "practice what we preach". That's not always easy, but it's essential if we're to have more than anecdotal evidence of key characteristics such as fitness.

FitSmart (Cognitive) Test

"Fitness education" is a curricular concept enjoying significant popularity in "new" physical education programs across the country. Some programs are basing their entire curriculum on a fitness approach (Westcott, 1992). One of the ways the "New PE" is different than traditional programs is that it includes the teaching of fitness knowledge and concepts rather than just the performance of activities such as calisthenics. Yet, there is relatively little research available to indicate the extent to which new teachers know and understand the concepts they are expected to teach.

This study examined the fitness knowledge of new teachers using FitSmart, a well regarded, valid and reliable test designed for high school students. Included in the test are many of the concepts teachers will be expected to explain and

teach to students in the newer curricula. Most students in this study scored in the 99th percentile, based on high school norms. While this may initially seem impressive, it should be noted that students could answer up to 13 questions incorrectly and still be in the 99th percentile. An average score of 75.2% is not highly impressive for college seniors who have already completed student teaching. While students were most competent (92% average) with regard to questions on exercise prescription, students were weakest in the areas of Components of Physical Fitness (67.7% average) and Scientific Principles of Exercise (67.7% average).

The scores on this test raise several important concerns, especially for colleges and universities. First, where are students learning the information that will be relevant to them as teachers of fitness skills and concepts? The primary course responsible for university students' knowledge of fitness concepts is often exercise physiology. Results like those in this study bring into question the role of traditional exercise physiology curriculum in the PETE program. Traditional exercise physiology courses usually focus on adults' adaptations to acute and chronic bouts of exercise. Developmental exercise physiology is a new concept and is typically a very small component of most curricula (Bulger, Mohr, Carson, Robert, Wiegand, 2000). Perhaps students are simply not learning the fitness material they need to work with children. This idea has also been proposed by others (e.g. Miller & Housner, 1998; Karper, 1997). Clearly there needs to be continued work in bridging the gap between theory and practice, between specific subdisciplinary knowledge and more generic pedagogical concepts in order to better prepare physical educators to teach physical fitness concepts, especially as they apply to children and adolescents.

Subject matter expertise may also be a factor in the scores on this fitness test. In addition to questioning whether or not meeting the 20th percentile of performance based health-related fitness standards is acceptable, the question of minimum requirements for fitness knowledge is also important. For example, most students took only one required course in which fitness concepts might be covered in depth, i.e. exercise physiology, and student grades in the class tended to be weak. Few students reported earning grades of "A" (4.76%) while many (49%) reported earning grades of "C" or lower. Almost 15% did not remember their grades. Few students were motivated to take additional courses in exercise physiology (9.52% had taken more than the required course). In this program, all physical education majors are now required to take the PES course (Fitness for Healthful Living) but this is a relatively new requirement and only a few of the student teachers had taken this course (25%) at the time we administered the FitSmart Test. Perhaps, as all students take this course it will increase their subject matter knowledge in fitness concepts. Some students took a course in advanced weight lifting which may have contributed to their knowledge of certain fitness concepts. However, for many students who only take one course in exercise physiology, subject matter expertise may be limited in this area. These factors speak to the importance of the need for reinforcement of fitness concepts in a variety of courses, such as exercise physiology, motor development, activity-based courses, methods courses, etc. It makes sense that difficult subject matter requires repetition and a variety of explanations within different contexts before it is mastered. Some universities, recognizing this as an issue for teachers, have begun to modify existing curricula by infusing health-related fitness concepts throughout the program (Bulger, Mohr, Carson, Wiegand, 2001) rather than leaving the bulk of the burden of teaching fitness concepts to one course in exercise physiology.

Certainly, pre-service students and beginning teachers need subject matter mastery themselves before they are capable of transforming that subject matter for students. Factors such as performance (grades) in courses such as exercise

physiology, relevance of material in exercise physiology courses to children, and reinforcement of fitness concepts throughout the curriculum are all relevant to the issue of where students are learning necessary information in regard to fitness.

Interestingly, the results in this study indicated that these beginning teachers believed strongly in the importance of fitness. Over 90% of the student teachers felt fitness was either "very important" or "the most important" component of a PE curriculum. However, beliefs may not be enough. Actual knowledge and comfort levels with that knowledge may be important for teachers in the real world. Kulinna, Silverman & Keating (2000) found that although many in-service teachers believed strongly in the importance of fitness, their actions often did not match their beliefs. Perhaps it is because of a lack of a solid, relevant knowledge base in fitness that there is a discrepancy between beliefs and actions. This may be especially true for new teachers. Whitley, Bailey, Sage & Sargent (1994) report that "... younger instructors...who received more recent education and training in cardiorespiratory fitness, were less likely to include fitness activities and cognitive explanations in their programs than their older, more experienced peers" (p.83). Hastie & Vlaisavljevic (1999) report that teachers pay more attention to quality of performance and student accountability when subject matter expertise increases. When confronted with high school students who may pressure teachers and "negotiate" to decrease activity levels and/or students who may ask difficult questions, it seems reasonable to speculate that without a genuinely strong knowledge base, teachers may acquiesce and eventually decrease the time and emphasis devoted to fitness. Thus, increased mastery of fitness knowledge may help link beliefs with actions.

Part of the link between beliefs and actions may involve perception of knowledge. Although students only scored an average of 75% on the *FitSmart* test, their perception of their own fitness knowledge was higher. Almost 94 percent of students rated their knowledge of fitness *concepts* as either "average" (39.7%) or "above average" (53.97), while 88.9% rated their knowledge of fitness *activities* as either "average" (30.2%) or "above average" (58.7%). Thus, they seemed more certain of the concepts than of the activities, perhaps reflecting their relatively limited experience. In addition, it seems that students may feel that they know more than their actual test results indicate.

On the other hand, when questioned further regarding comfort level in *teaching* fitness concepts and activities, the students seemed to know that their knowledge was somewhat limited. As the age of the potential student increased from elementary to college age, comfort level decreased from 92.1% to 73.0% feeling "comfortable" or "somewhat comfortable" (at K-8 level, 92% were either comfortable or very comfortable with teaching fitness; at 9-12 level, 87% were comfortable or very comfortable; only 73% were comfortable or somewhat comfortable teaching at the college level). We also conducted a two-tailed bivariate correlation between how students rated their knowledge of fitness activities and of their comfort levels in teaching various grade levels, including college. Not surprisingly, results indicated that those who rated their knowledge of activities and their comfort levels highest were also the students who scored highest on the test.

Conclusion

This study began to look at what pre-service teachers know and can do in relation to fitness. The reality is that (with commitment and support from the department) physical education majors may be in better shape than some might think and beginning teachers in this study knew considerably more than average high school students about fitness concepts. Many other issues remain to be explored and certainly a variety of issues have surfaced as a result of this initial

attempt to gather actual data on the subject. For example, where/how do students learn the most relevant information needed for teaching fitness? What problems are universities having when they teach fitness and wellness concepts? What effect does fitness testing have on the fitness levels of our majors? What problems do universities have with fitness testing? What are the consequences for students who do not pass fitness tests? Fitness is clearly an important issue in physical education today. Additional assessments of what new teachers believe, know, and can do in this area may give us some insight about ways to improve how teachers are being prepared and, consequently, what is being taught in K-12 schools.

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Table 1

Numbers and Percentages of Students Meeting Fitnessgram Standards

M = males

F = females

Test	# F passed	% F passed	# M passed	% M passed	Total % passed
1 mile run	18/19	94.74	55/57	96.49	96.00
BMI	16/19	84.21	51/57	89.47	88.00
Sit & Reach	19/19	100.00	56/57	98.25	98.68
Curiups	19/19	100.00	53/57	92.98	94.74
Pushups	18/19	94.74	56/57	98.25	97.37

Table 2

FitSmart Knowledge Test Scores

Test Component	Percentage Correct
Exercise Prescription	92.07 ± 2.24
Concepts of Fitness	82.54 ± 20.05
Effects of Exercise on Chronic Disease Risk Factors	77.25 ± 23.06
Nutrition, Injury Prevention, and Consumer Issues	70.02 ± 20.89
Components of Physical Fitness	67.77 ± 25.67
Scientific Principles of Exercise	67.73 ± 37.32

(Data is presented as percentages ± standard deviation with correct answer in each category)

Appendix 1

Demographic data of subjects (n = 63) Fitsmart test

- Gender: 47% female (n = 30) 53% male (n = 33)
- Age: 20-25 years (73%) 26-30 years (17%) Over 30 years (10%)
- Grade received in Introductory Exercise Physiology course:
  A (5%) B (30%) C (41%) D (8%) E (14%) NA (2%)
- Have you taken PES 315 (Fitness for Healthful Living)?
  Yes (25%) No (73%) NA (2%)
- Have you taken PES 343 (Advanced Weight Training)?
  Yes (30%) No (68%) NA (2%)

- Are you certified as a personal trainer?
  Yes (5%) No (92%) NA (3%)

- Did you participate in high school interscholastic sports?
  Yes (95%) No (3%) NA (2%)

- Did you participate In collegiate interscholastic sports?
  Yes (59%) No (40%) NA (1%)

- Did you participate in competitive sports outside of school?
  Yes (78%) No (21%) NA (1%)

- How would you rate your knowledge of fitness concepts?

Poor (0%) Below Avg (2%) Avg (40%) Above Avg (54%) Excellent (2%) NA (2%)

- How would you rate your knowledge of fitness activities that you would use in teaching?

Poor (0%) Below Avg (2%) Avg (30%) Above Avg (59%) Excellent (8%) NA (1%)

- How comfortable do you feel teaching concepts/activities of fitness to elementary school children?

Un. (0%) Somewhat (6%) Comfortable (51%) Very (41%) Unsure (0%) NA (2%)

- How comfortable do you feel teaching concepts/activities of fitness to middle school children?

Un. (0%) Somewhat (6%) Comfortable (54%) Very (38%) Unsure (0%) NA (2%)

- How comfortable do you feel teaching concepts/activities of fitness to high school students?

Un. (0%) Somewhat (11%) Comfortable (46%) Very (41%) Unsure (0%) NA (2%)

- How comfortable do you feel teaching concepts/activities of fitness to college students?

Un. (6%) Somewhat (19%) Comfortable (44%) Very (29%) Unsure (0%) NA (2%)

- How comfortable do you feel teaching concepts/activities of fitness to high school varsity athletes?

Un. (3%) Somewhat (14%) Comfortable (40%) Very (41%) Unsure (0%) NA (2%)

- How would you rate your own fitness level?

Poor (0%) Below Avg (6%) Avg (38%) Above Avg (46%) Excel. (8%) NA (2%)

- How important do you believe fitness is in a K-12 PE curriculum?

Un. (0%) Somewhat (0%) Important (8%) Very imp. (49%) Most (41%) NA (1%)