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The Effectiveness of Mentoring-Based Professional Development on Physical Education Teachers' Pedometer and Computer Efficacy and Anxiety

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The purpose of our study was to examine the impact of mentoring-based professional development on physical education teachers' efficacy. Experienced mentor teachers were paired ($n = 15$) with inexperienced protégé teachers ($n = 15$) at the beginning of a yearlong intervention study. It was hypothesized that teachers would increase their efficacy to use pedometers and computers to enhance instruction, and reduce their computer anxiety. Repeated-measures ANOVAs for mentors and protégés revealed a variety of significant main effects. We found increases in computer and pedometer efficacy. A second set of repeated-measures ANOVAs based on mentors', protégés', and control groups' scores revealed a significant interaction for computer efficacy, indicating that both mentors and protégés significantly increased their computer efficacy compared with the control group. Finally, a significant interaction effect was also found for pedometer efficacy, again indicating that both groups significantly increased their efficacy compared with control teachers.

Keywords: health, physical activity, physical education, psychology, exercise, kinesiology

Many children and adolescents are physically inactive and become even less active as they age (CDC, 1997, 2003; USDHHS, 1996, 2000). Non-Caucasian children from low-income families report the lowest levels of physical activity participation, thus placing African American children from inner-city environments, for example, at greater risk than Caucasian children from suburban settings. It is imperative that physical education professionals help children, especially minority children, become more active and healthier.

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Physical activity through school physical education is one way to help children increase their physical activity and fitness (National Association of Sport and Physical Education, 1997). The delivery of a physical education curriculum designed to promote physical activity can be enhanced through the incorporation of a technology such as the pedometer. The use of pedometers in physical education has become popular in recent years. Pangrazi and colleagues, for instance, have provided a text for physical education teachers that is devoted solely to pedometer use (Pangrazi, Beighle, & Sidman, 2003). Computers are also effective instructional tools. For instance, there are now a number of Web sites devoted to teaching physical education, such as <http://www.pecentral.org> and <http://www.pelinks4u.org>. Helping teachers become skilled at using computers and pedometers as part of a physical activity curriculum is a promising avenue to take for increasing teacher effectiveness and thus lead to enhanced student physical activity, fitness, and health. For example, many teachers use pedometers to help students monitor and increase the number of steps they take during physical education with the goal of promoting greater activity (Pangrazi et al., 2003).

Therefore, the purpose of the current study was to determine the effectiveness of a yearlong professional development program to enhance teacher efficacy at incorporating technology (i.e., computers and pedometers) into their teaching practices. More specifically, we were interested in assessing whether a mentoring-based professional development intervention designed to promote computer and pedometer use in conjunction with the Exemplary Physical Education Curriculum (EPEC) would enhance teachers' self-efficacy in these areas. Despite the increasing popularity of pedometers in physical education and physical activity settings, we are unaware of any researchers who have examined whether physical education teachers feel efficacious about using pedometers, and whether their efficacy can be enhanced. Similarly, although computers are ubiquitous in society in general, and in education specifically, we know of no published research on teacher's efficacy and anxiety regarding their use in physical education or whether these constructs are amenable to change. Thus, our research effort in this regard makes a unique contribution to the literature.

The literature on mentoring (Bey & Holmes, 1990; Smith & Ingersoll, 2004; Stroot et al., 1998), in addition to social cognitive theory (Bandura, 1997), guided the development of the current study. There are many possible benefits of mentoring, including mentors assisting newer teachers with the transition into education (Little, 1990) and helping them implement new curricula (Bey & Holmes, 1990). Mentoring programs are often structured to provide one-on-one assistance between a mentor and protégé (Bey & Holmes, 1990; Smith & Ingersoll, 2004). Because the key to successful mentoring programs is the effectiveness of the mentor (Stroot et al., 1998), in this project the mentors received formal mentor training in order to guide their protégé partners in learning to teach a new curriculum. At the same time, the mentorship program was grounded in reform-style professional development, which acknowledges the collaborative and reciprocal benefits of a mentor and protégé partnership. For example, we recognized that it was quite likely that the younger protégés might be more computer savvy than the older mentors and thus assume a more active role when using computers. Readers are encouraged to read the 2005 JTPE monograph, titled *Exploring Mentoring in Physical Education* (see, e.g., McCaughtry, Kulinna, Cothran, Martin, & Faust, 2005), for an overview of mentoring specific to physical education.

Within social cognitive theory, we were particularly interested in self-efficacy, one's perceived capability in a particular setting (Bandura, 1997). Bandura claims that efficacious teachers use more problem-solving strategies, develop greater skills, become more competent teachers, work harder, and persist more when failing compared with less efficacious teachers. Thus, physical education teachers who feel efficacious about using pedometers—for example, as aids to teaching a physical activity curriculum—should be more likely to do so than teachers who lack efficacy in using pedometers. Similarly, teachers who have strong computer self-efficacy should be more likely to use computers to access PE Web sites for information than teachers with weak computer self-efficacy.

Workshop activities were designed to target the major antecedents of self-efficacy as stipulated in self-efficacy theory, a subset of social cognitive theory. The most significant antecedent of self-efficacy is the mastery experience. Therefore, teachers were given a plethora of opportunities to practice and master EPEC lessons, computers, and pedometers. Furthermore, because a second major determinant of self-efficacy is persuasive feedback, Michigan Fitness Foundation (MFF) instructors and the research team provided critical, specific, genuine, and persuasive feedback and encouragement designed to enhance success and bolster self-efficacy. Another important antecedent of self-efficacy is modeling, so MFF personnel modeled the EPEC lessons. Finally, as mentor teachers modeled their mastery of the EPEC lessons, they also became a source of vicarious success, thus demonstrating to protégés that they too could master the EPEC. Vicarious success by similar models is another source of efficacy enhancement (Bandura, 1997).

Although self-efficacy research in physical education is sparse, Martin and colleagues' line of research shows promise. Martin, Kulinna, Eklund, and Reed (2001) found that teachers with strong self-efficacy for teaching physically active lessons were more likely to have strong intentions to teach active lessons and more favorable attitudes toward teaching physically active lessons compared with teachers who were less efficacious. Teachers who are efficacious about teaching active lessons despite a lack of space (e.g., no gym) were also confident in their abilities to motivate students who did not enjoy being physically active in physical education (Martin & Kulinna, 2003). Martin and Kulinna (2004) also found that teachers expressing efficacy in their ability to teach physically active lessons reported greater efficacy for overcoming barriers, stronger intentions, more favorable attitudes, and greater feelings of control compared with less efficacious teachers. In contrast to the above findings, Martin and Kulinna (2005) found that self-efficacy, compared with the importance teachers placed on a physically active program, was relatively unimportant. The above line of research examining teacher efficacy related to teaching physically active classes is a promising area of inquiry. However, to our knowledge, researchers have not examined teachers' computer or pedometer efficacy in physical education. Many people have an aversion to computers (Meier, 1985), and computer anxiety is inversely related to efficacy suggesting that as teachers gain efficacy with computers, any anxiety about computer use should be reduced. Therefore, a secondary question of interest was whether, over the academic year, teachers would reduce their computer anxiety.

Older individuals seem more prone to experiencing computer anxiety (Gardner, Render, Ruth, & Ross, 1985) than younger people. Ellis and Allaire (1999) suggested that older individuals' increased computer anxiety is likely the result

of having less knowledge and interest in computers. Therefore, we expected that the older and more experienced mentor teachers in our study who obtained their teaching degrees prior to the widespread use of computers may benefit more (i.e., increased efficacy and decreased anxiety) from computer training compared with the younger protégé teachers.

To summarize, the primary purpose of the current study was to determine whether a professional development intervention, based on mentoring processes and principles of social cognitive theory, using a physical activity–grounded physical education curriculum would result in increases in teachers' pedometer and computer self-efficacy and reductions in computer anxiety. Our major hypothesis was that both mentors and protégés would, as a result of developing computer and pedometer skills and knowledge, increase their efficacy in using computers and pedometers (and reduce their computer anxiety) compared with control group teachers. We speculated that the older mentor teachers may not be as familiar with computers as the younger protégé teachers, would report weaker efficacy at baseline, and would therefore benefit more from the intervention.

Method

Overview of the Project

We conducted our study in a large Midwestern inner-city school district that had adopted the EPEC. The EPEC is a health-related physical activity curriculum developed by the Michigan Fitness Foundation (Michigan's EPEC, 2000). The Centers for Disease Control awarded the EPEC the Achievement in Prevention Research and Research Translation in Chronic Disease Award in 2001. In the year preceding the current project, 30 district elementary physical education teachers participated in a comprehensive EPEC project (McCaughy, 2004). For the current study, 15 teachers were randomly selected from the 30 teacher participants from the previous project and were then trained in the current project as mentors for a group of protégé teachers. Mentor teachers had previously attended EPEC workshops, received comprehensive at-school support and guidance, demonstrated high levels of EPEC content knowledge, and reported and were observed using the curriculum in their classes. Protégé teachers were 15 newer elementary physical education teachers who volunteered to be mentored in the EPEC. These teachers were all unfamiliar with EPEC and were within their first 3 years of teaching or had recently moved from secondary physical education or classroom teaching assignments to elementary physical education. In general, these protégés were new to teaching EPEC and elementary physical education.

Teachers

Mentor and protégés participants were male ($n = 12$) and female ($n = 18$) and either African American ($n = 14$) or Caucasian ($n = 15$) (one teacher reported "other"). Overall, participants' experience teaching physical education ranged from several months to 37 years ($M = 13.56$, $SD = 11.89$), and mentors teachers had vastly more teaching experience ($M = 22.46$, $SD = 10.25$) than protégés ($M = 5.36$, $SD = 5.71$). A control group of teachers ($n = 17$) were recruited to participate in our study for

comparison purposes. They were all from the same school district as mentors and protégés and were fairly similar in demographic characteristics. Control teacher participants were male ($n = 8$) and female ($n = 9$) and either African American ($n = 13$) or Caucasian ($n = 4$). Their experience in teaching physical education ($M = 16.35$, $SD = 12.85$) was slightly higher than the overall mean for mentors and protégés noted above.

Students and Setting

Teachers in our study taught children in a very challenging inner-city environment. Students served by our teachers were 88% African American. In general, students were from low-income neighborhoods (e.g., 70% of them were eligible for free or reduced lunch programs). Teachers expressed an urgent need to help their students combat overweight and obesity through their physical education classes (McCaughtry, Martin, Kulinna & Cothran, 2006b). Additionally, teachers were also quite concerned about their students' emotional welfare (McCaughtry, Barnard, Martin, Shen & Kulinna, 2006a). Finally, teachers were worried about their student's physical safety and felt a sense of "deep sorrow" about the violence they saw their students growing up in while simultaneously expressing fear for their own safety owing to violence in the schools (McCaughtry et al., 2006a).

Workshops and Data Collection

Control Teacher Visits A. Control teachers were individually visited by the research team at their schools in October to collect baseline data (i.e., Time A1). Control teachers completed scales assessing demographics (e.g., gender), computer efficacy and anxiety, and pedometer efficacy.

Workshop B: EPEC Training for Protégé Teachers Only

In late October, the Michigan Fitness Foundation (MFF) taught protégé teachers about EPEC through presentations, lesson demonstrations, and discussion forums. Protégés received all curriculum materials (e.g., books) and physical education equipment (e.g., bats and balls) needed to teach the EPEC. This workshop took place prior to any mentoring activities and all scales were completed for baseline data (i.e., Time B1).

Workshop C: Mentor Training for Mentor Teachers Only

In early November, all 15 mentor teachers attended a daylong mentoring workshop taught by research team members who had knowledge of teacher development, self-efficacy theory, and mentoring literatures. Topics included the struggles of new teachers and challenges of learning a new curriculum. Teachers were given extensive supportive materials at all of the workshops.

Consistent with self-efficacy theory and the determinants of efficacy, we also encouraged mentors to model EPEC lessons using pedometers, provide persuasive feedback, and employ observational learning opportunities (i.e., show vs. tell) for

the protégés. Workshop leaders also role-modeled the above behaviors. Lastly, all the necessary equipment (i.e., 30 pedometers per teacher, EPEC materials) and workshop teaching aids (i.e., computer labs with 30 computers) were provided to enhance successful learning, skill acquisition, and efficacy. The last baseline data collection was completed at this workshop (i.e., Time C1).

Workshop D: Mentor and Protégé Pedometer Training

In early December, both mentors and protégés attended a half-day workshop on pedometers led by a nationally recognized pedometer expert. Teachers were taught how to correctly put them on and calibrate them, and how to efficiently distribute and collect them. They also learned to calculate baseline steps, set goals, and estimate distances in steps. Mentors and protégés completed pedometer efficacy scales one before and after the workshop (i.e., Times D2 and D3).

Workshop E: Mentor and Protégé Merged

At another early December workshop, each mentor teacher was paired with one protégé teacher. Pairing was done by the research team and the school district's physical education coordinator using the following considerations: (a) similar schools and facilities (e.g., K–8), (b) strengths and backgrounds of mentors and protégés, (c) personalities, and (d) school locations.

Teachers got to know one another, talked about EPEC, and commenced computer training. We offered both beginner and more advanced computer sessions. Researchers have demonstrated that by using computers older individuals can increase their computer efficacy (Karavidis, Lim, & Katsikas, 2005). Each mentor–protégé pair had their own private chat room to communicate (with monitoring by project staff). In addition, mentors had a mentor-only chat room and protégés had a protégé-only chat room. Mentor and protégés completed all scales before and after the workshop (i.e., Times E4 and E5).

Between Workshops E and F

The mentor–protégé pairs used chat rooms to discuss each teacher's school context and EPEC. After several weeks, teachers were given one prompt per week on the chat room by the research team. For example, "please discuss one EPEC lesson that you both taught this week." The rest of the electronic conversations were teacher driven.

Workshop F: EPEC and Pedometers

In late January, mentors and protégés continued learning about the EPEC, pedometers, and computers. Teachers were also given 30 pedometers to assist them in teaching the fitness components of EPEC. Pedometer follow-up training was similar to the training in Workshop D. Computer sessions consisted of further chat room training, accessing Web sites (e.g., PE Central) and basic Internet searches. Mentor and protégés completed all scales before and after the workshop (i.e., Times F6 and F7).

Between Workshops F and G

Chat room communication about EPEC and more general teaching and school challenges continued. Each protégé also videotaped two of their EPEC-taught lessons and sent them to his or her mentor. Protégés were encouraged to videotape lessons involving pedometers. The mentors evaluated the tapes and provided feedback via chat rooms.

Workshop G: EPEC Follow-up

The final workshop took place in March. Mentors and protégés discussed their successes and the challenges they faced, and they peer-taught EPEC lessons to one another. Finally, the computer sessions addressed chat-room issues, sending and receiving attachments, and advanced Internet searches. Mentor and protégés completed all scales before and after the workshop (i.e., Times G8 and G9).

After Workshop G

Chat room communication continued until the end of the school year. Mentors and protégés each visited the others' school for one entire school day to provide at-school assistance.

All Teacher Visits H. Similar to the fall data collection, we visited each control teacher individually at his or her school in May in order to collect their post data (i.e., Time H10). Additionally, we also visited all mentor and protégé teachers at their schools to obtain their final set of data (i.e., Time H10).

Instruments

Pedometer Self-Efficacy. Participants responded to 10 items by means of an 11-point Likert scale, with anchors of *not at all confident* representing the anchor of 0 and *very confident* representing the anchor of 10. As Bandura (2006, p. 4) stipulates, “efficacy scales must be tailored to activity domains.” Therefore, each item represented an important aspect associated with using pedometers. For example, teachers were asked how confident they were in “helping students start their pedometers correctly.” The specific objectives were developed based on the three authors' expertise, three other professors with knowledge of pedometers, and input from three teachers who had used pedometers in their classes. Content validity was established in three ways. First, consensus was agreed upon by the nine experts noted above. Second, the items selected matched the major steps in using pedometers (e.g., Pangrazi et al., 2003). Third, the items matched content presented in the two workshops on pedometer use.

Computer Self-Efficacy. Participants responded to eight items on an 11-point Likert scale with anchors of *not at all confident* representing the anchor of 0 and *very confident* representing the anchor of 10. An example item was “how confident are you in your ability to use computers to E-mail.” Items were generated from perusing two previous measures of computer efficacy (i.e., Compeau & Higgins, 1995; Murphy, Coover, & Owen, 1989) and considering our workshop content and goals. For instance, one question read, “how confident are you in your ability to

use computers for chat rooms” because using chat rooms was a critical method of communication between mentors and protégés.

Computer Anxiety. Teachers completed the four items from the Negative Feelings for Computers subscale of the Computer Aversion Scale (Meier, 1985). In a series of studies, Meier (1985) established reliability ($\alpha = .74-.81$) and validity of scores with factor analysis and concurrent validity via expected associations with similar scales (e.g., Computer Attitude). A sample question read, “I dislike computers” and participants responded on a 0- to 10-point Likert scale with anchors of *strongly disagree* and *strongly agree*.

Data Analysis

We first screened the data for incorrect or missing data followed by an examination of reliability of our measures. Next, we conducted descriptive analyses for all three measures at each assessment period. Finally, we conducted repeated-measures (RM) ANOVAs for both intervention groups using multiple assessments. The first set of RM-ANOVAs used the eight scores obtained for computer efficacy and anxiety at the beginning of the year (i.e., A1, B1, C1), before and after the three workshops (i.e., E4, E5, F6, F7, G8, G9), and at the end of the year (i.e., H10) for mentors and protégés only. For pedometer efficacy, we had an additional set (i.e., D2 and D3) of scores (for a total of 10 assessments) because mentors and protégés attended an additional pedometer workshop. The control group was not included in these RM-ANOVAs because they only had data from the beginning (i.e., A1) and end (i.e., H10) of the year, as they did not attend any of the workshops. The second set of analyses (i.e., ANOVAs) were conducted with mentors, protégés, and the control teachers’ scores obtained at the beginning (i.e., A1, B1, C1) and the end of the year (i.e., H10).

Results

Reliability of our Measures

To assess internal consistency, we examined coefficient alpha (Cronbach, 1951) for all 47 participants at the beginning (i.e., A1, B1, C1) and the end of the year (i.e., H10). Coefficient alphas are as follows: computer efficacy ($\alpha = .91$ and $\alpha = .95$), computer anxiety ($\alpha = .72$ and $\alpha = .81$) and pedometer efficacy ($\alpha = .99$ and $\alpha = .99$). They were all considered adequate because they exceeded Nunnally’s (1978) minimal criteria of .70. Test–retest reliability was also assessed from before to after, with the following results: computer efficacy ($r = .63, p < .001$), computer anxiety ($r = .59, p < .001$), and pedometer efficacy ($r = .52, p < .01$). We also found evidence of convergent validity with expected positive and significant correlations between computer and pedometer efficacy ($r = .39, p < .05$) and negative and significant correlations between computer efficacy and computer anxiety ($r = -.41, p < .01$).

Descriptive Statistics for Mentors, Protégés, and Controls

Means and standard deviations for all three groups can be found in Table 1.

Table 1 Mentor, Protégé, and Control Teachers Means and SDs for all Instruments at all Assessment Times

Workshop or teacher visits and data collection	Computer efficacy						Computer anxiety						Pedometer efficacy						
	Protégés		Mentors		Controls		Protégés		Mentors		Controls		Protégés		Mentors		Controls		
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	
A1, B1, and C1	8.0	9.8	6.3	2.0	5.6	2.9	1.3	0.9	2.5	2.1	2.3	1.8	4.2	0.8	4.1	3.7	2.9	3.6	3.6
D2	—	—	—	—	—	—	—	—	—	—	—	—	6.2	3.3	4.3	3.3	—	—	—
D3	—	—	—	—	—	—	—	—	—	—	—	—	8.8	1.5	8.5	0.9	—	—	—
E4	8.2	1.4	7.0	2.1	—	—	1.8	1.3	2.2	2.0	—	—	8.1	1.1	7.9	1.7	—	—	—
E5	9.0	1.3	8.4	1.2	—	—	2.1	2.4	1.8	1.9	—	—	8.6	1.1	8.2	1.7	—	—	—
F6	8.2	1.5	7.7	1.8	—	—	1.7	1.6	1.8	2.0	—	—	7.9	0.9	8.5	1.4	—	—	—
F7	8.8	1.3	8.5	1.3	—	—	1.3	1.1	1.3	1.8	—	—	8.7	1.1	9.1	1.0	—	—	—
G8	9.0	1.3	8.8	1.2	—	—	1.1	1.3	1.0	1.2	—	—	8.9	1.0	8.8	2.2	—	—	—
G9	9.2	1.4	9.1	1.0	—	—	1.4	1.4	.94	1.3	—	—	9.0	0.9	9.4	0.6	—	—	—
H10	9.1	1.2	8.8	1.2	4.9	2.7	1.1	1.2	1.1	1.4	1.9	1.6	9.2	1.0	9.4	0.6	3.9	4.1	4.1

Note. A: Control teacher visits for data collection. B: EPEC workshop for protégés only. C: Mentoring workshop for mentors only. D: Pedometer workshop for mentors and protégés. E: Mentors and protégés merged. F: EPEC and pedometer workshop for mentors and protégés. G: EPEC follow-up workshop for mentors and protégés. H: School visits for all teacher for last data collection. Letter (e.g., A) designates workshop where data was collected. Number (e.g., 1) designates data collection time. The research team visited control teacher schools for data collection purposes. The Computer Efficacy, Pedometer Efficacy and Computer Anxiety scales all ranged from 0 to 10.

Mentor and Protégé Differences

For computer efficacy, there was an interaction effect, $F(7, 22) = 2.68, p < .01$, partial $\eta^2; \eta = .09$). A follow-up linear trend analysis for the interaction was significant, $F(1, 28) = 8.33, p < .01$, partial $\eta^2; \eta = .23$), demonstrating that both groups increased their computer efficacy over the year, but differently (i.e., mentors gained more). The quadratic analyses were also significant, $F(1, 28) = 7.68, p < .01$, partial $\eta^2; \eta = .22$, and accounted for almost as much variance. These two findings indicate that in addition to a pattern of increasing computer efficacy scores over time (i.e., the linear trend) there was also evidence of an increasing and then a decreasing pattern (i.e., the quadratic trend) of scores over time (see Figure 1).

For computer anxiety, there was a main effect for time, $F(7, 22) = 3.79, p < .001$, partial $\eta^2; \eta = .12$, and no interaction effect, $F(7, 22) = 1.36, p = .225$, indicating that there were no differences between the mentors and protégés. A follow-up linear trend analysis was significant, $F(1, 28) = 15.28, p < .001$, partial $\eta^2; \eta = .35$, demonstrating that both mentors and protégés similarly decreased their computer anxiety. No other trend analyses (i.e., quadratic, cubic) were significant.

Finally, for pedometer efficacy we found a main effect for time, $F(9, 20) = 31.16, p < .001$, partial $\eta^2; \eta = .53$, and no interaction effect, $F(9, 20) = 1.2, p = .290$. A follow-up linear trend analysis was significant, $F(1, 28) = 69.49, p < .001$, partial $\eta^2; \eta = .71$, demonstrating that both mentors and protégés increased their

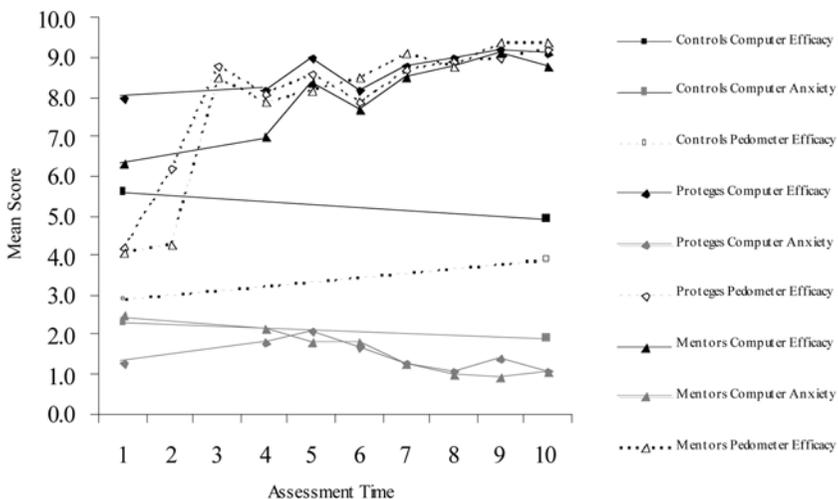


Figure 1 — Mentor, protégé, and control means for all instruments at all assessment times. Assessment times were as follows: 1 = Control teacher visits for data collection, EPEC workshop for protégés only, Mentoring workshop for mentors only; 2 and 3 = Pedometer workshop for mentors and protégés; 4 and 5 = Mentors and protégés merged; 6 and 7 = EPEC and pedometer workshop for mentors and protégés; 8 and 9 = EPEC follow-up workshop for mentors and protégés. 10 = School visits for all teacher for last data collection.

pedometer efficacy in a comparable fashion. The quadratic and cubic trend analyses were also significant but accounted for far less variance ($\eta = .57$ and $\eta = .41$, respectively), indicating that these trends, compared with the linear trend, are less representative of the data (see Figure 1). The range of effect sizes ($\eta = .09-.71$) varied from small to large based on Cohen's (1988) guidelines.

Mentor, Protégé, and Control Group Differences

For computer efficacy, there was a significant interaction, $F(2, 44) = 14.91, p < .001$, partial $\eta^2; \eta = .26$, indicating a difference between the groups and changes over time. An examination of the means shows that both intervention groups increased their computer efficacy over the year, whereas the control group decreased in efficacy. Post hoc tests (i.e., LSD) indicated a significant difference ($p < .03$) between protégés and mentors at the pretest, with protégés scoring higher. Protégés were also significantly ($p < .004$) higher compared with controls. At the posttest, protégés and mentors were not significantly different from each other but they were significantly ($p < .001$) different (i.e., higher) than the control group ($p < .001$).

For computer anxiety, there was a main effect for time, $F(1, 44) = 8.55, p < .01$, partial $\eta^2; \eta = .16$, indicating that all groups decreased their computer anxiety over time. The lack of an interaction indicates that there were no differences between the groups in their anxiety reduction.

For the last analyses, examining pedometer efficacy, there was a significant interaction effect, $F(2, 44) = 5.98, p < .01$, partial $\eta^2; \eta = .21$, indicating that the groups increased their pedometer efficacy differently over time. Post hoc tests (i.e., LSD) indicated a significant difference ($p < .001$) between protégés and controls and between mentors and controls. Both mentors and protégés scored significantly higher than controls at the posttest. Protégés and mentors were not significantly different from each other at the posttest. In general, the pattern of effect sizes ($\eta = .16, .21, .26$) were small to moderate (Cohen, 1988).

Discussion

The purpose of our study was to determine whether a yearlong EPEC professional development intervention would positively impact computer and pedometer efficacy and simultaneously reduce computer anxiety. Our findings were, in general, quite supportive of the beneficial effect of the intervention activities, as all six of our major analyses indicated either main effects over time, or interaction effects, with mean scores all consistent with our hypotheses. The most noteworthy findings were, in order, found for pedometer self-efficacy, computer self-efficacy, and computer anxiety.

In the analyses involving the mentor, protégé, and control teachers, we found that the mentors and protégés substantially increased their pedometer self-efficacy, as it more than doubled over the course of the year. In contrast, as evidenced by the significant interaction and post hoc tests, the control group teachers did not significantly increase their pedometer self-efficacy. This analysis also indicated that there were no differences between mentors and protégés in the efficacy gains. This later result, based on all three teacher groups, was also substantiated by the lack of an interaction effect for the analyses involving only the mentors and protégés

with the 10 pedometer efficacy scores spanning the whole year. The effect sizes from both analyses (partial η^2 ; $\eta = .71$ and $.21$) also support the meaningfulness of the gains in efficacy experienced by both mentor and protégé teachers. Finally, we logically expected that the most significant increases in pedometer efficacy would occur after the workshop (i.e., D) devoted solely to using pedometers. A visual analysis of the mean scores for pedometer efficacy before and after this workshop indicates support for this line of reasoning. Both protégé (M difference = 2.6) and mentor teachers (M difference = 4.2) exhibited their greatest increases during this workshop. In contrast, mentor and protégé teacher gains from before to after for the other workshops that covered multiple topics such as EPEC, as well as computer and pedometer use, were much more modest (e.g., M difference = .1, .3, .5). Finally, it is encouraging to note that pedometer efficacy gains from the December pedometer workshop (i.e., D) persisted for at least 6 months, when the last (i.e., May) pedometer efficacy assessment was obtained.

With respect to computer self-efficacy, both sets of analyses were significant for interaction effects. For the analysis involving only the mentors and protégés, it is clear that both groups increased their efficacy over the year. A visual analysis of the means indicates a consistent pattern. For all eight assessments, the protégés scores were higher than the mentors' scores although the difference in means tended to decrease with time. Thus, although the protégés started off with much stronger efficacy (M difference = 1.7) compared with the mentors, by the end of the year the differences were negligible (M difference = .3). In the analysis involving all three groups of teachers, the significant interaction and an examination of the means show that both mentors and protégés increased their computer efficacy over the year, whereas the control group decreased in efficacy. The post hoc tests substantiated the earlier observation that there was a significant difference between protégés and mentors at the pretest, with protégés scoring higher. The posttests also indicated that, compared with controls, the protégés and mentors were not significantly different from each other at the posttest, but they were significantly higher in computer efficacy compared with the control group.

The weaker pretest computer efficacy expressed by the more experienced mentor teacher group ($M = 6.3$) compared with the less experienced and younger protégés ($M = 8.0$) also supports our speculation that older teachers may have lacked efficacy, compared with younger teachers who presumably grew up in a much stronger "computer" culture. Qualitative data from a related study also suggests that the older teachers were less experienced using computers (McCaughy, 2004).

Our last set of findings concerns computer anxiety. From a practical perspective, all three groups started out quite low ($M =$ approximately 1–2.0) in anxiety, suggesting that none of the teachers were particularly anxious about using computers. Thus, "computer anxiety" may not have been a particularly relevant or salient feeling for these teachers. Given the teaching conditions of the school district and the teachers' strong emotional expressions of concern and even fear for their students' emotional, physical, and social welfare, as well as their own safety (McCaughy et al., 2006a, 2006b), it seems plausible that "anxiety" over using computers would seem relatively insignificant. The main effect results from both analyses, however, indicated that mentors and protégés did in fact manage to reduce their anxiety over the year. Although the interaction effect was not statistically significant, a visual examination of the means indicates that mentors were initially a little more anxious

($M = 2.5$) compared with the protégés ($M = 1.3$). This finding also adds support to the mentors' expression of less computer efficacy at the pretest compared with the protégés. According to social cognitive theory (Bandura, 1997), efficacy and anxiety should be inversely related. In the current study, computer efficacy and anxiety were significantly and negatively correlated.

Before concluding, a few limitations of the current study should be pointed out. Like all self-report research, our participants may have been prone to providing socially desirable answers, particularly given that they completed the scales numerous times. Although the evidence is supportive of the positive impact of our intervention, we do not know what particular components of the intervention were most effective. For example, our research design did not allow us to determine whether the specific EPEC workshop activities or, for example, the mentor–protégé specific activities (e.g., chat room communication) were more or less valuable relative to each other. Also, a major goal of our study was to improve teacher effectiveness at using technology in order to improve the delivery of a health-enhancing curriculum (i.e., EPEC). Our ultimate goal was to improve student activity, fitness, and health. We do not, however, currently have data on these teachers' students to determine whether they benefited (e.g., effectively used pedometers to become more active and fit from their teachers' participation in our project).

In conclusion, to our knowledge, this study is one of the first to examine the impact of yearlong physical education intervention on pedometer efficacy and computer efficacy and anxiety. Our findings provide evidence that interventions based on mentoring and social cognitive theory principles can positively affect pedometer and computer efficacy (and computer anxiety). Future researchers are encouraged to follow-up our work in this area. Specific questions of interest include the relative merits of mentoring principles versus social cognitive theory (e.g., role modeling, persuasive feedback) in enhancing efficacy. Finally, although the specific pedometer and computer intervention activities, compared with the total intervention, were modest in scope, it would be interesting to determine whether a less intensive intervention would be equally effective in changing efficacy.

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References

- Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: Freeman and Company.
- Bandura, A. (2006). Guide for constructing self-efficacy scales. In F. Pajares & T. Urdan (Eds.), *Adolescence and education: Self-efficacy beliefs of adolescents* (Vol. 4). Greenwich, CT: Information Age Publishing.
- Bey, T.M., & Holmes, C.T. (Eds.). (1990). *Mentoring: Developing successful new teachers*. Reston, VA: Association of Teacher Educators.
- Centers for Disease Control and Prevention (CDC). (1997). Guidelines for school and community programs to promote lifelong physical activity among young people. *Morbidity and Mortality Weekly Report*, 46, 1-36.

- Centers for Disease Control and Prevention (CDC). (2003). *National Center for Health Statistics, National Health and Nutrition Examination Survey, United States*. Hyattsville, Maryland: Public Health Service.
- Cohen, J. (1988). *Statistical analysis for the behavioral sciences* (2nd ed). Hillsdale, NJ: Lawrence Erlbaum Publishing Co.
- Compeau, D.R., & Higgins, C.A. (1995). Computer self-efficacy: development of a measure and initial test. *MIS Quarterly*, 19, 189-211.
- Cronbach, L.J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, 16, 296-334.
- Ellis, R.D., & Allaire, J (1999). Modeling computer interest in older adults: The role of age, education, computer knowledge, and computer anxiety. *Human Factors*, 41, 345-355.
- Gardner, E., Render, B., Ruth, S., & Ross, J. (1985). Human-oriented implementation cures "cyberphobia." *Data Management*, 23, 29-46.
- Karavidas, M., Lim, N.K., & Katsikas, S.L. (2005). The effects of computers on older adult users. *Computers in Human Behavior*, 21, 697-711.
- Little, J.W. (1990). The mentor phenomenon and the social organization of teaching. *Review of Research in Education*, 16, 297-351.
- Martin, J.J., & Kulinna, P.H. (2003). The development of a physical education teachers' self-efficacy instrument. *Journal of Teaching in Physical Education*, 22, 219-232.
- Martin, J.J., & Kulinna, P.H. (2004). Self-efficacy theory and the theory of planned behavior: Teaching physically active physical education classes. *Research Quarterly for Exercise and Sport*, 75, 288-297.
- Martin, J.J., & Kulinna, P.H. (2005). A social cognitive perspective of physical-activity-related behavior in physical education. *Journal of Teaching in Physical Education*, 24, 265-282.
- Martin, J.J., Kulinna, P.H., Eklund, R., & Reed, B. (2001). Determinants of teachers' intentions to teach physically active physical education classes. *Journal of Teaching in Physical Education*, 20, 129-143.
- McCaughtry, N. (2004, April). *Pedagogy Symposium: The Detroit Healthy Youth Initiative*. Paper presented at the American Alliance for Health, Physical Education, Recreation and Dance, New Orleans, LA.
- McCaughtry, N., Barnard, S., Martin, J.J., Shen, B., & Kulinna, P. (2006a). Teachers' perspectives on the challenges of teaching physical education in urban schools: The student emotional filter. *Research Quarterly for Exercise and Sport*, 77, 486-497.
- McCaughtry, N., Kulinna, H.P., Cothran, D., Martin, J.J., & Faust, R. (2005). Teachers mentoring teachers: A view over time. [Monograph]. *Journal of Teaching in Physical Education*, 24, 326-343.
- McCaughtry, N., Martin, J.J., Kulinna, H.P., & Cothran, D. (2006b). The emotional dimensions of urban teacher change. *Journal of Teaching in Physical Education*, 25, 99-119.
- Meier, S. (1985). Computer aversion. *Computers in Human Behavior*, 1, 171-179.
- Michigan's Exemplary Physical Education Curriculum (EPEC). (2002). *EPEC lessons: Grades K, 1, 2, 3, 4, 5, and user's manual*. Lansing MI: Michigan Fitness Foundation.
- Murphy, C.A., Coover, D., & Owen, S.V. (1989). Development and validation of the computer scale. *Educational and Psychological Measurement*, 49, 893-899.
- National Association for Sport and Physical Education. (1997). *Shape of the nation report: A survey of state physical education requirements*. Reston, VA: American Alliance for Health, Physical Education, Recreation, and Dance.
- Nunnally, J.C. (1978). *Psychometric theory* (2nd ed.). New York: McGraw Hill.
- Pangrazi, R., Beighle, A., & Sidman, C. (2003). *Pedometer Power—67 lessons for K–12*. Champaign, IL: Human Kinetics.

- Smith, T.M., & Ingersoll, R.M. (2004). What are the effects of induction and mentoring on beginning teacher turnover? *American Educational Research Journal*, *41*, 68-714.
- Stroot, S., Keil, V., Stedman, P., Lohr, L., Faust, R., & Schincariol-Randall, L. (1998). *Peer assistance and review guidebook*. Columbus, OH: Ohio Department of Education.
- U.S. Department of Health and Human Services (USDHHS). (1996). *Physical activity and health: A report of the Surgeon General*. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion.
- U.S. Department of Health and Human Services (USDHHS). (2000, November). *Healthy People 2010* (2nd ed., Vols. 1-2). With Understanding and Improving Health and Objectives for Improving Health. Washington, DC: U.S. Government Printing Office.