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The Use of Pedometers for Promoting Increased Physical Activity Levels and Positive Attitudes Towards Physical Activity in Children

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THE USE OF PEDOMETERS FOR PROMOTING INCREASED PHYSICAL ACTIVITY LEVELS AND POSITIVE ATTITUDES TOWARDS PHYSICAL ACTIVITY IN CHILDREN

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ABSTRACT

Recently, there has been a great deal of discussion on the role physical education plays in influencing people to be physically active. This discussion is important because the amount of time spent in physical education classes is very limited and most opportunities to be physically active will be found outside of school hours. Furthermore, children who are physically active are much more likely to be physically active adults. Thus, this study sought to examine the influence of wearing pedometers on activity levels, attitudes towards activity, and knowledge of physical activity.

The participants were members of three intact 4th-grade Physical Education classes from three elementary schools in the Calhoun County School District, Calhoun County, Alabama.

A simplified and modified version of the System for Observing Fitness Instruction Time (SOFIT; McKenzie, Sallis, & Nader, 1991) was used to gather information regarding the student's physical activity levels during physical education classes.

A questionnaire assessed affective traits and knowledge of physical activity. The TPB Questionnaire was designed to elicit information on: intentions, attitude, and perceived behavioral control as they relate to physical activity. The added knowledge variable consisted of two questions that related the ideas of physical activity levels and health benefits.

The treatment consisted of wearing pedometers either during physical education class only or all day long. There was also a Control Group that did not wear any pedometers at all. The four week treatment period was preceded by two weeks of gathering baseline data and two weeks of post treatment observation.

There were no significant differences in the physical activity levels of students wearing pedometers when compared to students without pedometers. A MANOVA revealed main effects indicating that the group wearing the pedometers all day had a significant change in perceived behavioral control scores and knowledge scores. The results are noteworthy

because perceptions of behavioral control and fitness knowledge are associated with higher levels of physical activity.

CHAPTER 1
INTRODUCTION AND REVIEW OF LITERATURE

Introduction

Recently physical activity has received much attention and is increasingly emphasized more than fitness by physical educators. Such an emphasis is in accordance with the recommendations of many physical education experts (Corbin, Dale & Pangrazi, 1999; Marcus & Forsyth, 1999, Sallis & McKenzie, 1996).   Subsequently, techniques for accurate assessment of physical activity are demanding increased attention. While it may be difficult to assess physical activity, it will continue to grow more necessary. Assessment of physical activity will be required if we are to promote the maintenance of a physically active lifestyle. For a variety of reasons traditional fitness tests do not provide an accurate assessment of physical activity and/or many health related measures of fitness (Butts, 1995; Flohr, 1997, Fox & Biddle, 1988). Even though they may be useful in some situations, fitness tests do little to change attitudes towards and knowledge regarding physical activity (Hopple & Graham, 1995).

Electronic devices such as pedomoters, accelerometers, and heart rate monitors are often used because they are proven, objective tools for measuring physical activity. Benificial for researchers and practicioners alike, they are less cumbersome and less time-consuming than some other methods of assessment. While some of these mechanical/electronical devices can be expensive, low end models are often reliable enough for many situations. Pedometers and similar devices are excellent tools for measuring groups of children as opposed to many observation methods that require selecting target students to observe. Direct observation may also be used for validating other measurement methods, and most methods require little training while remaining highly reliable.

Review of Related Literature

Introduction

Physical educators and public health officials agree that it is important to promote responsible life-long physical activity habits for children. Unfortunately, at least a segment of our youth does not receive the minimal amount of physical activity believed to produce significant health benefits (USDHHS, 1996). Promoting physical activity at young ages can influence children to become more active, thereby minimizing the short term consequences of an inactive lifestyle. Furthermore, being physically active at a young age may make one more likely to lead an active life as an adult, which in turn reduces risk factors for many "lifestyle" diseases.

Physical Activity and Public Health

Improved public health is often cited as a reason for promoting physical activity in children (CDC, 1997; Corbin, Dale & Pangrazi, 1999). Thus, it must be assumed that the health status of children is not at an acceptable level in the minds of many health officials. When comparing data gathered from large in-depth studies from the past 50 years, Kuntzleman and Reiff (1992) concluded that in fact children are getting fatter and declining in cardiovascular fitness. Others showed an increase in obesity levels and pediatric hypertension when comparing data from 1963 to 1980 (Gortmaker, Dietz, Sobol, & Wehler, 1988). Likewise, Sallis and McKenzie (1991) write that the evidence suggests that American children have become more obese with increased serum cholesterol levels and blood pressure. However, not everyone agrees that the lack of physical activity is solely responsible. Pangrazi and Corbin (1993) compared national physical fitness tests over several decades and concluded that when health related measures of fitness are compared, there is no evidence that children are declining in health. Because of the nature of the fitness tests used previously, comparing test scores will not help determine whether or not kids are becoming less fit.

Fitness tests are perhaps not as prized as they once were. Especially for children, an increasing number of experts are promoting physical activity rather than physical fitness (Corbin et al., 1999; Graham et al., 1998; Sallis & McKenzie, 1996). This begs the question, how then should one best assess physical activity levels? Many challenges make the accurate assessment of physical activity difficult, but if a desired level of physical activity is an educational objective, assessment should necessarily follow (Rink, 1998); after all, teaching for physical activity behaviors, attitudes and knowledge is an important goal for physical educators (NASPE, 1995). With an active life being such an important outcome of physical education, everyone will be better served as more information emerges on the subject; certainly more information is needed. While most of the reports on child activity levels are relatively positive, they are admittedly limited (Blair, 1992).

It may be encouraging to note that only 20 percent of adults are in the "least active" category, which significantly increases their risks for morbidity/ mortality, and children are more active than adults (CDC, 1997; Pratt, Macera & Blanton, 1999; USDHHS, 1996). Using the research data for adults regarding the minimum level of physical activity required for significant gains in health, Blair, Clark, Cureton, and Powell (1989) estimated that 90% of our children received a beneficial amount of physical activity. When evaluating data from four major national surveys (NHANES, NHIS, BRFSS, and YRBS) Pratt et al. (1999) discovered that children are more active than adults. National health surveys also reveal that only 14 percent of adolescents (grades 9 to 12) reported no recent vigorous or light physical activity. Findings have also emerged to suggest that most preadolescents engage in what is now recognized as the minimum amount of physical activity to produce health benefits, and the average child spends 30 to 40 minutes per day in moderate to vigorous physical activity (Shephard, Jequier, Lavellee, La Barre, & Tajic, 1980). However, in the past decade, there has been an emerging epidemic of obesity in the United States. Children comprise the population with the highest increase in obesity levels in part due to reduced opportunities to burn calories (Brownell & Stunkard, 1980; Koplan & Dietz, 1999).

Positive findings aside, physical educators and public health workers continue to call for increased physical activity. There are still too many high-risk children that need more physical activity (Sallis, Simons-Morton, Stone, Corbin, Epstein, Faucette, Ianotti, Killen, Klesges, Petray, Rowland, & Taylor, 1992) and much of the time children spend in sedentary endeavors could be better spent engaged in physical activity. Certainly there is no desire to simply settle for the minimum amount of physical activity when higher activity levels can provide even more protection.

Gradually getting children to engage in continuous vigorous physical activity as they pass from childhood to adulthood is also extremely important. Walton, Hoerr, Keine, Frost, Roisen, and Berkimer (1999) tell us that fifth and sixth grade students are watching 14 to 21 hours of TV a week, and outside of school they are only engaged in physically active pursuits for 1.6 hours per week. Because it is extremely likely that physical activity will decline with age (CDC, 1996), children need as much activity as possible, and they need to learn cognitive skills as well as affective skills that will more likely lead to an active adulthood.

Physical Activity Levels of Children

Even though information on children (6 to 11 years) is sparse, it is established that children are more active than adolescents. It may be necessary to promote strategies that help children overcome the barriers that tend to prevent them from being active as they age (Adams, Schoenborn, Moss, Warren & Kann, 1995; CDC, 1997; USDHHS, 1996). Though disputable, some claim there is little direct evidence that the average child is becoming less active (Sallis & Owen, 1999; Sallis & McKenzie, 1996) or even that children are less fit than past generations (Corbin & Pangrazi, 1992). Of course the rise in early onset hypokinetic diseases and childhood obesity may be indirect evidence that activity levels are declining (Gortmaker et al., 1997; Koplan & Dietz, 1999). So while there may be no consensus on the severity of the problem, no one disputes that there are millions of children who do not meet the recommended physical activity guidelines of at least 60 minutes of light to moderate physical activity nearly every day (USDHHS, 1996). An even greater percentage of adults do not get enough physical activity, and the consequences for them are much more costly. Because activity levels decrease with age and childhood attitudes and behaviors influence adult physical activity levels, high levels of physical activity should be the goal for all children.

Physical educators have been charged with ensuring that children are physically active. This raises questions about activity levels during physical education classes. Physical activity levels of children may in actuality be better than most people believe. Conversely, the low levels of physical activity during physical education classes may be surprising to many. Lee, Carter, and Greenockle (1987) reported that most elementary students were engaged in movement at appropriate difficulty levels for less than 40% of the class period. Others have reported that the average third to fifth grade student was engaged in moderate to vigorous physical activity (MVPA) for about 50% of the class period. Furthermore, the authors reported that 6.6% of the students participated in no MVPA and that 48.7% of them participated in less than 5 minutes of MVPA. Experts agree that physical activity levels during physical education currently account for a minuscule portion of the recommended daily activity level (McKenzie, 1995). This is not surprising considering the sparse allocation of time for physical education classes. There is not enough class time per week to meet reasonable physical activity objectives and much of what little time is available is spent on management and instruction (Sallis & McKenzie, 1996). All of these facts emphasize the importance of promoting physical activity over and above school hours.

Benefits of Physical Activity for Children

For centuries, there has been a belief that a physically active lifestyle is healthier than a sedentary one. In the life of a child, short-term benefits should play a crucial role in providing a happy, full childhood. In the long term, physical activity can help adults live vigorous, rich lives with reduced risks for illness and disease. Evidence for physical activity leading to improved health in adults is strong (Blair & Connelly, 1996; Paffenbarger, Hyde, Wing, Lee, Jung & Kampert, 1993). From a public health perspective, more should be done to get the most sedentary 20 to 25% of the adult population to be at least moderately active (Blair & Connelly, 1996). Fewer studies have dealt with adolescents and still fewer with children. This has led experts in the field to deem the literature on children and physical education as only "suggestive" of a beneficial link between physical activity and health (Sallis & Owen, 1999). In youth, physical activity should likely affect morbidity (decrease in weight or stress, or an increase in the immune response) while having no affect on mortality. Naturally, the effects of physical activity on mortality would not be noticed until adulthood when most lifestyle diseases manifest themselves (Sallis & Owen, 1999). So, perhaps it makes sense to equate the short-term benefits of physical activity with improved morbidity rates and long-term benefits with improved mortality rates.

Short-term benefits of physical activity in children are difficult to assess because so many factors influence the health and physical fitness of a growing child. Even though illnesses such as cardiovascular disease, high blood pressure, type II diabetes, and chronic back pain are normally diagnosed in adults, some children do suffer their early effects and increasing numbers of children are being diagnosed earlier (Koplan & Dietz, 1999). It is heartening to note that research provides evidence that children can substantially enhance their current health status in a fairly short amount of time by increasing physical activity levels (Sallis & McKenzie, 1996). As an example, Kuntzleman and Drake (1984) studied 266 children and found that cardiovascular fitness levels were positively associated with physiological risk factors. As fitness levels improved there was a statistically significant improvement in HDL/total cholesterol, tryglycerides, skin folds, and blood pressure. Another study suggests that physical activity as provided by specialists for one hour a day, over a five-year period of time, is sufficient to produce significant strength gains (Shephard & Lavellee 1994). Because weight training was not part of the children's' daily physical education, it is believed that the children grew stronger because of enhanced neuromuscular coordination. The coordination was lacking in the control students that received no structured physical education time.

There is a need for further research to better understand the relationship between physical activity, physical fitness, and health in children. Nonetheless, the growing body of research strongly supports the notion that physical activity will help children reduce immediate risk factors for chronic diseases that begin in childhood (CDC, 1997). It is still important to remember that the fitness of a child is not synonymous with his/her activity level. Physical fitness and health (especially during childhood when a lot of growth and development occurs) are heavily influenced by biology and environment (Pate, Dowda, & Ross, 1990), leading some to suggest that the other benefits, such as the social benefits and the long term health benefits, of physical activity be stressed more heavily.

Almost all HPER professional associations espouse lifelong physical activity as an important goal of physical education. This is a fitting goal, considering the overwhelming evidence that physical activity provides many health benefits for adults. Epidemiological studies have shown that men could lower death rates by increasing physical activity levels and that lowering physical activity levels leads to increases in death rates (Blair, Kampert, Kohl, Barlow, Marcera, Paffenbarger & Gibbons, 1996; Lissner, Bengtsson, Bjorkelund & Wedel, 1996; Paffenbarger et al., 1993). Increasing physical activity levels has been shown to reduce risk factors for CVD, hypertension, diabetes, and osteoporosis (CDC, 1997; USDHHS, 1996).

If we accept that a physically active lifestyle is important for adults, the proper question then becomes: Will children’s physical activity habits carry over into adulthood? Some suggest that children with good physical activity habits will be more likely to engage in physical activity as adults (Dishman, Sallis, & Orenstein, 1985; Katch, 1983, Vogel, 1986). Labbe (1993) studied the effects of an eight week aerobic conditioning program for youth. After a six month follow-up, the physiological group differences between the test group and the Control Group had disappeared. However, the health locus of control scores remained higher for the test group. The results are noteworthy because changing attitudes and mindsets regarding physical activity may be more important than merely increasing children's activity levels for a few weeks.

Sallis and McKenzie (1991) reviewed five studies from 1987 to 1989, all of which examined the relationship between childhood physical activity levels and physical activity levels in adulthood. They reached the following conclusion:

> The most parsimonious conclusion from these studies is that the findings conflict. Because all the studies have shortcomings, no one study can be considered definitive. The case could be made that all of the studies cited are irrelevant to the issue of long term effects of health related physical education (p. 131).

Powell and Dysinger (1987) reached the same conclusion with their own research, as they wrote, "...at best there is a suggestion of carryover (p. 279)." More recently, there appears to be slowly mounting evidence that supports what many have suspected. In Canada, Trudeau, Laurencelle, Trumblay, Rajic, and Shephard (1999) compared the physical activity levels of adults who as children received professionally taught physical education 5 days/wk to the physical activity levels of a Control Group who received physical education for 40min/wk from the homeroom teacher. As adults, those who attended physical activity classes 5 days a week were significantly more active than the Control Group. Likewise, others have reported that physical activity patterns, particularly extreme patterns (sedentary and highly active) track fairly well (Janz, Dawson, & Mahoney, 1999; Malina, 1996).

Physical Activity Recommendations

In a review of the relevant literature, Simons-Morton, Parcel & O'Hara (1987) concluded that there is no need to increase childhood fitness because the health related aspects of fitness do not carry over to adulthood. Others in the field support such a conclusion and continue to assert the importance of focusing on physical activity rather that physical fitness, especially when dealing with children (Corbin, Dale, Pangrazi, 1999; Simons-Morton, O'Hara, Simons-Morton, & Parcel, 1987). When considering children, the evidence doesn't support panic due to drastic decreases in fitness, but rather a need for moderate amounts of physical activity for the most significant increases in health benefits (Pangrazi & Corbin, 1993). Of course if certain children choose to partake in vigorous activities, experts believe they should be encouraged. However, children naturally gravitate toward moderate intensity activities and are likely to "burn out" if forced into vigorous activity (Pangrazi & Corbin, 1993). Childhood physical activity should be developmentally appropriate so that the child will grow into an adult with a physically active lifestyle (Graham et al., 1998).

If attention is to be focused more on physical activity than on physical fitness, we are apt to determine the quantity of physical activity required by children. Current recommendations call for children to participate in 60 minutes of accumulated physical activity throughout most days (Corbin et al., 1999; Pangrazi, 1996). It is important to emphasize that the recommendation is for *accumulated* activity. Children are naturally active in short bursts, and the adult recommendations of 20 to 30 minutes of continuous activity are not suggested for children. However it is preferable that 10 to 15 minutes of the accumulated 60 minutes is continuous (COPEC, 1998).

In the effort to promote physical activity among children, physical education is an obvious and important tool. Physical educators should focus on physical activity by integrating fitness concepts with skill acquisition, encouraging self assessment, and by providing information on the importance of physical activity for health maintenance (Strand, 1998). Another important recommendation is that children receive daily physical education, which will help them to acquire 60 minutes of physical activity on most days of the week (CDC, 1997; NASPE, 1998). Corbin et al. (1999) report a mounting number of calls for an increase in the number of schools that require daily physical education.

Physical Activity Intervention

We should consider physical education classes as opportunities to intervene where students need more activity in their lives or positive changes in their attitudes towards physical activity. Interventions may vary greatly in scope, methodology, and even desired outcome. A successful intervention will normally focus on variable(s) that have been shown to be consistently associated with childhood physical activity habits. For example, sex, parental weight status, physical activity preferences, intention to be active, perceived barriers, previous physical activity, diet, facility access, and time spent outdoors have been repeatedly shown to influence physical activity in children. Such variables were separated from many variables in a meta-analysis of 108 different studies on physical activity correlates for children (Sallis, Prockaska, & Taylor, 1999). Clearly there are many factors that influence activity behavior and it would be foolish to merely provide children with information about the health benefits of a physically active lifestyle. Knowledge alone about the benefits of physical activity is seldom enough to influence complex behaviors. Helping children learn how to move, how to be active, and perhaps most important - an appreciation for an active life, is much more likely to change habits (Gottlieb & Chen, 1985; O'Connell, Price, Roberts, Juurs, & McKinley, 1985). If children are taught how to be physically active, they will feel confident and believe that they can participate in various activities both as children and as adults. This is especially evident when given the research that indicates self efficacy is predictive of physical activity for children (Sallis et al., 1992; Trost, Pate, Ward, Sanders, & Riner, 1999). One can easily increase the physical activity levels of children even to the point of forcing them to improve fitness levels through rigorous training. However, if that causes them to dislike physical activity and consequently refuse participation in physical endeavors outside of school, it was a failure. A successful intervention would be one that provided enjoyable physical activity while addressing associated variables that would lead them to be active away from school and even into adulthood. Even though many interventions are successful at increasing physical activity levels during school hours, most do little to encourage children to remain active after school (McKenzie, 1998).

As mentioned, a number of organizations and many professionals have called for an increased emphasis in promoting physical activity among children. Because schools offer the greatest access to the largest number of children, school based interventions and intervention strategies are crucial. As a result physical educators and health educators alike have employed some innovative and unique intervention strategies.

Ignico and Etheridge (1997) studied an after-school intervention program in which children used heart rate monitors to assess themselves. The program consisted of aerobic activities and schemes for one hour a day three days a week. The children were encouraged to maintain heart rates of 150 bpm and they were found to have met this requirement 64% of the time. The results revealed increased performances in the 1-mile run, but perhaps more importantly, the authors concluded that the heart rate monitors themselves were extremely motivating for the children. Each student was able to look at his/her individual monitor, assess his/her activity level, and take responsibility for any needed increases in effort.

Other interventions consist of modifying or bolstering existing physical education classes. Luepker (1996) reports that one large scale comprehensive intervention was able to increase children's levels of moderate to vigorous physical activity during physical education classes. The intervention was also found to improve physical activity behaviors as measured by the Health Behavior Questionnaire and the Self-administered Physical Activity Checklist. Over a three-year period of time, food-service workers were educated about diet, physical education teachers were trained to provide more activity time, and students received health information from a classroom health curriculum. A less complex intervention included using the last 10 minutes of physical education class as *Fitness time*. The researchers reported a significant increase in class time spent with a heart rate greater than 156 bpm. Additionally, when compared to the Control Group that received the same lessons minus the "Fitness time," there was no difference in skill development (Quinn & Strand, 1995). In yet another community wide intervention Kelder, Perry, & Klepp (1995) followed the physical activity habits of students from sixth through twelfth grades in the Minnesota Heart Health Program (MHHP). The MHHP involved the dissemination of health and fitness information along with community support to provide for and promote physical activity detached from the normal school day. As part of the program, the physical activity levels of the students were estimated once a year with self-reports. The physical activity levels were higher in program participants, but only significantly so in females.

Most agree that interventions should incorporate physical education classes taught by trained physical educators. In addition, alternative approaches may be effective in many instances. For example, Robinson (1999) attempted to increase physical activity levels of children by decreasing sedentary activities. An 18-lesson classroom curriculum designed to reduce television, video, and video game use produced some promising results. Restricting television use, as reported through parental reports, tended to increase physical activity and at the conclusion of the study a decrease in body mass index was reported.

Quality physical education alone should be considered an intervention for inactivity. A good program will provide adequate amounts of physical activity while at the same time prepare students to lead physically active lives as adults. Many physical education interventions have shown improved physiological and/or behavioral outcomes (Sallis et al., 1992). Frankly, any meaningful effort to increase physical activity levels and/or improve attitudes towards physical activity, should absolutely involve physical education classes. Health promotion programs that target physical activity without directly influencing physical education classes tend to fail (Sallis & McKenzie, 1991; Sallis et al., 1992). Good physical education programs already employ many components and/or techniques proven effective for increasing physical activity among children. Optimizing choice and control while challenging students to become more skillful is crucial for keeping children active and ultimately, physically fit as adults (Lambert, 2000; Mandingo, 2000; Wright, 2000). Furthermore, simply being forced to exercise as children is inversely related to adult physical activity (Malina, 1996; Taylor, Blair, Cummings, Wun, & Malina, 1999). Physical educators are trained to use the techniques and teaching methods that will keep children active in class and ultimately produce physically educated adults, thus one should not underestimate the importance of having a trained physical educator helping children to learn healthy activity habits. Physical education classes taught by physical education specialists are more likely to improve physical activity levels of children (Sallis et al., 1992; Zhu, 1997).

Finally, effective interventions may realize more success when they also target family and community members (Mathias, Brynteson & Adams, 1997; Mcmurray, Bradley, Harrell, Bernthal, Fraum, & Bangdiwala, 1993). For instance, programs that supplement existing physical activity with opportunities to be physical activity outside of class show promise (Virgilio & Berenson, 1988). It is obviously apparent that environments lacking resources and support coincide with low physical activity levels (Johns, 1999).

Measuring Physical Activity

It is believed that enough physical activity will lead to an advantageous level of physical fitness, and it is well documented that physically fit persons are healthier than their unfit counterparts. This information may seem to suggest that assessing physical activity levels is not necessary and that a fitness test can easily identify children who are not physically active. However, for a variety of reasons this is not always the case. When comparing activity levels to scores on fitness tests, Butts (1995) reported no significant relationship between fitness test scores and activity levels as reported by student and parent journals. The conclusion of the author was that too much emphasis was being placed on testing at the elementary level to the exclusion of physical activity. Flohr and Williams (1997) concluded that a student’s mere perceptions of ability level could influence achievement on physical fitness tests. Qualitative interviews with children indicated that both high and low standards can adversely affect effort and performance.

There are many reasons for measuring the physical activity of children in addition to or even as an alternative to fitness. As with all types of assessments, the information gathered can serve many purposes. Measuring physical activity seems compulsory when in fact a physically active adult is the ultimate goal (Freedson & Rowland, 1992). The fact is, many children are unmotivated by traditional fitness tests (Hopple and Graham, 1995). While fitness tests are still useful, programs might be more successful by assessing other components of health, such as physical activity.

Gilliam, Freedson, Geenen & Shahraray (1995) used heart rate monitors in an effort to measure physical activity levels of children. Based on diaries kept by parents, the authors determined that the devices did not restrict physical activity, and the children were able to go about their normal activities with no problems. Heart rate telemetry (HRT) does appear to be a valid measurement tool even for small children (Durant, Baranowski, Davis, Rhodes, Thompson, Greaves, & Puhl, 1993) and thus many investigators use HRT as a criterion for assessing the validity of other measurement tools. HRT is useful for measuring physical activity outside of a school or a lab because the monitors can be worn all day and the stored information can be downloaded to a computer. They are also somewhat useful for measuring energy expenditure based on the principle that VO2 increases linearly with heart rate (HR). However, the linear relationship may not be too stable at low intensities and many environmental factors can influence HR other than physical activity (Rowlands, Eston & Ingledew, 1997). So while useful, there are some limitations with HRT, just as there are with all other methods of assessing physical activity.

Activity monitors, including pedomoters, are interesting options because they are objective and uncombersome and less time-consuming than some other methods of assessment. Some activity monitors can also be used to measure energy expenditure in addition to physical activity. Rowlands et al. (1997) suggested that pedometers could be useful in measuring physical activity levels of children. Cited advantages included: relatively low cost, ease of use, and objectivity. Additionally, pedometers and similar devices are excellent tools for measuring groups of children as opposed to many direct observation methods that require selecting target students to observe.

An even more accurate measurement tool than a simple pedometer is the activity monitor. Various brands have been shown to be reliable and valid for assessing physical activity of children (Balogun, Martin, & Ciendenin, 1989; Janz, 1994; Montoye, Washburn, Servais, Ertl, Webster, & Nagle, 1983; Pambianco, Wing, Robertson, 1990), though lab investigations have consistently yielded higher reliability and validity scores than field studies (Welk & Corbin, 1995). More advanced monitors that can detect movement in three dimensions have also been studied recently. They are just as accurate as the two dimensional monitors (Welk & Corbin, 1995) but they can offer additional information that is likely to make energy expenditure estimations more accurate (Coleman, Saelens, Wiedrich-Smith, Finn, & Epstein, 1997). Whether or not the 3-d monitors are more accurate is still to be determined (Colmane et al., 1997; Jakicic, Winters, Lagally, Ho, Robertson, & Wing, 1999).

Pen and paper instruments have been popular tools for measuring physical activity. These instruments are popular because they are very inexpensive and can be used with large numbers of subjects. Physical activity measures gathered by this method are less reliable in children than in adults and all age groups are more likely to overestimate physical activity (Rowlands et al., 1997).

The purpose of one recent study was to examine self-reports on physical activity by 4th-grade students. The children were to recall all of their out-of-school activity bouts and that information was compared to data collected from Caltrac® activity monitors. The results indicated that the reliability of the children's self reports was weak (Sallis, 1993). This is consistent with other research that self-reports correlate poorly with HRT and activity monitor results in children (Coleman al., 1997). Activity recalls in general may not be optimal for assessing physical activity for children. In fact, simple activity ratings are more strongly related to health risk factors than are seven day recalls (Sallis, Patterson, Buono, & Nader, 1988). When Koo & Rohan (1999) compared 4 physical activity questionnaires, they found that the one multi-item questionnaire had low test-retest reliability and it was poorly correlated with the three simple single item questionnaires. Thus, activity ratings appear to be easier to use and more accurate. Lastly, paper and pen instruments will always be useful because they can be used to evaluate thoughts and attitudes. As noted previously, attitudes and beliefs are strongly associated with participation in physical activity, so being able to assess and understand them is and will continue to be important. For example, Deeter (1988) found that there was a positive relationship between attitudinal commitment and frequency and duration of high intensity exercise. The conclusion was that the commitment to physical activity scale (CPA) was useful in predicting physical activity involvement of children.

Direct observation of children can provide rich, detailed information regarding physical activity patterns in context. Direct observation makes the measurement of physical activity levels difficult outside normal school hours, but not impossible. Bailey, Olson, Pepper, Porszasz, Barstow, & Cooper, (1995) observed children for 12 hour days and found that 22.3 minutes per day were spent in high intensity activity, which is consistent with activity levels reported in research elsewhere (Shephard et al., 1980). Mackenzie (1991) reviewed eight different instruments designed to observe physical activity of children. Half of the instruments were designed to be used during school hours, and the other half were designed for use outside of school. It was established that direct observation was useful for validating other measurement methods, and all of the observational instruments were found to require little training while remaining highly reliable. Mackenzie (1991) did cite some of the usual concerns such as time constraints and distractions created by the presence of the observer. Finally, various methodologies used across the studies were called into question. Implications being that perhaps different recording strategies should be tested and compared with one another (i.e. momentary time sampling verses partial time sampling).

Often, direct observation is necessary to understand the context surrounding physical activity. Direct observation of children has led to greater understanding of the social and environmental influences pertaining to physical activity levels and patterns (Bailey et al., 1995; McKenzie, 1995). There are times when direct observation may not be the best suited method for assessing physical activity. Benefice and Cames (1999) concluded direct observation was fairly accurate, but still the "least preferred" method for estimating energy expenditure due to the afore mentioned logistical difficulties.

Attitude Towards Physical Activity

Researchers and practitioners agree that "development of attitude" is an important goal for physical education (Carre, Mosher, & Schutz, 1980; Graham, 1992; NASPE, 1995). Of course it is very difficult to determining whether or not that goal is met. Attitude is a construct and thus not open to direct observation. It is only possible to make inferences about an individual's attitude (Bittle & Mutrie, 1991). Furthermore, when trying to link this construct to a behavior such as physical activity participation, controlling for the myriad of other psychological constructs (beliefs, personality, motivation, etc.) that will influence behavior is enormously challenging (Biddle & Mutrie, 1991). Nonetheless, even though difficult to measure and difficult to change, attitudes have been shown to be malleable (Silverman & Subramaniam, 1999) indicating that this is a worthwhile topic for inquiry.

Part of the concern for the development of positive attitudes towards physical activity, stems from the belief that such an attitude will influence behavior (Brustard, 1991; Brustard, 1996). There is some evidence supporting that assumption, but it is weak at best. Reynolds, Killen, and Bryson (1990) found in a longitudinal study that psychosocial variables were related to physical activity patterns in later life. Deeter (1988) reported that the more positive a student's attitudes towards physical activity, the greater his or her involvement in physical activity. The majority of research indicates that the relationship between attitude and behavior is not well established and models must be revisited and revised (Biddle & Mutrie, 1991; Schutz, Smoll, Carre, & Mosher, 1985). The fact is that many preadolescents have positive attitudes towards sport and physical activity. However, physical activity patterns still sharply decline as children get older (Wang & Biddle, 2001). Thus, research in this area is important for comprehending these inconsistencies. Even while admitting that the evidence for an attitude-behavior relationship is weak, most researchers still believe that developing the affective domain is a worthwhile goal of physical educators.

Summary

In physical education, the emphasis has gradually been shifting from one of exercise and physical fitness to one of physical activity. From a public health perspective, a greater focus on physical activity could allow for the reallocation of funding previously used to treat lifestyle disease. From the physical educator's perspective, a greater focus on physical activity should provide every individual student with the knowledge, skills, and attitudes to realize the happiest and healthiest lifetime possible.

Fitness is heavily influenced by genetics and maturation and closely associated with exercise, which many children find unappealing. Physical activity, however, can be achieved by virtually anyone and there is a lot of opportunity for individual success. Like adults, children can find enjoyment in a variety of activities, many of which naturally fit into their daily schedules such as walking to school or playing with friends.

With so much at stake, the importance of learning more about children’s physical activity habits and patterns, becomes evident. A better understanding of the topic will allow physical educators in all positions to better address challenges, be it with legislation, interventions, or teaching strategies. Thus, assessing physical activity both at home and at school becomes crucial. Currently the average child receives an adequate amount of daily physical activity. However, concerns remain about the children below average and the drastic declines in activity levels that occur as children grow older. A sizable portion of all children will grow up to be sedentary adults and increase their risks for hypokinetic diseases and a low quality of life. Therefore, the challenge lies in helping children to acquire a skills and attitudes necessary to be physically active adults.

Acquiring Cognitive knowledge relating to Physical Activity

Dyson, Griffin and Hastie (2004) concluded that physical education programs were more successful when constructivist learning models were used. Such models allowed the students to be active, social and creative, all of which made the content more meaningful and led to a deeper level of understanding. Even though physical education is “hands on” by nature, too often active learning techniques are neglected, especially when teaching concepts and cognitive knowledge dealing with health and fitness. Neide (2000) contends that in addition to physical education skills, information can be retained and attitudes can be shaped when inquiry is encouraged through active learning. Active learning involves students, encourages hands on work and provides avenues for exploration. As such, active learning has been shown to increase understanding and retention of knowledge (Shakarian, 1995). When five similar experiments were reviewed by Cromley (2000), the following became evident: subjects hearing and performing tasks outperformed subjects only hearing about the task or hearing and watching another perform the task. The "doers" remembered .33 to 2 times more information and for longer periods of time.

Mekenzie and White (1982) measured retention of geography in three groups. One group took a field trip to the place of interest and took notes, another group took a field trip and checked items on a list as they were pointed out by the teacher, and the final group discussed the topic in class with the students taking notes. On a test taking immediately after lesson, the students taken on the filed trip scored 13 percent better on a written test. Three months later, the students taken on the field trip scored 75% better on a written test.

Ignico and Corson (1997) reported that first graders that wore and learned to use rate monitors, scored better on fitness knowledge test than did children in a Control Group. The rational for increasing activity levels by helping people grow more knowledgeable could be summed up by Beighle, Pangrazi, and Vincent (2001): "Pedometers not only let children know that all activity is important (not just high intensity), they also teach that activity throughout the day is just as good as activity completed in on session."

Statement of the Problem

The purpose of this study was to examine the value of pedometers as a motivating factor for improving physical activity levels of children, and/or affective characteristics associated with physical activity habits.

Significance of the Problem

Many attitudes and habits that will eventually lead to a sedentary lifestyle begin early in childhood. It is also known that the early stages of many hypokinetic diseases are beginning to manifest in inactive youth (Koplan & Dietz, 1999). Thus, there is a real need to help children become physically active so they may enjoy a happy and healthy childhood that will eventually lead to a healthy adulthood. For this to occur, children should learn about the relationship between physical activity and fitness and maintain positive attitudes regarding both (Hopple & Graham, 1995; NASPE, 1995). Certainly, one goal is to keep children physically active during the school day. Still, it may be even more important to foster the skills, knowledge and attitudes that will keep children active outside of the school day. In exploring ways to motivate students and promote positive affective traits, one might consider the use of pedometers. Pedometers are relatively inexpensive, easy to use, and extremely practical.

Delimitations

The following delimitations will be placed upon this study:

1. The study took place between September, 2002 and October, 2002 in three elementary schools from the Calhoun County School District in Calhoun County, Alabama.
2. The study was conducted using three sample groups consisting of intact 4^{th}-grade physical education classes from Wellborn Elementary, Ohatchee Elementary, and Spring Garden Elementary.
3. All of the subjects had to complete simple assent forms and all parents will complete informed consent forms before being allowed to participate (Appendices A & B).

Limitations

The following limitations were foreseen:

1. Daily fluctuations in weather and climate determine the nature and location of student activity during school hours as well as outside of school.

2. Clear instructions were given regarding the use of the pedometers. However, there were no means of completely ensuring that subjects do not tamper with the pedometers.
3. The sample groups were limited in size and representation.
4. There was an effort to coordinate similar lesson contents with all of the participating teachers. However, the type and amount of absolute activity time was naturally dependant of the lesson plans and instructional practices of the individual physical education teacher.

Research Hypotheses

1. Physical activity levels of the students wearing pedometers, as measured by a modified SOFIT during physical education class, will be significantly higher than activity levels of students not wearing the pedometers.
2. Attitudes towards physical activity of the students wearing pedometers all day, as measured by a modified Theory of Planned Behavior (TPB) Questionnaire, will be significantly more positive than attitudes of students wearing pedometers only during class, and attitudes of students wearing pedometers only during class will be significantly more positive than attitudes of students in the Control Group.
3. Intent to participate in physical activity of the students wearing pedometers all day, as measured by a modified TPB Questionnaire, will be significantly greater than the intent to participate of students wearing pedometers only during class, and intent to participate of students wearing pedometers only during class will be significantly greater than the intent to participate of students in the Control Group.
4. Perceived behavioral control over physical activity of the students wearing pedometers all day, as measured by a modified TPB Questionnaire, will be significantly greater than attitudes of students wearing pedometers only during class, and perceived behavioral control of students wearing pedometers only during class will be significantly greater than perceived behavioral control of students in the Control Group.

5. Physical activity Knowledge of the students wearing pedometers all day, as measured by a modified TPB Questionnaire, will be significantly greater than attitudes of students wearing pedometers only during class and physical activity knowledge of students wearing pedometers only during class, will be significantly greater than physical activity knowledge of students in the Control Group.

CHAPTER 2
METHODOLOGY

Participants

The participants were members of three intact 4th-grade Physical Education classes from three elementary schools in the Calhoun County School District, Calhoun County, Alabama: Spring Garden Elementary, Wellborn Elementary, and Ohatchee Elementary. All three were rural schools, in Northeast Alabama and were comparable in size (number of students) and demographic make-up. Forty to fifty percent of the students at each school were eligible for free or reduced price meals. Each school was ahead of the county average (5.8) for the students per computer ratio (SBE, 2002).

Spring Garden served as the *Home Group*. This was the treatment group that wore the pedometers all day long. The principal voiced support for the program and mentioned that he was a former coach and physical education teacher. The physical education teacher was a white male with 15 years of teaching experience, all at the same school. He was an avid runner and coach of the high school girl's basketball team. The physical education teacher had no teaching aids, but at the time the data were collected, a student teacher was present for whom he served as the supervising teacher. The facilities consisted of a very small *old gym,* a larger *new gym,* a large field surrounded by track, and a playground with eight pieces of equipment. Most of the equipment consisted of various types of balls (mainly basketballs) and jump ropes. All but a few of the 56 children were Caucasian. They seemed eager to participate in class activities and presented few behavioral problems during physical education class.

Wellborn served as the *Control Group*. This was the group that never wore any pedometers at any point. Most of the conversations with the principal dealt with the researchers following protocols for visitors, and little was mentioned about the quality of the physical education program. The physical education teacher was a white female who had two years of experience, both at the same school. She had no coaching duties and was on a year to year contract. One teacher's aid was assigned to help. The facilities consisted of one small metal gym, a large field surrounded by a track, and a playground with ten pieces of equipment. The equipment room did not appear to be stocked with a great quantity, but there was a variety of equipment. Most of the 63 children in the class were Caucasian, with about six to nine African-American children on any given day. They seemed eager to participate in class activities, but there seemed to be slightly more behavioral problems during physical education class when compared to the other two sites. Also, it appeared to the researcher that this group contained noticeably more overweight children than the other two groups.

Ohatchee served as the *In-class Group.* The principal mentioned on several occasions, her commitment to improving the physical education program. During one visit she even asked about securing pedometers for all the teachers at the school, so they might serve as role models. The physical education teacher was a white female who had been at the school for the past nine years, but had a total of 11 years experience. She had no coaching duties, but did serve as a reading tutor for remedial students. There was one teaching aid. The facilities consisted of a brand new medium sized gym (the entire school building was less than a year old), and there was no playground equipment. The outdoor activity area consisted of the outfields in the softball and baseball fields of the neighboring secondary school. The equipment room was well stocked and contained a variety of equipment. There were 62 students in the class and about five appeared to be non-white. They seemed eager to participate in class activities and presented few behavioral problems during physical education class.

Letters seeking consent and explaining the study were sent home to the students' parents or guardians (Appendix A). Only students agreeing to participate and gaining parental approval were included in the study. Children also provided their consent to participate by completing a short and simply worded child assent form (Appendix B).

Instrumentation

Direct observation

A simplified and modified version of the System for Observing Fitness Instruction Time (SOFIT; McKenzie, Sallis, & Nader, 1991) observation instrument was used to gather information regarding the student's physical activity levels during physical education class (Appendix C). The SOFIT is a momentary time sampling (20 second intervals) recording system designed to quantify physical activity levels of youth and the time allotted for physical activity. When using SOFIT, one target student is observed for 10 seconds and a 10 second record interval follows. The 10 second record interval is used to record information regarding three main categories: Student activity, lesson context, and teacher behavior. Activity levels are recorded as one of the following subcategories: Lying down, sitting, standing, walking, or very active. Lesson context is recorded as one of the following subcategories: Management, general knowledge, physical fitness knowledge, fitness, skill practice, gameplay, or free play. Finally, teacher behavior is recorded as one of the following subcategories: Promotes fitness, demonstrates fitness, instructs generally, manages, observing, or other. Upon conclusion of the 10 second record interval, the observer's attention turns towards a different target student and the process (10 second observe, 10 second record) repeats continues.

The modified observation instrument to be used in this study differs from the standard SOFIT in two ways. First, the lesson context categories are reduced to two possible choices: (a) Nonactivity - any time when the students are not intended to be moving. This is mainly instructional and management time. (b) Activity - when the intention of the teacher is that the students are to be moving. The second difference was that the teacher behavior was not recorded at all.

During each observed class period, three students were randomly selected as target students as the class entered the gym. Target student activity levels were coded every 20 seconds (10 seconds for observation and 10 seconds for recording) on a rotational basis. The activity level of the student fell into one of 5 categories: lying down, sitting, standing, walking, and very active (any movement more strenuous than walking). Simultaneously, the lesson context was recorded as active or nonactive. A pacing tape played in a portable tape player with headphones alerted the observer of the 10-second intervals. Activity levels were recorded based on the target student's activity status, which was most prevalent during the interval. For example, if a target student stood still for 2 seconds but walked for the 8 seconds, a “w” would be recoded for “walking.” If the target student appeared to split time equally between two or three activity categories, the activity requiring the most energy was recording. For example, if a student was sitting for half the time and running for half the time, a “v” would have been recorded for “very active.”

Several studies have indicated that the SOFIT instrument is a consistent and valid measure of physical activity levels in children (Mckenzie et al., 1991; McKenzie, Sallis, & Armstrong, 1994; Rowe, Schuldheisz, & Van Der Mars, 1997). SOFIT codes have been calibrated with heart rate monitors (McKenzie, 1991) and validated with Caltrac accelerometers (McKenzie et al., 1994). The instrument is easy to use and believed by experts in the field to be a valid group measure of physical activity.

The instrument has been shown to be reliable when used by trained observers who have reported interobserver agreement scores of .90 and higher (Deng Keating, 1999; McKenzie et al., 1991). Furthermore, when manually recorded SOFIT scores were compared with scores recorded on a lap top computer, the correlations of the 5 subcategories ranged from .73 to 1.0 (Deng Keating, 1999). Construct validity is thought to be strong because SOFIT scores have been highly correlated with related variables. The five subcategory activity scale for intensity showed no significant differences when heart rates were compared to energy expenditures derived from SOFIT data (McKenzie et al., 1991). Similarly, concurrent validity was demonstrated when energy expenditure estimates made from SOFIT observations were correlated with accelerometer data. McKenzie et al. (1994) discovered a significant correlation ($r=.74$, $p<.001$). Rowe et al. (1997) also reported significant differences in the five activity level heart rates when an ANOVA revealed significant within subjects differences ($F[6,990]=2309$; $p <.0001$).

For this particular study, the acceptable criteria of interobserver agreement was set at 85%, as this was also the criteria used to certify observers by McKenzie (1995), one of the creators of the original SOFIT. In that study, all of the observers were certified after 11 hours of training. However, because the tool was simplified for this study and the ratio of trainer to trainee was 1:1, it was believed that the nine class periods along with post-observation discussions would be sufficient to reach our target agreement threshold of 85%. As previously noted, most earlier research studies report agreement percentages in the high 80s and low 90s. Furthermore, Harman (1977) concluded that for interval by interval observation tools, any percentage over 80% is considered high. Interobserver agreements were calculated throughout the study in an effort to prevent observer drift. Agreement never fell below 80% for any single class period. As expected, observer drift was not problematic. Long periods of time without using the observation tool and numerous and/or complex definitions are sited as the major contributors to observer drift (van der Mars, 1989), and neither of those situations were present.

Pedometers

Accusplit® Alliance 3000 pedometers were chosen because they are sturdy, inexpensive pedometers that require no batteries, plus they have no display buttons that might tempt young children. The pedometers are designed to measure the number of steps performed. When the wearer's foot contacts the ground with enough force, a large hand (like a clock) moves to indicate that a step has been taken. When 1,000 steps have been recorded, a small hand indicates this by moving clockwise on the display face. Even though pedometers are meant to measure the number of steps taken, any movement that jars the body enough will register as a step. For example, the forces produced from jumping up and down would definitely cause the indicator hand to move, thus recording that a step has been taken.

Questionnaire

The questionnaire (Appendix D) used for this study was a modified version of the Theory of Planned Behavior Questionnaire (TPB Questionnaire; Hagger, Chatzisarantis, Biddle, & Orbell, 2001). The original questionnaire is derived from the study of the theory of planned behavior (Ajzen, 1991). Research has lead to the establishment of a social cognitive framework for studying health behaviors, which includes but is not limited to physical activity. The questionnaire created by Hagger et al. (2001) was designed to collect information on five variables believed to influence physical activity participation. Respondents answer questions regarding: Intent to be active, attitude towards physical activity, subjective norms (influence of significant others), perceived behavioral control (PBC), and past behaviors. Three of those variables were included in the modified questionnaire used in this study. Thus the consistencies of those particular variables were of interest. Hagger et al. (2001) report Cronbach's alphas for intentions, attitudes, and PBC of .70, .82, and .45, respectively. Cronbach's alpha is a coefficient of reliability for consistency based on inter-item correlations and it will range between 0 and 1 (BYUTS, 1997). The TPB model has been shown to be a valid model for the prediction of health related behaviors (Ajzen, 1991). Hagger et al. (2001) reported significant results from factor analyses on four of the five variables that comprised their questionnaire, with subjective norms being the only variable not to produce significant results. This led the researchers to state that the predictive and construct validities of the instrument were "supported by the data" (p.405).

As noted, the modified TPB questionnaire used in this study consisted of three of the variables used in the TPB Questionnaire; intentions, attitude, and perceived behavioral control (Appendix D). The *past behaviors* variable was omitted because it was thought that the 4-week treatment period did not allow enough time for someone to create a *new past*. The *subjective norm* variable was also omitted because it has been shown to have little influence on behavior and there was no overt attempt to influence the behaviors of significant others anyway. The one variable that was added was termed *knowledge*. There were two questions that relate the ideas of accumulated activity and intensity and their influence on health. The final product totaled nine questions.

The knowledge questions were added in an attempt to determine whether or not the children understood the concept of accumulating daily physical activity for health benefits, even if simply at moderate intensity levels. While all three groups were informed of the importance of an hour of accumulated, daily physical activity, it was believed that the students with the pedometers would gain a deeper understanding of the concept by *doing*, as hands-on learning often leads to a more substantial, higher level of cognition. Such cognitive beliefs influence attitude as well as other affective beliefs (Silverman & Subramaniam, 1999). Thus the modified questionnaire was an attempt to recognize the multidimensional nature of attitude often ignored by instruments (Bagozzi & Burnkrant, 1979). Sallis et al. (1992) claim that, for behavior change, knowledge of how to be active is probably more important than knowledge of the health effects of physical activity. The question items dealing with cognitive knowledge in the questionnaire were as follows: 1) A total of one hour of physical activity each day is good for your health. 2) Physical activity is not the same as exercise. These items are believed to deal with the *how to* as apposed to the *why* of physical activity. By wearing the pedometers all day, the children may gain a better understanding of the concept of accumulated daily physical activity.

The questionnaire (Appendix D) required responses to be placed on a 7-point semantic differential scale. Examples for each of the four variables can be seen in Figure 1.

Intentions
I plan to do physical activities at least three or more times during my free time in the next week.
Likely ___: ___: ___: ___: ___: ___: ___ Unlikely

Attitude
My doing physical activities three or more times a week is…
Exciting ___: ___: ___: ___: ___: ___: ___ Boring

PBC
Do you think it will be easy or difficult for you to participate in physical activities at least three or more times in the next week?
Easy ___: ___: ___: ___: ___: ___: ___ Difficult

Knowledge
Physical activity is not the same as exercise.
Disagree ___: ___: ___: ___: ___: ___: ___ agree

Figure 1. Examples of questionnaire items.

During a pilot project, the questionnaire was administered to 34 children between the ages of 9 and 12. Three of the children indicated that they did not understand at least one question and one child left a question blank. Thus, the instrument seemed to be appropriate for the age groups. Also, an ANOVA revealed that there were no significant differences between the four age groups when comparing the four variables. The probabilities ranged from .337 to .911.

Procedures

Permission to begin gathering data was obtained from the Human Subjects Committee at Florida State University (Appendix E) and the Calhoun County School District. The physical education teachers at each of the three test sites were briefed about the nature of the study and the procedures to be employed. Shortly thereafter, the researcher met with the teachers from the three elementary schools in an attempt to coordinate lesson plans. For example, having one class learning archery while the other classes learn fitness skills would not have been an advantageous situation. All agreed that they would teach "fitness units" for the duration of the study. The teachers were also given a script at that time (Appendix F) that emphasizes the importance of physical activity and provides encouragement to be physically active. Lastly, an informational letter and informed consent letter were sent home with the children (Appendix A).

For one week (three days), during their daily physical education lessons, each of the three intact classes were observed and coded for physical activity levels with the modified SOFIT. Because all three participant groups were at separate schools, none of the three groups were made aware of the activities of the other two groups. Following the first week of observations, four additional weeks (three days a week) of observations occurred with two of the three classes under treatment conditions. One treatment group, the *In-class Group*, only wore the pedometers for the duration of its physical education lesson. Another treatment group, the *Home Group*, wore the pedometers all day even wearing them home at the end of the school day. They were to wear the pedometers during the waking hours, excluding times when it was not possible such as while bathing or swimming. The Home Group also had the responsibility of using a recording sheet to keep track of the pedometer readings. Parents/guardians of participants in the Home Group received a letter explaining that aspect of the study and asking for support (Appendix G). The third class served as a Control Group (Control Group) and they did not wear any pedometers at any time, but they did receive a sticker to wear on their shirts during their physical education class. The sticker had a positive message about being active movers in PE class (See figure 2). This was done in an attempt to control for fact the students in the two treatment groups were being given a *gift* that could motivate them to try harder and fully engage in the class. Thus the Control Group was also given a *gift* that could possibly influence behavior. This was an effort to insure that behavior and/or attitude changes were due to the pedometers and not a reaction to special attention.

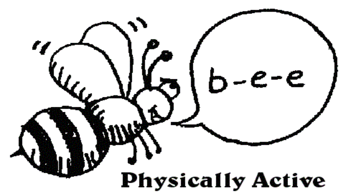

Figure 2. Sticker given to the Control Group to wear during class.

At the end of each lesson, the In-class Group's pedometer readings, which indicated the number of steps taken, were recorded by the researchers on a simple recording sheet (Appendix H). Students in the Home Group were instructed to record the pedometer readings at home before going to bed. Finally, the pedometers were removed prior to a final week of the study (three days).

The children were made aware of the fact that the investigators would be observing the physical education lessons. Every effort was made to observe the classes without disturbing the teacher or the students. Practicum students regularly made visits to all of the study sites and it was believed that their presence in the past may have helped to acclimate the students to the presence of the outsiders. All three physical education classes were observed using the modified SOFIT to record the physical activity levels of the students.

Interobserver reliability was monitored by having a trained observer simultaneously code intermittent lessons which were compared with the SOFIT results of the investigator. During the week prior to the collection of baseline data, one volunteer observer was trained in using the modified SOFIT. The training site was not one of the three schools mentioned as study observation sites. The investigator thoroughly discussed the procedure for using the observation tool and the associated definitions needed to adequately use the modified SOFIT. A total of nine class periods (3 classes on 3 separate days) were simultaneously observed by the investigator and the volunteer observer. The observer agreements for all six lessons were calculated. If the observations for the final three lessons had not resulted in at least an 85% agreement, the baseline observations would have been postponed and training would have continued until the 85% threshold was reached. The final three agreement percentages were: 88%, 92%, and 91%. For the duration of the study, at least three class periods (33%) were simultaneously observed by the investigator and the volunteer observer, to control for observer drift. Had the agreement ever dropped below 85% on any given day, additional training and clarification of definitions would have occurred until agreement percentages again exceeded 85%.

Prior to and at the conclusion of the 4-week observation period, the questionnaire regarding physical activity beliefs was administered to the students. All of the classes were instructed to do their best and they were made aware that no grades were affected by the results. The participants were informed that there were no "wrong" answers.

Data Analysis

The data from the modified SOFIT was input into a Microsoft 98, Excel spreadsheet, making it possible to plot/graph class activity levels over time and to present descriptive data for each of the three groups in the study. With the interrupted time series design, the graphs could then be viewed in an attempt to identify any emerging trends. Time spent in each of the five activity levels was divided by the total amount of time that the class was supposed to be in activity time. Thus, each activity category could be represented as a percentage of total activity time, indicating just how active the students were at times in which they were instructed to be active.

Hypothesis one, which stated that the activity levels of the Home Group would rise more than In-class Group, which in turn would rise significantly more than the activity levels of students in the Control Group, was examined by a one way repeated measures MANOVA. Hypotheses two through five, which state that the various physical activity behavior indicators (intent, attitude, perceived behavioral control, and knowledge) of the students wearing pedometers will be significantly more positive than those of students wearing pedometers only during class, and that the behavior indicators of students wearing pedometers only during class will be significantly more positive than attitudes of students in the Control Group, were also examined using repeated measure MANOVA. An alpha level of .05 was used for all statistical tests, as this has historically been acceptable in social science research (DeMarrais & Lapan, 2004).

The students' questionnaire scores for each of the three groups were entered into the Statistical Package for the Social Sciences (SPSS Version 12.0). With the SPSS program, a repeated measures MANOVA was used to analyze the questionnaire scores for each group. A MANOVA was preferred to a series ANOVAs because it was believed that the dependant variables are related.

Activity levels, presented as SOFIT scores, were entered into the SPSS program, a repeated measures MANOVA was performed to assess the differences in each groups' SOFIT scores before treatment, during treatment, and following the removal of the treatment.

CHAPTER 3
RESULTS

To examine the hypotheses that pedometer treatments of the In-class Group and the Home Group will result in more positive questionnaire responses for intent to be active, attitude towards physical activity, perceived behavioral control, and knowledge of physical activity as compared to a Control Group, a Repeated Measures MANOVA was performed using intent, attitude, perceived behavior control, and knowledge dimensions as dependant repeated variables with time intervals (pre-post) as a within subject factor and group assignment (home, in-class, and control) as a between subjects factor. The analysis results are shown in Table 1. The analysis revealed three significant ($p<.05$) effects: dimension, time by treatment, and time by dimension by treatment. A tendency towards significance ($p=.08$) was noted also for treatment. The main effect for dimension is presented in Figure 3.

Table 1
Repeated Measures MANOVA for Intent, Attitude, PBC and Knowledge

Effect	Wilks'λ	F	df	p	η^2
Between-Subjects					
A. Treatment	.94	2.66	2,83	.08	.06
Within-Subjects					
B. Time	.99	.18	1,83	.67	.002
C. Dimension	.62	16.47	3,81	.000	.38
D. A by B	.87	6.0	2,83	.004	.13
E. A by C	.94	.79	6,162	.58	.03
F. B by C	.99	.27	3,81	.85	.01
G. A by B by C	.79	3.4	6,162	.003	.11

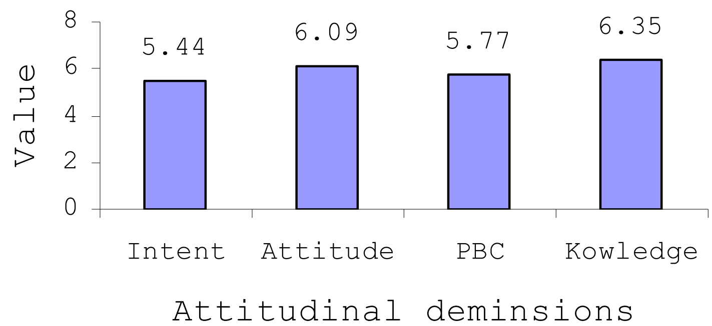

Figure 3. Mean values for attitudinal dimensions across treatment.

These results indicate that students in all treatment groups across time scored more positively in the knowledge dimension than in intent (Δ=16.7%) and attitude (Δ=6.1%). Also, attitude was rated more positively than intention (Δ=11.9%) and than PBC (Δ=5.5%).

The time by treatment significance (p=.004) is shown in Figure 4.

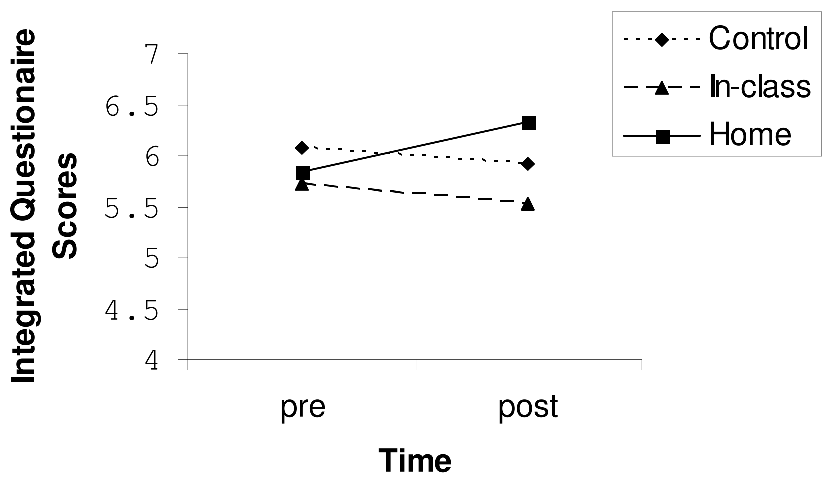

Figure 4. Mean questionnaire integrated values for the three studied groups before and after the experimental period (one month).

Figure 4, which illustrates the time by treatment significant interaction, shows that both control and In-class Groups decreased slightly from the outset until the end of the experiment on the integrated attitude questionnaire. Only the Home Group students increased by 8.2% from start to end.

Figure 5 depicts the time by dimension by treatment significant (p=.003) interaction. The portion of the figure that is particularly noteworthy is the graph of PBC. This interaction is a robust test for our hypothesis that perceived behavioral control over physical activity of the students wearing pedometers all day would be significantly greater than attitudes of students in the Control Group and In-class Group. The Home Group scores increased sharply, while the control group scores declined sharply and the In-Class Group scores fell slightly. Yet still across all the graphs one notices an increase in post test results for the Home Group. This is the only group in which this trend is evident.

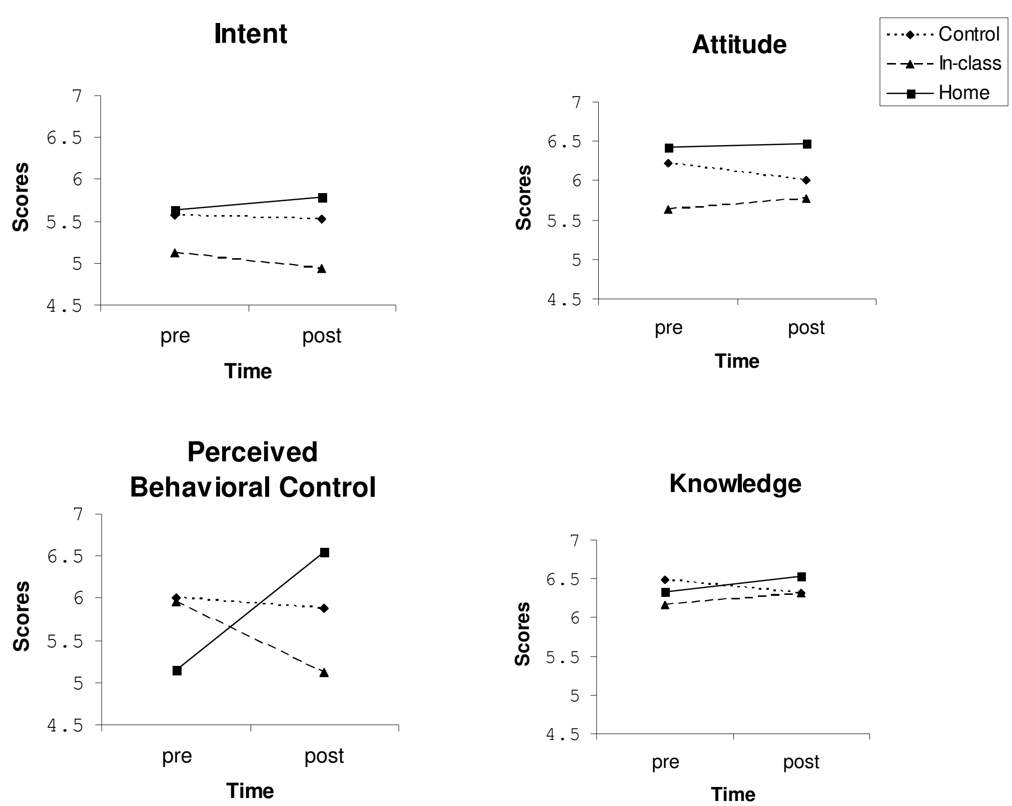

Figure 5. Mean attitudinal questionnaire values for each of the four questionnaire dimensions before and after the experimental period.

To examine the hypotheses that pedometer treatments of the In-class Group and the Home Group will result in higher physical activity levels, a Repeated Measures MANOVA was performed using SOFIT score as a dependent repeated variable with time intervals (pre, trt, post) as a within subject factor and group assignment (home, in-class, and control) as a between subjects factor. The analysis results are shown in Table 2.

Table 2

Repeated Measures MANOVA for SOFIT scores

Effect	Wilks'λ	F	df	p	η^2
Between-Subjects					
A. Treatment	.85	2.10	2,24	.144	.15
Within-Subjects					
B. Time	.88	1.53	2,23	.24	.12
C. A by B	.65	2.82	4,46	.035	.20

The analysis revealed a significant time by treatment effect (p=.04), illustrated in figure 6. Figure 6, which illustrates the time by treatment significant interaction, shows an increase in both the control (22.5%) and the home (18.0) group from the outset until the end of the experiment with regard to SOFIT scores. However, the In-class Group students decreased by 42.4% from start to end.

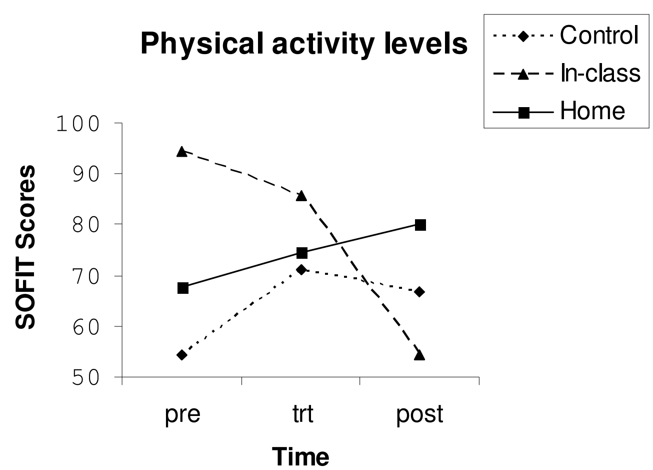

Figure 6. Mean SOFIT values for the 3 studied groups before (2 weeks), during (4 weeks), and after (2 weeks) the treatment period.

CHAPTER 4
DISCUSSION

Physical Activity Levels

Contrary to hypothesis one, the activity levels of the students wearing the pedometers were not significantly higher than activity levels of students not wearing pedometers. In fact, a time by treatment interaction effect revealed that the In-class Group actually decreased significantly over the course of the experiment. Of course, physical activity levels of children during a physical education class are primarily a function of the lesson context and class management which is controlled by the teacher (Godbout, Brunelle, and Tousignant, 1983; Metzler, 1989). There was an assumption that the lessons would be very similar, as all the teachers were to teach fitness activities so as to control for context as much as possible. Unfortunately, the lessons were very different, with all three of the teachers straying from their lesson plans at times. In retrospect, it was likely unrealistic to make such an assumption. Furthermore, the direct observations of the class periods seemed to indicate that any drastic differences in physical activity levels during class were due to the lesson context.

As an example of the teacher/context affecting %MVPA, a comparison of two activities observed at different sites is presented below:

Example activity at Control Group site.

"Sideline soccer" is a game where the students are divided into eight groups and each group is given a number. The students scatter out standing on the out of bounds line for the basketball court. Two numbers are called (for example: "three and eight") and all students in the eight group run on to the playing surface and try to score on one end of the court, while all the students in the three group run out and try to score at the opposite goal. They stay until two new numbers are called, at which time they return to the sideline. While standing on the sideline, the students are supposed to be relatively still and wait for their turn. Many of the students used that time to horseplay and run and crawl around behind the wall of students standing on the line. So even though the intent was that they not be active at that time, sometimes they were very active and they were coded as such. The result is an elevated %MVPA, which would be lower with a teacher who enforces the rules and ensures that the students stand still on the line.

Example activity at Home Group site.

Students were divided into 6 groups and each group was assigned to a basketball goal. They were to sit in a line near the top of the key, the first person would dribble to the free throw line and shoot; if they missed they would get the rebound and keep shooting lay-ups until one was made. Then the student would dribble back to the line, hand off to the next person in line and go sit down at the back of the line. The student with the ball would then stand up and take his or her turn. The pattern would repeat indefinitely. With the students sitting, they were much less likely to horseplay or run around and on the rare occasion they did so, the teacher would reprimand them.

It appeared that the children were going to be fairly active any time they were given a chance, which was expected. Parcel, Simons-Morton, O'Hara, Baranowski, Kolbe and Bee (1987) reported that given recess opportunities, elementary age children would remain active 72.8% of the time. Sleap and Warburton (1991) reported that preadolescent children spent over 50% of their break time engaged in MVPA. Children enjoy play, and physical education is normally the only class of the day that provides them with an opportunity to be vigorously active and perform gross motor skills (Graham, 1992; Sleap & Warburton, 1991; Wankel, 1988). In fact, the pretreatment physical activity levels were already so high, that it would have been difficult to find any intervention that would significantly raise them. The amount of class time spent in activity (engaged time) ranged from 41.5% to 63.5%. These percentages are average to high when compared to activity times reported by others (Mckenzie, 1991; Parcel et al., 1987; Siedentop, Doutis, Tsangaridou, Ward, & Rauschenbach, 1994; Silverman, 1991).

Given that children already tend to be very active in class (when provided the opportunity), and since one goal was to evaluate changes in physical activity levels, perhaps future research should also focus on physical activity that occurs outside of physical education classes. Most experts agree that simply being active in physical education classes will never be able to provide enough activity time to produce desired health benefits (Duncan, Duncan, Strycker, & Chaumeton, 2002; Giles-Corti & Donovan, 2003; Mathias et al., 1997; Sallis & Owen, 1999). As a percentage, children are less active at home than they are at school (Sleap & Warburton, 1991), with 5th and 6th graders watching an average of 14-21 hours of television a week (Walton et al., 1999).

There are many logistical issues that make assessment of physical activity difficult and sometimes impractical. Still, some researchers have had success in assessing physical activity in school settings unrelated to physical education class time. Break times, lunch, recess, before and after school programs have all provided students with opportunities to be active and served as useful settings for gathering physical activity data (Bailey et al., 1995; Parcel et al., 1987; Sleap & Warburton, 1991). All represent times when the students' activity levels were more dependant on choice rather than the direction of a teacher.

Further study might also be enhanced by establishing personal goals for the children wearing pedometers. In fact there is some evidence that simply wearing a pedometer only, as an environmental cue or as a reaction to the fact they are being monitored, will not alter behavior. Unpublished thesis data indicated that when pedometers were sealed so that the children could not read step counts, their behaviors were not altered like they were when the pedometers were left unsealed (PCPFS, 2002). The simple act of wearing the pedometers alone may not be effective in changing behavior. One of the benefits of pedometer use is that it affords the wearer the opportunity to self monitor behavior. When step counts are then related to a goal, the wearer will often modify behavior (increase steps taken) to meet the goal once he/she realizes that more progress is need to meet the goal. Parcel et al. (1987) reported that self monitoring and goal setting are effective components of many intervention programs. Likewise, several other studies, although mostly involving adults, support the idea that pedometers can motivate the wearers to be more active by providing feedback which allows for self monitoring and the chance to pursue and obtain a goal (Freedson & Miller, 2000; PCPFS, 2002; Sidman, 2002).

Finally, when studying activity levels of students in physical education classes, future studies might also make every effort to account for differences in lesson context.

Using the same teacher teaching from the exact same lesson plan would be much more effective.

Affective and Cognitive Data

A MANOVA revealed main effects indicating that the Home Group had a significant positive change for the PBC dimension of the questionnaire. Thus, students wearing the pedometers all day, including home, seemed to benefit more from the experience than those who wore the pedometers only during a physical education class and those that wore no pedometers.

The positive gains in PBC for the Home Group are important for several reasons. Many motivational theories emphasize that PBC contributes greatly to behavior, even leading to voluntary participation in some behaviors (Bandura, 1977; Brustard, 1991). Of course voluntary participation in physical activity is arguably the most important goal of physical education. Sallis et al. (1999) and Tappe, Duda, and Ehrnwald (1989) found that participation in physical activity was positively associated with the perception of limited barriers to participation. Possibly, the students in this study came to realize that over the course of an entire day, they ultimately controlled their activity levels and not the school, the teachers, or parents. It is also likely they realized they could increase step counts in increments of moderate activity thus overcoming some of the perceived barriers like, dislike of intense exercise, or lack of playmates to play a game with.

Results showed that the treatments had no effect on attitude or intent. While most researchers believe that attitude plays some role in physical activity participation, evidence of such has not been overwhelming. Sallis et al. (1999) reviewed 11 studies on the topic and found that six of the studies reported a positive relationship between attitude and activity and the other five found no relationship. It is possible that the treatment period was not long enough to change such a stable construct as attitude. Mott, Virgilio, Warren, and Berenson (1991) found no significant changes in attitude after instituting a cardiovascular fitness model intervention for secondary students. They concluded that the seven week treatment period may not have been long enough for attitude changes to manifest. The treatment period in this study was only four weeks.

As previously noted, the children were already very active in class and already had a very positive attitude towards physical activity. On a seven-point scale, Haggar et al. (2001) reported mean attitude scores of 6.01 when 12 – 14 year olds were questioned. The scores of the three groups of younger students observed in this study were very similar ranging from 5.6 to 6.4. Shutz et al. (1985) believe they were unable to find improvement in children's attitudes towards physical activity, as measured by CATPA, due to the high "ceiling values." Others concur that children normally have extremely positive attitudes towards physical activity (Hagger et al., 1999; Theodorkis, Doganis, Bagiatis, & Gouthas, 1991). The probable ceiling effect of children's attitudes raises important implications for future study. Perhaps the real value in assessing attitudes lies in: First, the ability to determine abnormally poor attitudes and subsequently address the needs of at-risk children and second, a better understanding and combating the gradual decline in attitude towards physical activity that occurs as children grow older (Sleap & Warburton, 1991).

When comparing results of the knowledge dimension, there were no significant differences between treatment groups. However, across all groups, there was a tendency towards significance when the knowledge dimension values were compared to the other three dimension values. The knowledge dimension was the only one of the three dimensions created by the researcher. The intent, PBC and attitude dimensions have been used and studied extensively as part of the Theory of Planned Behavior, causing one to question the validity of the knowledge domain used in this study. This of course would be fertile ground for future research. There is certainly a need to quantify children's knowledge of physical fitness and physical activity knowledge at various grade levels.

Pedometer Data

The children in the In-class Group averaged 2,729 steps per class (106 steps/min) period. Scruggs, Beveridge, Eisenman, Watson, Shultz, and Ransdell (2003) found that first and second grade students averaged 63.13 and 63.16 steps/min, respectively, under similar circumstances. Given that the step count was only measured for close to 30 minutes, the children were making solid progress towards the 12,000 to 16,000 steps/day recommendation made by the President's Council on Physical Fitness (PCPFS, 2002). The students were also able keep from fidgeting with the pedometers and participate normally while wearing them.

Methodology Issues

Some of the results, in particular the SOFIT data results were somewhat disappointing. Beyond a failure to reject the hypotheses, the data was not completely coherent. It would appear that some methodological limitations led to the puzzling data. Primarily, the groups of study were not randomly assigned. The large differences in the SOFIT pre test scores indicate that all three experimental groups may not have been as similar as is desired. Furthermore the limited sample sizes only compounded the problem. It appears that group differences could have influenced the significant findings more so than the treatments. Finally, the SOFIT was really not a valid measure of motivation to be physically active. As employed, the SOFIT was truly a tool that measured the effectiveness of the teachers to motivate and manage a class. As evident when viewing all the graphs, the Home Group was the only group to show rising values from pre to post treatment. While this may indicate some value in long term (daily) use of pedometers, it is important to emphasize that the afore mentioned methodological concerns make it difficult to be too confident.

Recommendations for Further Research

1. Use pedometers in conjunction with goal setting for step counts.
2. Couple the promotion of physical activity with the reduction of sedentary activities.
3. Validate questionnaire items related to fitness and physical activity knowledge.
4. Gather attitude related data both during and outside of physical education class. Determine whether or not the respondents' attitudes are related to physical activity or physical education class.
5. Repeat this study with truly randomized experimental groups with a longer intervention period.

Recommendations for School Use

1. Require the use of tethers. There were some problems with lost and damaged pedometers because they were not attached securely enough for active children.
2. Allow students to take pedometers home. It was evident that they could handle the responsibility and that it was an enjoyable experience.
3. Make sure parents are totally supportive if young kids are to keep the pedometers over night.

APPENDIX A

PARENTAL CONSENT LETTER

Parental Consent Letter

Dear Parent:

I am a graduate student under the direction of Professor Imwold in the physical education department/College of Education at Florida State University. I am conducting a research study to examine the influence of physical activity measurement devices (pedometers) on activity levels during physical education classes and attitude towards physical activity.

Your child's participation will involve the completion of a short survey regarding attitudes towards physical activity, and they will be observed as they participate in their regular physical education classes for three weeks. There is also a possibility that your child will be given a pedometer (mechanical device that counts the number of steps taken - size and appearance of a watch face) to wear for a one-week period. One group of children will wear the pedometers only for the duration of their physical education class. The other group of children will be allowed to take their pedometers home and they will be asked to wear them most of the day except for time when it would not be pertinent such as swimming of bathing etc… All of the observations and survey will take place during the allotted physical education time with the guidance and permission of your child's regular physical education teacher.

Your participation, as well as that of your child, in this study is voluntary. If you or your child choose not to participate or to withdraw from the study at any time, there will be no penalty. Choosing not to participate will in no way affect your child's grade. The results of the research study may be published, but your child's name will not be used.

Although there may be no direct benefit to you child, the possible benefit of your child's participation is a better understanding of how to motivate children to be physically active. It is believed that children that enjoy and participate in physical activities will be more likely to maintain a healthy lifestyle as adults.

If you have any questions concerning this research study of your child's participation in the study, please call me at (850) 224-9584 or Dr. Imwold at (850) 644-0918.

Sincerely,

Kory Hill

****

I give consent for my child, _____________________________________ to participate in the above study.

Parent's name___________________________________

Parent's signature_________________ Date__________________

If you have any questions about your rights as a subject/participant in this research, or if you feel you have been placed at risk, you can contact the Chair of the Human Subjects Committee, Institutional Review Board, through the Vice President for the Office of Research at (850) 644-8633

APPENDIX B

CHILD ASSENT FORM

Child Assent Form

I have been told that my parents (mom or dad) have said it is okay for me to participate, if I want to, in a project about physical activity.

I know that I can stop at any time I want to and it will be okay if I want to stop.

Name: _______________________________________

APPENDIX C

DIRECT OBSERVATION INSTRUMENT

MODIDIED SOFIT

Location ________ Date_____

Participants ______ Lesson Content _______

Modified SOFIT

S1______

AL																		
Con																		

S2______

AL																		
Con																		

S3______

AL																		
Con																		

Codes

Activity Level (AL)

L: Lying down
S: Sitting
T: Standing
W: Walking
V: Very Active

Context (Con)

A: Active
N: Non-active

APPENDIX D

MODIFIED TPB QUESTIONNAIRE

Physical Activity Questionnaire

1. I plan to do physical activities at least three or more times during my free time in the next week.

   Likely ___: ___: ___: ___: ___: ___: ___ Unlikely

   ☐ I don’t understand

2. I expect I will do physical activities at least three or more times during my free time in the next week.

   Likely ___: ___: ___: ___: ___: ___: ___ Unlikely

   ☐ I don’t understand

3. I intend to do physical activities at least three or more times during my free time in the next week.

   Likely ___: ___: ___: ___: ___: ___: ___ Unlikely

   ☐ I don’t understand

4. My doing physical activities three or more times a week is…

   Good ___: ___: ___: ___: ___: ___: ___ Bad

   Exciting ___: ___: ___: ___: ___: ___: ___ Boring

   Fun ___: ___: ___: ___: ___: ___: ___ Unpleasant

   ☐ I don’t understand

5. Do you think it will be easy or difficult for you to participate in physical activities at least three or more times in the next week?

Easy ___: ___: ___: ___: ___: ___: ___ Difficult

☐ I don't understand

6. It is mostly up to me whether I do physical activities three or more times a week.

True ___: ___: ___: ___: ___: ___: ___ False

☐ I don't understand

7. There is very little I can do to make sure I do three or more physical activities in the next week.

Agree ___: ___: ___: ___: ___: ___: ___ Disagree

☐ I don't understand

8. A total of one hour of physical activity each day is good for your health.

Agree ___: ___: ___: ___: ___: ___: ___ Disagree

☐ I don't understand

9. Physical activity is not the same as exercise.

Agree ___: ___: ___: ___: ___: ___: ___ Disagree

☐ I don't understand

Instruction for administering the Questionnaire

Read by Administrator:

Each of you has a questionnaire; please leave it face down in front of you. Place your pencil beside the questionnaire and listen very carefully. I want to know how you feel about physical activity. Physical activities are sports, games and dancing, such as soccer, tag, 4 square, line dancing, roller bladding, riding your bike, and walking. In order for us to find out how you feel about physical activity, I want you to answer a few questions about physical activity according to how you feel about each question. This is not a test. There are no right or wrong answers. This is how you will answer the questions. First, I will read the question out loud as you read it quietly to yourself. For example, take this question which is *not on your* questionnaire - it is only for practice:

"It will rain today?"

Below each question are some words and spaces for you to put "x"s in. (Refer to visual aid).

"It will rain today?"

Likely ___: ___: ___: ___: ___: ___: ___ Unlikely

☐ ***I don't Understand***

- After reading the question, if you think it is extremely likely (almost certain – dark clouds with lighting) that it will rain today, put an "X" in the space closest to the word "likely". If you think it is likely (but not extremely likely), you would mark this space (demo 2nd to left). If you think it is somewhat unlikely or sort of likely, you would mark this space (demo 3rd from left).
- If you think it is extremely unlikely (almost certain – not a cloud in the sky) that it will not rain today, put an "X" in the space closest to the word "unlikely". If you think it is unlikely (but not extremely unlikely), you would mark this space (demo 2nd to right). If you think it is somewhat unlikely or sort of

unlikely, you would mark this space (demo 3rd from right).

- If you think it is neither likely nor unlikely to rain (maybe a 50% chance of rain) you would mark the space in the middle.
- If you do not understand the question, simply check the box by the words "I don't understand"

Let's try one more for practice.

Pepperoni pizza taste…

Good ___: ___: ___: ___: ___: ___: ___ Bad

Any questions?

APPENDIX E

FLORIDA STATE UNIVERSITY

IRB/HUMAN SUBJECTS APPROVAL FORM

Florida State
UNIVERSITY

Office of the Vice President
for Research
Tallahassee, Florida 32306-2763
(850) 644-5260 • FAX (850) 644-4392

APPROVAL MEMORANDUM
from the Human Subjects Committee

Date: **May 17, 2002**

From: **David Quadagno, Chair** DQ/HW

To: **Kory Hill**
107 7th Avenue NE
Jacsonville, AL 36265
Dept: **Physical Education**
Re: **Use of Human subjects in Research**
Project entitled: The Influence of Pedometers on Physical Activity Levels and Attitudes of Elementary School Students

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The forms that you submitted to this office in regard to the use of human subjects in the proposal referenced above have been reviewed by the Human Subjects Committee at its meeting on July 12 2001. Your project was approved by the Committee.

The Human Subjects Committee has not evaluated your proposal for scientific merit, except to weigh the risk to the human participants and the aspects of the proposal related to potential risk and benefit. This approval does not replace any departmental or other approvals which may be required.

If the project has not been completed by July 11, 2002, you must request renewed approval for continuation of the project.

You are advised that any change in protocol in this project must be approved by resubmission of the project to the Committee for approval. Also, the principal investigator must promptly report, in writing, any unexpected problems causing risks to research subjects or others.

By copy of this memorandum, the chairman of your department and/or your major professor is reminded that he/she is responsible for being informed concerning research projects involving human subjects in the department, and should review protocols of such investigations as often as needed to insure that the project is being conducted in compliance with our institution and with DHHS regulations.

This institution has an Assurance on file with the Office for Protection from Research Risks. The Assurance Number is IRB00000446.

APPLICATION NO. 01.334

APPENDIX F

PHYSICAL ACTIVITY SCRIPT

Physical Activity Script

Class,
As you may have noticed, we have a guest. His name is Mr. Hill and he will be observing our class for a few weeks. I don't want you to distract him or allow yourselves to be distracted by him. He is interested in your physical activity habits and finding out what you think about physical activity.

With that in mind, let me talk to you about physical activity. When you are being physically active you are moving your body. When we are watching TV or playing video games we are not being physically active. However, there are many different activities we can participate in to be physically active. Some people enjoy activities that are sports or games like soccer, volleyball or tag. Others enjoy activities like walking, swimming, or jogging. Still others like to be physically active by working or doing chores. They might cut the grass, vacuum the carpet, or walk the dog. Of course one of the best ways to be a physically active person is to participate in PE class.

Whatever activities you choose, you should try to accumulate at least one hour of physical activity every day. This means that if you spend 10 minutes walking to school in the morning, and 40 minutes participating in PE class, and another 10 minutes walking the dog after school, you've done it! You built up one hour of physical activity.

Getting an hour of physical activity just about every day is important for good health. It will help keep you heart and muscles strong, and it can help you keep a sharp mind. Finally, you just might find an activity that is exciting or fun or filled with friendship.

APPENDIX G

PEDOMETER HOME RECORDING SHEET

& LETTER TO PARENTS

Letter to Parents

Dear Parent:

Hello again. Just to remind you, I am a graduate student at FSU and I am conducting a research study to examine the influence of physical activity measurement devices (pedometers) on activity levels during physical education classes and attitude towards physical activity.

Your child's class has been selected as the group of students that will be given pedometers to wear (clip on) all day. Of course, this will include wearing the pedometers home at night and back to school again the next day. I am asking that the student wear the pedometer from the time he/she gets dressed in the morning until the time he/she goes to bed at night. Naturally the children should remove the pedometers anytime there is a likelihood of damage to the device or injury to the child (swimming, wrestling, etc…). Except for such situations, the students will be instructed to go about their normal daily activities. While I hope to get all of the pedometers back in working condition, I understand that there is a chance that some of them could be lost or broken. If that happens, you should know that your child will not be scolded, punished or blamed in any way. I too was a kid once and I lost/broke things all the time.

The children will be instructed on the use of the pedometers at school. However anything you could do to remind them to fill out the record sheet would be appreciated.

Your participation, as well as that of your child, in this study is voluntary. If you or your child choose not to participate or to withdraw from the study at any time, there will be no penalty. Choosing not to participate will in no way affect your child's grade. The results of the research study may be published, but your child's name will not be used.

If you have any questions concerning this research study of your child's participation in the study, please call me at (850) 224-9584 or Dr. Imwold at (850) 644-0918.

Sincerely,

Kory Hill

Pedometer #: ___________

Pedometer Recording Sheet

Please write in the number on the pedometer at the top of this page. There is no need to write anyone's name on this sheet.

Day	**Steps**	**Comments: malfunctions, lost pedometers, stayed in bed with illness, etc…**
Monday		
Tuesday		
Wednesday		
Thursday		
Friday		

If you have any questions concerning this research study or your child's participation in the study, please call me at (850) 224-9584 or Dr. Imwold at (850) 644-0918. Thank you for your time and effort.

If you have any questions about your rights as a subject/participant in this research, or if you feel you have been placed at risk, you can contact the Chair of the Human Subjects Committee, Institutional Review Board, through the Vice President for the Office of Research at (850) 644-8633

Sincerely,

Kory Hill

APPENDIX H

PEDOMETER RECORDING SHEET – SCHOOL

Pedometer Recording Sheet
Entire Class

Pedometer #	Steps	Problems to report

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BIOGRAPHICAL SKETCH

Educational Preparation

1998 – present	Florida State University Tallahassee, FL **PhD (ABD)**
1993–1995	Colorado State University Ft. Collins, CO **Masters of Science/Exercise Science**
1989–1993	Abilene Christian University Abilene, TX **Bachelor of Science/Biology**

Professional Experience

- **Instructor**, *Jacksonville State University, Jacksonville, Alabama.* August 2001 - present.
- **Graduate Teaching Associate**, *Florida State University, Tallahassee, Florida.* August 1998 - July 2001.
- **Intramural sports director**, *Abilene Christian University, Abilene, Texas.* July, 1995 - August, 1998.
- **Adjunct Instructor in Exercise Science Department**, *Abilene Christian University, Abilene, Texas.* August, 1996 - May, 1998.
- **Graduate Teaching Assistant**, *Colorado State Unvisited, Ft. Collin Colorado.* August 1993 - May 1995.
- **Physical education assistant**, *Abilene Christina High School*. January, 1989 – May1989.

Presentations

1. K. Hill and R. Thornburg. *Electronic portfolios for pre-service teachers.* Fall Conference, Alabama State Association of Health, Physical Education, Recreation and Dance. Birmingham, AL, Nov. 17, 2003.
2. K. Hill. *Pedometers for motivating children to be physically active.* Fall Conference, Alabama State Association of Health, Physical Education, Recreation and Dance. Birmingham, AL, Nov. 18, 2003.
3. R. Thornburg and K. Hill. The physical education curriculum. In-service training seminar, Piedmont Independent School District. Piedmont, AL, Sept. 2003.
4. K. Hill and R. Thornburg. *Electronic portfolios for pre-service teachers.* Spring Conference, Alabama State Association of Health, Physical Education, Recreation and Dance. Orange Beach, AL, April 25, 2003.
5. K. Hill. *You don't have to be on the pro tour to teach golf.* Fall Conference, Alabama State Association of Health,

Physical Education, Recreation and Dance. Birmingham, AL, Nov. 18, 2002.

6. K. Hill. Activities to improve motor skills: k-2. In-service training session, Calhoun County School District, Calhoun County, AL, August 22,2002.
7. K. Hill. *Stress Reduction Techniques*. Faculty and Staff In-service Presentation, Weber Jr. High, Ft. Collins, Colorado, Spring, 1994.

Manuscripts in Review

1. K. J. Hill, Hey, D., and Hey, W. *Teacher Burnout in HPER*. Manuscript in Progress. Has been accepted by the Kentucky Journal of Health, Physical Education, Recreation and Dance. Publication date to be announced.
2. K. J. Hill and R. Thornburg. *You don't have to be a PGA pro to teach golf.* Has been accepted by Strategies. Publication date to be announced.

Professional Service

1. Grant consultant for Cleburne County Schools. 2004.
2. Research Chair, ASAHPERD, 2004
3. Article reviewer for the Alabama State Journal for Health, Physical Education, Recreation and Dance. Stephen Ruble, Editor. November, 2003.
4. Member of the Visiting Committee, North Carolina Special Olympics Summer Games. Raleigh, NC, May 2003.

Professional Memberships and Certifications

1. American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD)
2. Alabama State Association of Health, Physical Education, Recreation and Dance (ASAHPERD)
3. Higher Education Partnership (HEP)