

Knowledge in Action: Effectively Teaching
Healthy Behavior Knowledge in Physical Education Classes

by

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ABSTRACT

An intervention study was conducted with elementary physical education teachers and their use of a newly developed series of fitness segments called Knowledge in Action (KIA). This study was designed to enable teachers to teach healthy behavior knowledge (HBK) in their classes without sacrificing physical activity levels. This study has two phases. First, the intervention was conducted to determine the effectiveness of the KIA fitness segment intervention. Second, teachers' perceptions of both teaching HBK and the KIA fitness segments were investigated. Ten teacher participants were randomly assigned to the intervention or control group. Intervention teachers participated in professional development, provided with all teaching materials, and YouTube videos that modeled the teaching of the KIA fitness segments. Teacher fidelity was measured through observations. Student physical activity patterns were measured in randomly selected teachers' classes (both intervention and control) to determine potential physical activity pattern differences between groups. Teachers were interviewed from one to three times across the project in order to determine perceptions of teaching HBK and the KIA fitness segments. Researchers used constant comparison method to uncover possible common themes. Student knowledge was assessed pre/post using PE Metrics Standard 3 cognitive test to determine HBK changes. Data analysis included General liner models (GLM) at the student level (gender) and Hierarchical linear models (HLM) at the school level (treatment, school). There was a moderate mean teacher fidelity score (77.9%) found among the intervention teachers. HLM results

showed students in the intervention group had a 3.4(20%) greater improvement in HBK scores when compared with their control counterparts ($p<0.001$). Student activity levels were found to be similar in both groups with 871.33 and 822.22 steps in the intervention and control groups, respectively. Although all of the teachers thought it was important to teach HBK they were not spending time on it during classes at pretest. Three common themes were discovered: (a) Effective Teacher Training of the Segments, (b), Teachers Learned a Novel Strategy, and (c) Teachers Recommended Modifications. In summary, the KIA fitness segments received favorable views and gave teachers a way to teach HBK without reducing physical activity time.

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TABLE OF CONTENTS

	Page
LIST OF TABLES	vi
LIST OF FIGURES	vii
CHAPTER	
1 INTRODUCTION	1
2 LITERATURE REVIEW	10
3 KNOWLEDGE IN ACTION: EFFECTIVE FITNESS SEGMENTS THAT TEACH ELEMENTARY HEALTHY BEHAVIOR KNOWLEDGE.....	34
Methods.....	40
Results.....	47
Discussion	52
4 KNOWLEDGE IN ACTION: PHYSICAL EDUCATION TEACHER PERCEPTIONS ON TEACHING KNOWLEDGE	57
Methods.....	64
Results.....	69
Discussion	76
5 DISCUSSION/CONCLUSION	81
REFERENCES	83
APPENDIX	
A RESEARCH STUDY DESIGN	102
B TEACHER FIDELITY CHECKLIST	104

APPENDIX	Page
C KIA LESSON PLAN	107
D POSTTEST INTERVIEW GUIDE	122
E PE METRICS ASSESSMENT TOOL.....	125
F IRB APPROVAL AND ADDENDUM.....	131

LIST OF TABLES

Table	Page
1. Students' Ethnicity and Rate of Free and Reduced Lunch Rates by School....	41
2. Description of KIA fitness segments.....	99
3. Descriptive Statistics Across Gender and Treatment	100
4. Estimated Effects of KIA on Changes in HBK.....	101

LIST OF FIGURES

Figure	Page
1. Teacher Fidelity.....	49
2. HBK Mean Score Comparison.....	50
3. Mean Step Count Across KIA Lesson Segments	52
4. Mean MVPA Time Across KIA Lesson Segments	52

Chapter 1

INTRODUCTION

This paper outlines two distinct phases. Phase 1, examines the implementation of Knowledge in Action (KIA) fitness segments by determining differences across intervention and control class in students' healthy behavior knowledge and physical activity patterns using PE Metrics and accelerometers. Phase 2, examines physical education teachers' perceptions of KIA fitness segments as it was implemented in their respected elementary school by using developed themes from semi-structured interviews.

HBK and Physical Activity in Physical Education

Approximately 17% of children and adolescents, ages 2 through 19, are classified as obese in the U.S. (Ogden, Carroll, Kit, & Flegal, 2012). The two main contributors are physical inactivity and improper diet (Dietz, 2001). According to the U.S. Department of Human and Health Services ([USDHHS], 2008), many youth and the majority of adolescents (81.8%) and do not engage in the recommended amount of physical activity. Due to inactivity and poor nutrition public health organizations and local schools districts health professionals have called for the examination of efficient and cost-effective methods for increasing healthy and active behaviors in children.

The foundation of healthy and active behaviors can be built from quality physical education programs in schools. Physical education programs should not only encourage, but also prepare individuals for continuing physical activity and

health behaviors for a lifetime. For this to be accomplished programs need to offer positive physical activity experiences and behavior patterns, teach skills in a wide-variety sport and activities, and teach the requisite content knowledge needed to engage in lifetime activity. Grossman, Wilson, and Shulman, (1989) explained that, “Content knowledge is defined as the ‘stuff’ of a discipline: Factual information, organization principles, or central concepts” (p. 27). We will use the term healthy behavior knowledge (HBK) as the health content in physical education. This should result in students leaving such programs with the confidence and competence to continue engagement in healthy and active behaviors into adulthood. This is the overarching goal of physical education as stated by National Association of Sport and Physical Education (NASPE).

This study was designed to help physical education teachers with one strategy aimed to effectively teach HBK. This study examined the following areas: (a) student physical activity behaviors, (b) student attainment of HBK, and (c) teacher perceptions of teaching HBK and learning this particular innovative strategy of teaching HBK.

Student Physical Activity in Physical Education Classes

According to the USDHHS (2009), students should engage in moderate-to-vigorous physical activity (MVPA) for at least 50% of their physical education class time. As seen across numerous research studies, many programs have not achieved this goal (e.g., Fairclough & Stratton, 2005a; Fairclough & Stratton, 2005b; van Beurden et al., 2003). This is important to provide children, as many are not

participating in sufficient amount MVPA when they get home. Numerous researchers and intervention programs have been examined ways to raise the amount of MVPA students are engaging in during physical education classes. The Child and Adolescent Trial for Cardiovascular Health ([CATCH] Leupker et al., 1996) was one intervention found to increase physical activity during physical education classes to meet the recommended MVPA for a given class time. Physical education programs need to be efficient and effective in promoting large amounts of MVPA. Therefore, advancement in teacher instruction in physical education classes should not have a negative effect on MVPA.

Current Levels of HBK Among Students

HBK has been suggested as essential for well-educated individuals to engage in physical activity for a lifetime (NASPE, 2004). Unfortunately, many physical education programs, across the U.S., have been marginalized to the point that students are not receiving the requisite knowledge needed to be physically active (e.g., Brusseau, Kulinna, & Cothran, 2011; Desmond, Price, Lock, Smith, & Stewart, 1990; Stewart & Mitchell 2003). Soukup and Henrich (2010) examined high school students and their HBK, and found that all students failed to obtain passing scores across all content areas with the exception of one. The researchers concluded that physical education curricula should be further developed in order to teach needed healthy behavior content to students. Almost 20 years earlier, Desmond et al. (1990) found that regardless of ethnicity, results indicated that all of the students

lacked adequate age-appropriate health knowledge with only 70% of students answering five out of 12 healthy behavior questions correctly.

The current status of students HBK is concerning given that many researchers believed that knowledge provides the foundation for intelligent decision-making and that students need adequate knowledge on healthy behaviors and fitness in order to become “fitness-independent” (Fox & Biddle, 1988).

Furthermore, HBK has been linked to physical activity and the adoption of healthy behaviors, and fitness performance (Liang et al., 1993; DiLorenzo, Stucky-Ropp, Vander Wal, & Gotham 1998; Thompson & Hannon, 2012).

Physical Education Teachers’ Perceptions of Teaching HBK

A few studies have been conducted on teachers’ perceptions of HBK. Goc-Karp and Woods (2008) conducted a qualitative study of physical education teachers’ perceptions of HBK. Teachers reported favorable perceptions of teaching HBK to students, but they reported an unwillingness to give up valuable physical activity time for students to sit and be taught on knowledge during physical education classes. If HBK is not taught in physical education classes it is difficult to determine where these students will get this knowledge. Teachers further explained that creative methods for assessment should be formed for a seamless implementation of the teaching and assessment of HBK with the least amount of time taken away from physical education classes (Goc-Karp & Woods, 2008). Ha, Lee, Chan, and Sum (2004), examined physical education teacher perceptions and receptivity to curriculum change in physical education with the use of professional

development sessions. Teachers thought the training was necessary to implement the innovative curriculum and reported positive attitudes toward the new model after attending the development program.

Implementation of New Curricula and Teacher Change in Physical Education

The process of implementing innovative curriculum is not unusual in physical education history. Fullan and Hargreaves (1992) indicated to effectively implement educational reform, teachers must effect change for the better in their knowledge about current policy and education. Cothran (2001) examined the process of change during the implementation of various innovative curriculum models in physical education and found similar themes occurring. For physical education teachers the biggest motivator was primarily related to student response. If students were enthusiastic and engaged teachers were more likely to continue implementation. Ha and colleagues (2004) examined the effectiveness of an in-service training program and the teachers' receptivity to curriculum change in physical education (Ha et al., 2004). The shift in this study was moving from skill-related, movement education to the importance of health and physical activity. Teachers felt more secure and confident about implementing the curricular change after frequent collaborative support (Ha et al., 2004). Others have found that teachers' attitudes and teachers' openness of change plays a significant role in any change process (Richardson, 1991). Lastly, Fullan (2001) explained that the school principal's involvement in curricular change is critical as well, and the

administration should provide continual support and acceptance of the novel curriculum.

Guskey's Model of Teacher Change

According to the Guskey Model of Teacher Change (GMTC), teacher change has been perceived to be a long and complicated process (Guskey, 2002). This study utilizes GMTC as a grounding framework to more fully understand the relationship between teacher perceptions and the process teacher change.

GMTC has three comprehensive principles that explain the process of teacher change. The first principle states that teacher change takes time and effort to successfully modify the rituals and practices of an experienced classroom teacher (Guskey, 2002). The second principle is that in order for the classroom teacher to 'buy in' to a new curriculum, they must observe positive change in learning outcomes. The third and final principle Guskey (2002) explains that teachers need support and follow-up, which aids them in fully implementing the curriculum. This last principle is essential in order to complete this process of change and needs to be consistent over time.

GMTC has been researched in multiple educational studies. For example, Lowden (2006) discovered that teachers who participated in research-based professional development sessions over time yielded an increase in student learning and academic achievement. In addition, Martin, McCaughtry, Kulinna, and Cothran (2008) discovered that if the curriculum being taught matched the teachers' beliefs,

then teacher efficacy toward the new teaching method the process of change was more seamlessly achieved.

Cognitive Mediation

Children come to school with strong conceptions about physical education and physical activity. Oftentimes stemming from past experiences or personal beliefs, cognitive mediators can greatly affect the learning process (Solmon & Lee, 1996). Lee, Fredenburg, Belcher and Cleveland, (1999) examined student mediation of 50 fifth grade students. Researchers used open-ended interview techniques to examine students' perceptions toward explicit activities taught in physical education. Results indicated that many student conceptions were of confidence and motivational were and driven specifically by gender appropriateness (e.g., basketball is for boys and dance is for girls).

Doyle (1977) was first to explain the process and evolution of the cognitive mediating paradigm. His belief was that learning does not automatically occur from teaching and that knowledge transmission is mediated by students' cognition. Therefore, a tremendous amount of thought about and sensitivity to student cognition should be taken when attempting to create and implement an innovative curriculum in physical education classes.

Rationale

There is an immediate need for HBK to be taught in physical education classes. However, its inclusion cannot be done at the expense of physical activity. This study can make a significant impact on the field of physical education by

providing teachers with new strategies to teach HBK during physical education classes improving students HBK, which has been discovered to affect a person's behavior (DiLorenzo et al., 1998).

The proposed study builds upon a similar pilot study conducted in 2011 (Hodges, Kulinna, & Lee, in review). It was found in the pilot study that students in the implementation group scored significantly higher ($p=0.042$) at posttest than the control group. Furthermore, student physical activity levels, measured by pedometers, remained unchanged yielding no significant difference ($p=.054$) between the two groups.

Statement of Purpose

The purpose of the current study was to investigate the effectiveness of the revised fitness segments in producing significant change in fifth grade students' HBK. In addition, this study examined the physical activity levels in both groups to determine if the implementation of the fitness segments allowed for physical activity levels to remain unchanged. In addition, teacher perceptions of teaching HBK were examined throughout the study. The following three hypotheses were tested:

1. The classes that include HBK fitness segments will have a significant increase in students' HBK scores at posttest then control classes.
2. The classes that implement the HBK fitness segments will not have significantly different in physical activity levels as compared to the control classes.

3. Teachers' perceptions and experiences with the HBK segments will be positive and favorable.

Definition of Terms

Healthy Behavior Knowledge (HBK). Knowledge that encompasses the necessary knowledge needed for individuals to live a lifetime of activity. For example, importance of exercise, benefits, physical fitness components, FITT (frequency, intensity, time, type) principle, nutrition, injury prevention, and fitness goal setting (Zhu, Safrit, & Cohen, 1999).

Physical activity. Any voluntary movement of the body by skeletal muscle that has an outcome of energy expenditure (Caspersen, Powell, & Christenson, 1985).

Moderate to vigorous activity (MVPA). Any activity that require at least as much effort as brisk or fast walking (Armstrong & Bray, 1991).

Chapter 2

LITERATURE REVIEW

Current Obesity and Health Risks

There are 37 and 41 million adult women and men, respectively classified as obese in the U.S. (Ogden et al., 2012). Astoundingly, that accounts for approximately 35.7% of the entire U.S. adult population. This has raised concern given that health-related risks such as osteoarthritis, coronary heart disease, hypertension, and diabetes have been linked to obesity and unhealthy lifestyles (Malnick, & Knobler, 2006; Raitakari et al., 1997). It has also been found that approximately 17% of our nation's youth, ages 2 through 19, are obese (Ogden et al., 2012). Deckelbaum and Williams (2001) have indicated that obesity in childhood and particularly in adolescence is the main predictor for obesity in adulthood. In addition, they suggest that morbidity and mortality rates in adults are increased in individuals who were overweight in adolescences even if they lose the extra weight during adulthood (Deckelbaum, & Williams, 2001). Furthermore, in a recent study, Freedman, Zuguo, Srinivasan, Berenson, and Dietz (2007) discovered that 70 percent of obese children, ages 5 through 17, had at least one risk factor for cardiovascular disease. Consequently, researchers have frequently indicated that this will be the first generation that will not outlive their parents (Wakefield, 2004).

It has also been shown that the increase of obesity among the U.S. population has caused a great deal of economic strain on the U.S. economy. In 2008, it was estimated that health care costs related to obesity exceeded \$147 billion

(Finkelstein, Trogdon, Cohen, & Dietz, 2009). This amount of money could have covered the projected fiscal year of 2012 state budget shortfalls in all U.S. states by a factor of 2 (Oliff & Palacios, 2012). Subsequently, there have been urgent calls from national and international organizations, including the World Health Organization, for researchers to study the psychological and behavioral mechanisms associated with obesity.

Physical Activity Guidelines and Trends

Dietz (2001) explained that inadequate physical activity is one of the two primary contributors to the rise of obesity in the U.S., with the other being dietary consumption. According to the USDHHS (2008) recommendations, adults should participate in a minimum of 150 minutes of moderate-intensity (i.e., brisk walking) or 75 minutes of vigorous-intensity (or a combination) each week. Furthermore, for more extensive health benefits it has been recommended that adults can increase their aerobic activity to 300 minutes of moderate intensity or 150 minutes of vigorous aerobic intensity activity a week. Participation in muscle-strengthening activities has also been recommended, and should be done twice a week at a moderate or high intensity (USDHHS, 2008). The USDHHS (2009) recommended children and adolescents, engage in at least 60 minutes of physical activity per day and muscle-strengthening should be a part of the child's physical activity at least three times per week.

Despite the of physical activity guidelines and the positive effects that physical activity has on reducing health risks later in life, the majority of adults and

many children in the U.S. are still inactive (CDC, 2012). According to CDC (2011b), approximately 23% of children ages 9 through 13, do not engage in any free-time physical activity on any days of the week. Inactivity was actually more prevalent in girls at 29% compared to 17% in boys (American Heart Association, 2012; Biddle, Gorely, & Stensel, 2004; CDC, 2012), which is the opposite trend to previous year. It has also been found that sedentary behaviors and physical inactivity increase, as both girls and boys grow older (Corbin, Pangrazi, & Le Masurier, 2004; Morrow, Martin, Welk, Zhu, & Meridith, 2010). In fact, decreasing physical activity behaviors have been shown to start as young as first grade (Troost et al., 2002). Similarly, according to the National Health Interview Survey of 2010 (CDC, 2012) 33% of U.S. adults do not engage in any leisure-time physical activity and only 47% of adults are sufficiently active in leisure-time physical activity. These findings have raised much concern as a many health benefits are found with regular participation in physical activity (Troost et al., 2005).

Benefits of Physical Activity

Research studies have indicated that physical activity contributes to many positive effects on the body, as well as the overall health and wellness of an individual. Warburton, Nicol, and Bredin (2006) reported that being physically active attributed to the prevention of many chronic diseases, most notably cardiovascular disease, Type II diabetes, hypertension, obesity, osteoporosis, cancers (i.e., colon cancer and breast cancer) and the prevention of premature death. Additionally, positive physiological effects have been found from regular

physical activity CDC (2011a). These effects have ranged from controlling ones body weight, building and maintaining healthy bones, muscles, and joints, and prevention or delaying the development of high blood pressure (CDC, 2011a). Psychosocial improvements such as body image, mood, self-esteem, anxiety, and feelings of depression have also found to be associated with regular participation in physical activity behaviors. In addition, research has shown individuals who participate in regular physical activity develop better sleep patterns (CDC, 2011a), which also has an effect on lifelong health benefits. Lastly, Pate and colleagues (1999) discovered that physical activity and healthy living can be habitual and that healthy children will eventually become active and healthy adults.

Strong et al. (2005), in their review paper reported on the health outcomes from physical activity for children. They reported: (a) reduction in total body and visceral adiposity, (b) reduction in triglyceride and insulin levels, (c) enhancement of aerobic fitness, (d) reduction in anxiety and signs of depression, and (e) enhancement of the child's self-concept, to be found after children regularly engaged in physical activity.

There has also been a growing body of literature linking physical activity to improved academic performance among youth and adolescents (Castelli, Hillman, Buck, & Irwin, 2007; Carlson et al., 2009; Chomitz et al., 2009; Kwak et al., 2009; Sallis et al., 1999; Strong et al., 2005; Trudeau & Shephard, 2010). Sibley and Etnier (2003) conducted a meta-analysis of published studies that examined the relationship of physical activity and cognition among youth. The findings showed

an overall effect size to be .32, suggesting that there is a moderate positive relationship between physical activity and cognitive functioning in children. In another review of research, Trost and van der Mars (2009) concluded that student achievement levels remained unchanged when schools either increased or decreased physical education class time. In addition, it was suggested that the more fit a child is, the more likely they will have better grades and test scores (Trost & van der Mars, 2009).

This developing literature base suggests that physical activity has a positive impact on cognition and academic performance through a variety of direct and indirect physiological, cognitive, emotional, and learning mechanisms (Hillman, Castelli, & Buck, 2005; Rosenbaum, Carlson, & Gilmore, 2001). As a result, schools have been called to increase opportunities for physical activity for children throughout the school day for health and improved academic performance.

Physical Activity in Schools

Schools have been identified as ideal settings for promoting increased physical activity and health behaviors in children (CDC, 2011b; McKenzie, 2007). Opportunities such as physical education, recess, before and after school programs, and classroom physical activity breaks have been recognized as avenues for children to increase their physical activity and other healthy behaviors during school-hours. Although physical education programs have been seen as effective places to increase physical activity among children and youth during school hours, the actual time available for physical education has been reduced. According to the

School Health and Policies Study (CDC, 2007), researchers found that only 13.7% of elementary schools, 15.2% of middle schools, and 3.0% of high schools provided physical education for at least 3 days a week or equivalent, for the entire school year. It has been argued that this reduction comes to aid the academic achievement of students as measured by standardized tests and budget cuts (NASPE, 2012; Thomas, 2004). There is no data to support this argument. Studies have shown that increasing physical education class time does not reduce academic achievement (Trost & van der Mars, 2009).

The USDHHS (2009) recommends that students engage in moderate-to-vigorous physical activity (MVPA) for at least 50% of their physical education class time. MVPA can be defined as activities that require at least as much effort as brisk or fast walking (Armstrong & Bray, 1991). Unfortunately, several studies in the U.S. and Europe have reported much lower MVPA levels during physical education classes (Cardon, Verstraete, De Clercq, & De Bourdeaudhuij, 2004; Coe, Pivarnik, Womack, Reeves, & Malina, 2006; Fairclough & Stratton, 2005a; McKenzie, Marshall, Sallis, & Conway, 2000; Simons-Morton, Taylor, Snider, Huang, & Fulton, 1994; van Beurden, et al., 2003). Cardon et al. (2004) found similar results in fourth and fifth grade students by videotaping classes and analyzing MVPA with an objective assessment tool (i.e., System for Observing Fitness Instruction Time [SOFIT] Mckenzie, 2009). Surprisingly, the results showed that students in non-swimming classes were engaging in 40% MVPA versus 52% MVPA in swimming classes. As a

result, researchers have been called on to examine other methods to increase MVPA in physical education programs.

Sallis et al. (2012) suggest that health optimizing physical education programs (HOPE) can enhance children's MVPA levels during physical education classes. HOPE curricula focus on maximizing MVPA in physical education classes while concurrently developing children's HBK, movement skills, abilities, and confidence to be physically active for life (Sallis et al., 2012). The expected outcomes from HOPE are for students to be engaged in an active lifestyle and to develop self-efficacy toward being physically active. There is a growing body of research studies that support health-related curricula that provide MVPA at or exceeding 50% of physical education class time (McKenzie, 2009).

Based upon a systematic review, Sport Play and Active Recreation for Kids (SPARK), Child and Adolescent Trial for Cardiovascular Health (CATCH), and Go for Health, were found to be effective interventions for increasing children's physical activity participation levels during physical education because they passed the recommended 50% MVPA and CATCH shown improved student eating behaviors (Kahn et al., 2002). The CATCH intervention was implemented in four major U.S. cities in 96 elementary schools and found to increase students' average time spent in MVPA from 37.4% to 51.9% during physical education classes (Luepker et. al., 1996). The Go for Health program was another intervention focused on increasing MVPA during physical education and healthy eating during lunch time. Results showed a jump from baseline physical activity levels of approximately 10% to 40%

at posttest and a decrease in total fat and saturated fat consumption (Simons-Morton, Parcel, Baranowski, Forthofer, & O'Hara, 1991).

Researchers have also examined the implementation of conceptual physical education (CPE) programs, which focused on increasing HBK in the classroom and lifetime activities in the gym. The CPE program was implemented during Project Active Teens (Dale, Corbin, & Cuddihy, 1998) in one high school in which researchers examined the effect of the CPE on leisure time physical activity as compared to a traditional physical education (TPE) program. Results indicated after the first year of implementation that 9th grade boys in the CPE program were more active as compared to student from the TPE program. Dale and Corbin (2000) followed up on the Project Active Teens and examined the CPE and TPE of students who had those models to determine if there were different physical activity levels. Results indicated no significant difference in moderate or vigorous participation between groups. With these evidenced-based programs, policy makers and researchers are called upon by national and international organizations to continue the focus on MVPA promotion, HBK, and lifelong activity focus in the physical education programs.

Assessing Physical Activity

Based upon current trends and issues, such as reduction in physical education class frequency and duration (Sallis et al., 2012) as well as low levels of student activity during leisure time, effective delivery and organization of physical education programs have become essential. Grissom, Ward, Martin, and Leenders

(2005) suggested physical education should be used to influence the physical activity patterns of children by focusing on the promotion of MVPA during class lessons. Therefore, researchers have assessed physical activity levels of students as one measure in the evaluation of quality physical education programs. To date there has been a number of practical measurement techniques that have produced reliable and valid scores for student physical activity in physical education programs. Sirard and Pate (2001) categorized these measurement techniques into three groups: (a) subjective measures, (b) secondary objective techniques, and (c) primary objective techniques. The following measurement techniques are explained from subjective to objective measures.

Questionnaires and Surveys. Self reporting measures of questionnaires, interviews, physical activity recall surveys, and activity diaries have been explained as subjective measurements of physical activity. According to Sirard and Pate (2001), authors explained that subjective measurement instruments carry the least compelling validation results and are not recommended for youth. The main limitation explained when using subjective measuring among youth is the sporadic nature of the child's physical activity (Bailey et al., 1995) and the child's inability to self quantify, count and group their activity (Sirard & Pate, 2001). Self-report physical activity instruments have been scarcely used among children due to lack of reliability and validity (Freedson, 1991; Pate, 1993). It is suggested that activity diaries are considered one of the most accurate subjective technique for adults;

however, youth and adolescents abilities to accurately complete the diary is of great concern (Sirard & Pate, 2001).

Heart rate monitoring. Heart rate monitors have been widely used and have been popular in past research because of the linear relationship between heart rate and energy expenditure during exercise. Heart rate monitors are considered a secondary measurement technique of physical activity. One common method found in research studies was to take the absolute heart rate values to distinguish between activity intensities (Gilliam, Freedson, Greenen, & Shahraray, 1981). This method was based on using a percentage of the maximum heart rate and the recommendation of Simons-Morton, Parcel, O'Hara, Blair, and Pate (1988) that the intensity of ≥ 140 beats per minute (bpm) approximates an MVPA movement.

Even though heart rate monitoring was once a common measurement technique, there are major limitations found in the literature. One limitation found was the inability of heart rate monitors to distinguish between light and moderate intensity activities (Conley, Gastin, Brown, & Shaw, 2011; Hands, Parker, & Larkin, 2006).

Pedometers. Pedometers are considered a secondary measurement technique of physical activity. Many studies have used pedometers as a measurement technique to assess physical activity in both physical education and free-living settings. Most pedometers have contained a horizontal spring suspended lever arm that moves with the vertical acceleration of the hips during movement

(Tudor-Locke, Williams, Reis, & Pluto, 2002). As authors explained when the threshold is exceeded the device counts providing an overall estimate of steps taken.

In general, most pedometers are cheaper than accelerometers. Therefore, researchers have suggested this measurement technique may be more feasible for use in large groups (Schneider, Crouter, Lukajic, & Bassett, 2003) and most physical education studies (Sruggs, 2007a). Furthermore, pedometers have been found equipped with the ability to measure "activity time" (Beets, Patton, & Edwards, 2005), which calculates the amount of time an individual is actually engaged in activity equivalent to walking or jogging.

Corder, Ekelund, Steele, Wareham, and Brage (2008) explained the main limitations to pedometers are that most devices, especially the more cost effective pedometers do not yield intensity and vary among student height and stride length. As a result, researchers have reported step frequency and energy expenditure to be variable across different physical activities and when measured with different pedometers (Corder et al., 2008). It has been shown that error generally increases when individuals are walking at speeds below 3.2km/h (Beets et al., 2005).

To date, many studies have chosen to use pedometers to examine youth physical activity during physical education classes (Flohr, Todd, & Tudor-Locke, 2006; Kodish, Kulinna, Martin, Pangrazi, & Darst, 2006; Pangrazi, Beighle, & Sidman, 2003; Scruggs, Beveridge, Watson, & Clocksin, 2005b). In addition, some have attempted to calculate level of intensity using pedometers. For example, Scruggs (2003) attempted to correlate students' pedometer output and MVPA in physical

education, using systematic observation (i.e., SOFIT) as the criterion instrument, and pedometry as the predictor instrument. Authors discovered that 1st and 2nd grade students needed approximately 60-63 steps/min or 1800-1890 steps to accumulate MVPA of 33% for a 30-minute class period. Similarly, Pangrazi et al. (2003) looked at total steps taken and suggested 1,200 to 2,000 steps were an appropriate amount of steps to reach to classify someone as reaching an active level during a 30-minute physical education class. Tudor-Locke et al. (2006) examined step values in physical education as part of the segmented day among 11-12 year olds. Students accumulated an average of 1,429 and 1410 steps for boys and girls, respectively.

Scruggs et al. (2005b) used this validation technique to determined specific step cut-points for third and fourth grade students. Authors (2005) reported 58-61 steps per minute equated to 33% of MVPA during a typical 30-minute physical education class using multiple measurement devices. The correlations between physical activity measures were strong ($r=.82-.89$) and found to be similar to other studies (Kilanowski, Consalvi, & Epstein, 1999; Morgan, Pangrazi, & Beighle, 2003). Scruggs (2007a) then found the cut points for fifth and six grade students. He suggested that students needed about 60 to 62 steps/min to indicate MVPA of 33% in a 30-minute physical education class. In addition, Graser, Pangrazi, and Vincent (2009) found higher results, as they indicated that 120 to 140 steps per minute for all students between the ages of 10 and 12 was a good indicator of the person engaging in MVPA.

Tudor-Locke et al. (2011) examined the amount of steps adults need to perform in order to reach the recommended 30 minutes of MVPA. Researchers found that 100 steps/min was a value indicative of moderate intensity walking. Therefore, they discovered that 7,000 to 11,100 steps taken per day was an appropriate to accomplish the recommended 30 minutes of MVPA with appropriate habitual daily living (Tudor-Locke et al., 2011).

In summary, it has been suggested that pedometry as a measurement technique in physical education to be a practical tool to assess physical activity when resource limitations prevent the use of more advanced objective methods (Corder et al., 2008).

Accelerometers. Motion sensors such as accelerometers are considered practical, objective, and valid assessments of physical activity (Sirard & Pate, 2001). Although most accelerometers vary in size and cost, they are all designed to provide a very detailed output (i.e., kilocalories, time spent in MVPA, monitor 'wear time,' and steps). Essentially, accelerometers offer data on time spent in certain physical activity intensities (sedentary, light, moderate, and vigorous) on various movements. Since children are likely to engage in activities that involve squatting, bending, running, and throwing, some researchers have chosen to use accelerometers in school (i.e., physical education class, recess, etc.) as well as out of school to assess youth physical activity (Hastie & Trost, 2002; Sallis et al., 1997; Trost et al., 2002b; Verstraete, Cardon, De Clercq, & De Bourdeaudhuij, 2006).

Research studies have been published providing information on validity measures for a number of different accelerometers. For example, the Caltrac was the first commercially made accelerometer and the most frequently studied. Sirard and Pate (2001) found positive but variable associations between Caltrac and direct observation methods ($r=.016$ to $.086$). The Computer Science Application accelerometer is another device in which Sallis et al. (1990) have reported high correlations ($r=0.87$) with physical activity. To date, the ActiGraph (Pensacola, FL, USA) accelerometer is the most widely used accelerometer in physical activity research (Bassett & John, 2010; Freedson, Pober, & Janz, 2005; Treuth, Hou, Young, & Maynard, 2005).

Accelerometers have high a higher correlation between physical activity measurements and V_{O_2} max scores than any other secondary objective measuring instruments (Eston, Rowlands, & Ingledew, 1998; Scruggs, Beveridge, & Clocksin, 2005a). For that reason, accelerometers have been one of the most commonly used objective measurements of youth physical activity (Rowlands, 2007). In fact, recent reviews of physical activity measurement instruments have shown that 63% of youth habitual monitoring devices were accelerometers (Oliver, Schofield, & Kolt, 2007). In summary, it has been suggested that when direct observation is unavailable, accelerometers are a promising alternative (Sirard & Pate, 2001).

Hart, Brusseau, Kulinna, McClain, and Tudor-Locke (2011) validated the NL-1000 for the use of children ages 10-11 years old. The research team used the

accelerometer count cutoffs of MVPA range of 5-9, found by previous researchers to be recommended for children ages 10-11 years old (McClain et al., 2007)

Systematic Observation. Systematic observation has previously been explained as a primary measurement technique used by research members to directly observe and record precise physical activity (Sirard & Pate, 2001). System for Observing Fitness Instruction Time (SOFIT; McKenzie, 2009) has been commonly used in physical education class settings because authors have explained less invasive than strap-on devices, such as pedometers and accelerometers. The SOFIT was used for examining three aspects of physical education lessons: (a) student physical activity levels, (b) lesson context, and (c) teacher behavior. This instrument was described as a momentary time sampling and interval recording system designed to calculate factors believed to promote health-related physical activity. The coding of student physical activity levels has been correlated with and has shown concurrent validity with energy expenditure estimates, heart rates, and accelerometer measures (McKenzie, 2002; McKenzie et al., 1991; Pope, Coleman, Gonzalez, & Heath, 2000; Rowe, Schuldheisz, & van der Mars, 1997; van der Mars, Rowe, Schuldheisz, & Fox, 2004).

Researchers have suggested the use of SOFIT to be simple, requiring minimal time to train observers to generate reliable data, and is an appropriate measurement technique for assessing the physical activity levels of elementary students in physical education classes (Heath, Coleman, Lensegrav, & Fallon, 2006). On the contrary, others believed direct observation is cumbersome, costly, requires

high expertise and long measurement time periods (Scruggs et al., 2005; Sirard & Pate, 2001).

Assessments of Students' HBK

Only a few cognitive assessment tools have been shown to produce valid and reliable outcomes for students HBK. In general, most measures have been intended for instructional purposes, and reported = content validity by expert panels only with little attention to reliability of scores.

Stradtman and Cureton (1950) constructed the first fitness knowledge test, which contained a 100-question for secondary students. Content validity of the measures and test-retest reliability of .95 were obtained. Mood (1971) later designed a test to measure college physical education majors' knowledge of fitness. Two separate 60-question forms were developed. This test had the content validity confirmed and test-retest reliability of .75.

FitSmart (Zhu et al., 1999) was the only high school HBK assessment that has received the NASPE endorsement. This test contained 50 standardized multiple-choice items that measures HBK and fitness knowledge among secondary students. FitSmart had six different content areas which are concepts of healthy behaviors and fitness: (a) scientific principles of exercise, (b) exercise prescription, (c) components of physical fitness, (d) components of physical fitness, (e) effects of exercise on chronic disease risk factors, and (f) nutrition, injury prevention and consumer issues.

The FitSmart knowledge assessment instrument was put through extensive validation efforts in order to identify and then measure the major concepts necessary for understanding and maintaining physical fitness and healthy lifestyles. Three leading experts were asked to evaluate the content areas and identify which portions of the test were appropriately measuring student healthy behavior content knowledge. The authors conducted several pilot tests with students and different versions of the test were administered in the process of developing the final standardized questions for the test (Zhu et al., 1999).

Recently, a new HBK assessment tool has been introduced and endorsed from NASPE, that is, PE Metrics (NASPE 2010b). PE Metrics provided assessments for K-8th grade students in the psychomotor and cognitive domains as related to the NASPE standards. PE Metrics provides valid and reliable scores for use in the elementary physical education setting. The written tests were subjected to the following sequence of validation: (a) pre-pilot, (b) pilot, and (c) national data collection. A task force revised the problematic questions multiple times and the test was piloted with another smaller number of students. No studies could be found that have used this tool beyond the validation studies.

Research on HBK

Teachers. Castelli and Williams (2007) examined middle school teachers' HBK and their self-efficacy towards their own HBK in one school suburban district. The findings showed that teachers were confident in how they would perform on the HBK test; however, their anticipated scores were much higher than what their

actual scores were. Only 38% of teachers passed the health related fitness knowledge test revealing the notion that many teachers did not have the knowledge expected of ninth-grade physical education students.

Preservice Physical Education Teachers. Several other studies have examined differences of HBK among pre-service Physical Education Teacher Education (PETE) candidates. Barnett and Merriman (1994), for example studied 90 physical education majors (15 freshman, 25 sophomores, 25 juniors, and 25 seniors) fitness knowledge as compared to non-physical education students, in New York City. The Survey of Knowledge of Physical Fitness was developed and used which contained 27 multiple-choice items. Researchers conducted a split-halves reliability measure, which indicated a correlation of .83. Overall results showed that physical education juniors and seniors scored the highest, with an average of 80% correct while non physical education majors scored much lower.

Petersen et al. (2003) examined 63 PETE candidates during their senior year on their HBK using the FitSmart (Zhu et al., 1999) test and comfort levels in teaching health content. Results from the FitSmart test showed that PETE candidates scored a disappointing mean score of 75.18%, with the students' weakest area being the Scientific Principles of Exercise and Components of Physical Fitness. This score was far lower than anticipated, while further analysis showed that those who rated their comfort levels highest on teaching HBK were also the students who scored the highest on the knowledge assessment (Petersen et al., 2003). Miller and Housner (1998) found similar results when they examined senior PETE candidates'

knowledge as compared to non-PETE candidates with the FitSmart (Zhu et al., 1999) assessment tool. Their discovery showed that PETE candidates performed better than non-PETE candidates, however, PETE candidates scored poorly overall (below 70%). This is quite disappointing that over a decade of time PETE candidates still have insufficient HBK.

College and Secondary Students. Studies have also examined the HBK in college and high school students. General findings from the literature have shown that these students possess very low HBK (Keating et al., 2010; McCormick & Lockwood, 2006; Merkle & Treagust, 1993; Miller & Housner, 1998; Miller & Berry, 2000; Placek et al., 2001; Stewart & Mitchell, 2003; Zapata, Bryant, McDermott, and Hefelfinger, 2008).

Elementary Students. There are a few studies found in past research that has assessed student HBK. A recent study by Brusseau et al. (2011) examined elementary students from two different Native American communities' and their physical activity and health behavior knowledge. Students completed three to six health-related physical activity and health behavior portfolio tasks. Results indicated that students demonstrated minimal understanding of physical activity and healthy behaviors concepts. Kulinna (2004) found similar results using portfolio assessments among urban 1st through 6th grade students. The Author (2004) concluded that students had similar misconceptions of physical activity and healthy behavior content knowledge. Trost et al., (2000) examined HBK among fourth grade students and discovered that students in both groups before their

intervention demonstrated a limited understanding of the concept of physical. Hopple and Graham (1995) examined 52 4th and 5th grade students HBK through the use of interviews and written quizzes. Results indicated that many students did not enjoy taking the 1-mile test and did not have a clear understanding why they needed to take the one-mile run test after actually taking it.

Research results clearly indicated that physical education programs are providing insufficient healthy behavior content knowledge. As a result, researchers have been called on to examine ways to increase HBK in students that require minimal training, effort, or expertise from instructors.

Process of Teacher Change

Guskey's Model of Teacher Change (GMTC; Guskey, 2002) explains the process of teacher change as it occurs in schools. Essentially, GMTC assumes that teacher change begins during teacher training sessions and then progresses through a series of events. The classroom teacher first has to attempt to implement the newly adopted curriculum, and then causes an interaction and student learning outcomes. If these outcomes are generally positive, this then will lead to a change in the teacher's belief system and further inclusion of the implemented material (Guskey, 2002).

This model of teacher change has been supported through numerous other studies. Lowden (2006), for example, showed that teachers who participated in research-based professional development sessions over time revealed a perceived increase in student learning and academic achievement. Findings were associated

to Guskey's principles and teacher need for support during the process of teacher change. Kulinna (2012) used GTMC as a grounding framework in her study on indigenous children. This study looked at physical activity change among ten different schools. Results showed a small change among physical activity levels in both intervention and control groups. Congruent to Guskey's (2002) second principle, teachers were able to see pupils' physical activity levels increasing which may have caused teachers to continue using physical breaks in their classrooms (Kulinna, 2012).

Martin et al. (2008) examined the dose-response relationship that professional development had on teachers' self-efficacy when implementing an innovative curriculum, that is, the Exemplary Physical Education Curriculum (EPEC). The participants were randomly assigned into either the implementation of EPEC group or the comparison group (no EPEC). Both groups received an eight hour workshop at the initiation of the model, and only the high impact group received follow up and additional workshops throughout the implementation year. Results indicated that one-day workshop positively impacted teacher self-efficacy towards a new curriculum for both groups with no significant difference in efficacy ratings between both groups (Martin et al., 2008). The researchers explained that perhaps the EPEC workshops reinforced the knowledge and skills that the teachers already possessed. Similarly, Guskey (1998) stated that more professional development is not always better and oftentimes an increase amount of professional development can be problematic.

These findings are in contrast to past research regarding professional development. For example, Armour and Yelling (2004) studied this idea and found that teachers want and need longer more sustained professional development in order to sustain change.

Cognition Mediation

Doyle (1977) was first to explain the process and evolution of the cognitive mediating paradigm. His belief of cognitive mediation is that learning does not automatically occur from teaching. Therefore, student learning is filtered through mediating factors that intervene between teacher behavior and student cognition (Doyle, 1977). Many factors have been seen to have an influence of students' perceptions and interpretations of teacher instruction. That is why most methodologies found in related literature rely predominately on analysis of self-report data. This has raised much concern with researchers given that self-report data from children can cause many inaccuracies. Assor and Connell (1992) however, explain that if the self-report data is collected with care and follow particular guidelines then the data can actually provide valid and reliable results. Some common techniques found in research are: (a) open-ended questionnaires (Rukavina, Lee, & Solmon, 2001), (b) surveys (Solmon & Lee, 1997), (c) recall interviews (Lee et al., 1999), (d) thought sampling techniques (Locke & Jensen, 1974), and (e) narrative procedures (Langley, 1995).

Lee et al. (1999) examined student mediation of 50 fifth grade students. Open-ended interview techniques were used to collect students' perceptions and

beliefs about the activities taught in physical education. They discovered that conceptions of confidence and motivational beliefs were driven by gender appropriateness (i.e., basketball is for boys and dance is for girls). Solmon and Lee (1996) found similar results examining 6th grade students during a four-day instructional unit on the forehand pass in volleyball. Researchers examined students with the Perceived Competence Scale for Children and Cognitive Process Questionnaire to elicit information about students' attention levels, use of strategies and motivation levels during instruction. Results showed that students with low self-schema (self-efficacy towards hitting the forehand pass) were unlikely to exert effort during practice since they viewed the possibility of success as unrealistic (Solmon & Lee, 1996).

Hebert, Landin, and Solmon (2000) were among the few whom examined college aged students ($N=81$) and student cognition. The researchers examined college students as they were engaged in their tennis class. Students practiced the serve under one of three conditions. It was found that students task-related thoughts varied according to entry skill level and practice conditions. This study concluded that positive entry characteristics and design of practice could foster positive patterns of cognition.

The learning environment has a great effect on student cognition. Byra and Jenkins (1998) examined this idea and the effect of the learning environment on 42 5th grade students' thoughts and behaviors in two short (30 minutes) physical education lessons focused on striking skills. Using data task sheets during the

striking lesson and posttest interviews, results showed that students selected different levels of task difficulty when given the opportunity. Researchers further explained that students' decisions were based upon perceived success and the challenge of the task at hand. By understanding the method in which cognitive processes facilitate student achievement, it will be possible to provide teachers with novel segments that efficiently teach HBK.

Chapter 3

KNOWLEDGE IN ACTION: EFFECTIVE FITNESS SEGMENTS THAT TEACH ELEMENTARY HEALTHY BEHAVIOR KNOWLEDGE

Despite the importance of regular physical activity in promoting lifelong health, activity levels among youth and adolescents are relatively low. The National Association of Sport and Physical Education (NASPE) and National Institute of Health (1998) among many other health associations have recommended that children and adolescents achieve at least 60 minutes of physical activity a day. According to the 2011 National Youth Risk Behavior Survey (YRBS), self-reported data only 29% of high school students participated in at least 60 minutes per day of physical activity (CDC, 2011). Another study conducted using accelerometers to measure youth physical activity found only 42% of children and 8% of adolescents engaged in moderate-to-vigorous physical activity (MVPA) for at least 60 minutes each day. MVPA can be described as activities that require at least as much or more effort as brisk or fast walking (Armstrong & Bray, 1991). Strong et al. (2005) found many health benefits for youth and adolescents associated with physical activity and engagement in MVPA, such as: (a) reduction in total body and visceral adiposity, (b) reduction in triglyceride and insulin levels, (c) enhancement of aerobic fitness, (d) reduction in anxiety and signs of depression, and (e) enhancement of the child's self-concept.

Schools have been described as ideal settings for the promotion of physical activity since they can reach a large number of young people (CDC, 2011; Corbin,

2002; Jackson, Morrow, Hill & Dishman, 2004; McKenzie, 2007; Pate et al., 2006). Although recent budget cuts and an increased focus on academic achievement, has resulted in a reduction of physical education classes and other opportunities for physical activity at schools (NASPE, 2012; Thomas, 2004). According to the CDC (2010), only 4% of elementary schools, 8% of middle schools, and 2% of high schools in the United States provide daily physical education or its equivalent for all students across grade. Rink (2008) suggested that in order for physical education programs to be effective they need to teach motor skills, knowledge needed for a physically active lifestyle, and to encourage regular participation in physical activity. This suggestion resonates with the NASPE standards for a quality physical education program (NASPE, 2010a).

Physical Activity Participation in Physical Education

The Physical Activity Guidelines for Americans recommend that children and adolescents participate in at least 60 minutes of MVPA most days of the week, in order to attain health benefits (USDHHS, 2008). To help reach this goal, Healthy People 2010, recommended that students be engaged in MVPA for at least 50% of P.E. class time. Regrettably, many elementary physical education programs are not reaching this suggested amount of MVPA (Barnett, van Beurden, Zask, Brooks, & Dietrich, 2002; Cardon, Verstraete, De Clercq, & De Bourdeaudhuij, 2004; McKenzie et al., 1995). Subsequently, many interventions have been created and implemented during physical education classes aiming to improve the accumulation of MVPA during physical education classes (Kahn, et al., 2002).

The Go for Health program was one intervention found intended to decrease unhealthy eating in schools as well as increase MVPA during physical education. Results indicated a decrease in total fat and saturated fat consumption along with and improvement in physical activity engagement from approximately 10% to 40% (Simons-Morton, Parcel, Baranowski, Forthofer, & O'Hara, 1998). Sports, Play, Active Recreation, for Kids (SPARK; Sallis et al., 1999) was one large intervention project that targeted increased student MVPA as an outcome goal. Authors reported increase MVPA during classes to approximately 50% of the time (McKenzie, 2001). CATCH (McKenzie et al., 2003) was another successful intervention that displayed pronounced effects on enhancing physical activity levels among children during physical education class time. Middle School Physical Activity and Nutrition (M-SPAN) was another intervention found to enhance 3 minutes of MVPA, approximately 18%, during physical education class time without increasing the lesson length (McKenzie, et al., 2004).

Many studies have chose to use pedometers to examine youth physical activity during physical education classes (Flohr, Todd, & Tudor-Locke, 2006; Kodish, Kulinna, Martin, Pangrazi, & Darst, 2006; Pangrazi et al., 2003; Scruggs, Beveridge, Watson, & Clocksin, 2005b). It has been suggested that approximately 2000 steps would be a sufficient amount of steps needed to accumulate the baseline recommended MVPA levels during physical education classes (Pangrazi, et al., 2002; Tudor-Lock et al., 2006). Others have suggested that 120 to 140 steps per minute for 10 and 12 years olds would classify as someone engaging in MVPA (Graser et al.,

2009), resulting in a total of step count of 1,800 to 2,100 for 50% of a 30-minute class engaged in MVPA.

Lack of HBK Instruction in Physical Education

Most intervention studies have left out instruction of HBK as an intervention component in physical education classes. This is an issue as K-16 students have found to possess low levels of HBK (Keating et al., 2009b). Elementary (Brusseau et al., 2011; Kulinna, 2004; Hopple & Graham, 1995; Trost et al., 2000), secondary (Desmond et al., 1990; Keating, Chen, Guan, Harrison, & Dauenhauer, 2009a; Placek et al. 2001; Soukup & Henrich, 2010; Stewart and Mitchell, 2003), college (Barnett & Merriman, 1994; Keating et al., 2010; Losch & Strand, 2004; Miller & Berry, 2000; Petersen et al., 2003) and even current physical education teachers (Castelli & Williams, 2007) have recorded low levels of HBK. These findings come as no surprise since these trends have been apparent for over a decade (Hopple & Graham, 1995). Pate et al., (2006) explained that more efforts (e.g., instruction of HBK, promotion of physical activity, etc.) from physical education programs are needed to help combat the many health problems caused by the abundant amount of child sedentary living.

There have been various efforts found in the literature that aim to increase student learning and instruction of HBK. Dale et al. (1998) examined the implementation of the Comprehensive Physical Education (CPE) program during Project Active Teens aimed at increasing knowledge in the classroom and using lifetime activities taught in the physical education program. Results indicated after

the first year of implementation that 9th grade boys in the CPE program were more active during their leisure time as compared to student from the Traditional Physical Education (Dale et al., 1998). Palmer, Graham, and Elliot (2005) looked to increase students' knowledge through a web-based health program. Their intervention led to a significantly increase in student knowledge and positive attitudes toward physical activity (Palmer et al., 2005). Alongside the promotion and increased physical activity participation during physical education classes, HBK needs to be increased as research supports the notion that the acquisition of HBK can result in increased activity (Dale & Corbin, 2000; DiLorenzo et al., 1998; Liang et al., 1993; Pearman et al., 1997; Thompson & Hannon, 2012).

It is important to use physical education efficiently and effectively in order to be successful in improving students' ability to develop skills for continued future participation in a variety of activities. To address these two goals that is: (a) to increase student HBK, and (b) to maximize physical activity participation levels in classes, the research team has developed an effective strategy to teach HBK while maintaining high levels of MVPA during physical education classes. Cognitive mediation theory was used as the grounding framework for the creation of the KIA fitness segments, ensuring the students were fully engaged and offered a self-enhancing and constructive learning environment.

Cognitive Mediation Theory

The cognitive mediation theory, describes the link between teacher behavior and student learning as not direct, but rather having many mediating factors that

contribute to the learning process (Doyle, 1977). In order for students to profit from instruction, they must be actively engage in it. Subsequently shifting the teacher's role from instructing and expecting student learning through absorption, to being a facilitation of and creator of the students learning environment and supporting their learning outcomes. Mediating factors that may be present in the physical education context include student interest, gender appropriateness, environmental influences, and self-efficacy. Chen (2001) investigated the role of student interests, specifically 'motivation' in physical education instructional units. Results indicated that if activities were new, cognitively challenging, and offered immediate enjoyment, then students were more likely to be engaged. Children come to school with pre-conceived conceptions about learning in physical education and physical activity. Therefore, student perceptions should be considered when attempting to design a HBK curriculum. Lee et al. (1999) examined 50 students and their perceptions of two gender orientated activities. Authors found that student conceptions of confidence and motivational beliefs were driven by gender appropriateness (i.e., basketball is for boys and dance is for girls). Byra and Jenkins (1998) further examined cognitive mediators and the role the environment and choice has in physical education. Results indicated that students' selected different levels of task difficulty when given the opportunity and that student decisions were based upon perceived success and the challenge of the task at hand (Byra & Jenkins, 1998). Solmon and Lee (1996) studied 6th grade students self-efficacy during a four-day instructional unit on the forehand pass skill in volleyball. Students with low

self-schema (self-efficacy towards hitting the forehand pass) were unlikely to exert effort during practice, since they viewed the possibility of success as unrealistic. Cognitive mediation factors were considered when developing the lessons such as: (a) self-development, (b) motivational techniques, (c) constructive learning environment, and (d) task progression.

The purpose of the current study was to investigate the effectiveness (i.e., student learning outcomes) of the implementation of the fitness segments. The KIA fitness segments were designed to teach HBK while maintaining physical activity participation levels during physical education classes. There were two specific research hypotheses guiding this study: (a) the classes randomized to the KIA group will have significant higher HBK than those in the control classes at posttest, and (b) the KIA classes will not have a significant difference in student physical activity levels in classes across the study than those in the control classes.

Methods

Participants and Setting

The present study was conducted in a suburban school district. Physical education was offered for student twice every six days for 30 minutes. Five intervention and five control schools were randomly assigned from the schools interested in participating in the study in order to test the primary research hypotheses. Institutional Review Board approval was obtained from the University and the School District.

Teacher Participants. Physical education teachers were recruited via email, phone, or in-person. Once 10 physical education teachers were recruited, they were randomly placed into either the control or the intervention group. Three intervention teachers ($n=8$ classes; $n=145$ students) and two control teachers ($n=6$; $n=102$ students classes) were randomly selected to use accelerometers in their classes. The physical education teachers' years experience teaching ranged from 5 to 27 ($M=11.83$, $SD=6.56$). Physical education teachers' ethnic backgrounds were reported (9 Caucasian, and 1 Hispanic).

Student Participants. Fifth grade students were the participants for this study. There were a total of ($N=30$) class groups with ($N=633$) students. Students' ethnic backgrounds and schools free and reduced lunch can be seen in Table 1.

Table 1

Students' Ethnicity and Rate of Free and Reduced Lunch Rates by School

Intervention Teachers	Caucasian	Hispanic	African American	Asian American	Free/Reduced Lunch
Brad	35.7	42.9	12.5	7.1	51.52
Mike	58.2	17.9	16.4	6.0	16.70
Ruth	53.8	21.8	9.2	21.0	3.65
Jessica	78.1	9.4	0.0	12.5	15.48
Gabby	47.4	29.8	7.0	14.0	16.76
Total (Mean)	54.64	24.36	9.02	12.12	20.82
Control Teachers	Caucasian	Hispanic	African American	Asian American	Free/Reduced Lunch
Larry	63.6	13.6	15.9	2.3	16.70
Abby	49.2	16.4	21.3	9.8	13.24
Jessie	63.8	8.5	10.7	10.06	9.26
Jillian	0.00	87.1	11.4	0.00	93.88
Steven	63.7	15.1	11.3	6.3	21.4
Total (Mean)	48.06	28.14	14.12	5.692	30.896

Note: All values are in percentages

The intervention group ($n=17$; class groups) contained ($n=331$; 166 boys and 167 girls) students with the age range of 9 to 11 ($M=10.07$, $SD=0.42$) and the control group ($n=13$; class groups) contained ($n=302$; $n=144$ boy and $n=158$ girls) students with the age range of 9 to 12 ($M=10.14$, $SD=0.48$).

Intervention

The goal of this study was to build upon the pilot (Hodges et al., in review) by enhancing students' HBK while maintaining high physical activity levels, with closer alignment to the assessment tool, PE Metrics (NASPE, 2010b) Standards 3 & 4 for fifth grade students. A total of seven KIA activities were organized into seven KIA fitness segments and was implemented by the intervention physical education teachers during the fitness segment of their 5th grade physical education classes. Teachers were provided with YouTube videos demonstrating the KIA 12 minute lessons to view as well as all station signs, lesson plans, and equipment to teach the KIA fitness segments.

KIA Fitness Segments. The KIA fitness segments were modified from a previous pilot study (Hodges et al., in review). There were two new activities added that were designed to enhance student learning based on pilot study results (i.e., Roll the Dice, and Bearing the Weight). Some of the other activities were altered for better treatment (e.g., managerial issues, enhanced instruction, or reduce student confusion) and reorganized into the seven KIA fitness segments. See Appendix C for all seven lesson plans describing the fitness segments.

Activities from the *Physical Best Activity Guide* (NASPE, 2005) and the *Dynamic Physical Education* ([DPE] Pangrazi & Beighle, 2013) were modified and influenced the creation of some KIA activities. For example, 'Barker's Hoopla' a DPE introductory activity influenced the creation of the KIA activity 'Body Composition Avengers.' The main difference from these activities is that instead students grabbing beanbags from the opponents' hula-hoops, students in the KIA activity either grabbed their opponent's muscle (red) beanbags or got rid of their fat (yellow) beanbags emphasizing on the body composition concept.

The KIA segments were designed to last no more than 12 minutes, which included a brief description of activities (1-2 minutes), four 1 minute and 45 seconds KIA activities (7 minutes), three 30-second transitions between stations (1 minute and 30 seconds), and a brief closure recapping the HBK concepts (1 minute). Each KIA lesson contained four different KIA activities that were positioned in each corner of the playing area. The KIA fitness segments are on a rotating lesson design. For example, if (Lesson 1) had activities, "W," "X," "Y," and "Z," the following lesson (Lesson 2) would introduce a new activity "A" in place of the first activity "W." This would result in activities, "X," "Y," "Z," and "A." The subsequent lesson (Lesson 3) would then introduce a new activity, "B," thus Lesson 3 would have activities "Y," "Z," "A," and "B." This allowed for students to be exposed to the activity four times during the seven-lesson study. See Table 2 for a complete description of activities and the concepts emphasized in each.

Teachers were encouraged to play pre-set music of 1 minute and 45 second activity period. The purpose of the music was to serve as motivation for students during activity and a guide for teachers ensuring uniformity. During the 30-second transition period instructors were also encouraged to check for student understanding with a quick question on one of the concepts being taught during that day.

Procedures & Data Collection

Teacher Fidelity Checklist. The observation instrument that was used for this study included seven dichotomous scale items (i.e., whether the KIA segments was implemented or not, and if activities were timed appropriately), which documented group adherence and examined instruction of the KIA fitness segments. Time intervals were documented for each component of the lesson, as this was an integral part of the KIA segments (i.e., duration of entire lesson, duration of teacher initial explanation of the activities). See Appendix B for the Teacher Fidelity Check Sheet used by the research members.

All research members were educated on the KIA fitness segments as well as how to record teachers' fidelity to the lesson. A member of the research team observed the physical education teachers in both participating groups during the implementation of the KIA fitness segments.

HBK Assessment. NASPE has endorsed the PE Metrics (NASPE, 2010b), which was used to examine HBK in this study. More specifically, the research team used Standards 3 & 4 fifth grade students that contained 28 multiple-choice items.

Eight performance descriptors categorized the items. See Appendix E for complete PE Metrics test. The written tests were subjected to the following sequence of validation: (a) pre-pilot, (b) pilot, and (c) national data collection. A task force revised the problematic questions multiple times and the test was piloted with another smaller number of students. No studies could be found that have used this tool beyond the validation studies.

First members of the research team administer the knowledge assessment test following a specific protocol during the week of pre and post data collection. Each question and answer was read to students, giving a approximately 20-30 seconds wait time for each question.

Physical Activity Assessment. The New Lifestyles NL-1000 accelerometers were used to assess students' physical activity levels. The NL-1000 detects the maximum acceleration over each 4-s epoch, and categorized into one of 11 activity intensity levels. There was an on-board keypad and screen display, which offered an output of activity time and steps Hart, Brusseau, Kulinna, McClain, and Tudor-Locke (2011) validated the NL-1000 for the use of children in their study with 10-11 year old children. The research team used the accelerometer count cutoffs of MVPA range of 5-9, which was previously recommended for children ages 10-11years (McClain et al., 2007).

Students arrived to the physical education class and immediately placed their assigned NL-1000 accelerometers just above the hipbone on their waistband. After completion of the KIA fitness segments or for the control group students at 15

minutes, accelerometers were removed and recorded by a trained research member.

The research team members documented each students' accelerometer (steps and time in MVPA) immediately after the student returned the device. The research members cleared the accelerometers after data collection and left the accelerometer for subsequent lessons.

Data Analysis

Descriptive statistics (M , SD) for the study participants were calculated across gender and treatment (i.e., intervention and control) categories. Similar analysis was conducted on teacher fidelity data. Cronbach α coefficients were used to estimate the internal-consistency reliabilities for the HBK pretest and posttest scores, respectively, by dividing odd and even assessments. One-way ANOVA was used to determine significant mean differences in students' steps across intervention and control groups.

General linear models, at student level (level-1), with Scheffe's post-hoc tests were used to test mean differences for changes in HBK between intervention and control groups. Hierarchical linear models, at school level (level-2), were used to compare mean differences for changes in HBK between intervention and control groups after adjustment for gender and gender*treatment interaction. The outcome measures for student level (level 1) include changes in HBK (HBK Δ). The student level (level- 1) covariate is gender. The school-level (level- 2) covariate is treatment variable (intervention vs. control). The two-level multilevel models are as follows:

Level 1: $HBK \Delta = \beta_{0j} + \beta_{1j} (Sex) + e_{ij}$, where $i = 1, 2, \dots$ students, $j = 1, 2, \dots$ schools.

Level 2: $\beta_{0j} = \gamma_{00} + \gamma_{01} (Intervention\ vs.\ Control) + u_{0j}$

$\beta_{1j} = \gamma_{10} + \gamma_{11} (Intervention\ vs.\ Control)$

Full model (Model 1):

$HBK \Delta = \gamma_{00} + \gamma_{01} (Intervention\ vs.\ Control) + \gamma_{10} (Sex) + \gamma_{11} (Intervention\ vs.\ Control) (Sex) + u_{0j} + e_{ij}$

Baseline mean difference for the HBK scores between intervention and control groups was significantly different ($p < 0.001$). Thus, we also tested intervention effects after adjustment for the baseline HBK scores in the following full model (Model 2).

Model 2: $HBK \Delta = \gamma_{00} + \gamma_{01} (Intervention\ vs.\ Control) + \gamma_{10} (Sex) + \gamma_{11} (Intervention\ vs.\ Control) (Sex) + \gamma_{02} (Baseline\ HBK) + u_{0j} + e_{ij}$

Intervention: $HBK \Delta = (\gamma_{00} + \gamma_{01}) + (\gamma_{10} + \gamma_{11}) (Sex) + \gamma_{02} (Baseline\ HBK)$

Control : $HBK \Delta = \gamma_{00} + \gamma_{10} (Sex) + \gamma_{02} (Baseline\ HBK)$

The covariance parameter estimates for the random effects (μ_{0j}, e_{ij}) were tested to examine the statistical significance of intercepts (τ_{00}) and slopes (τ_{11}) across schools. Intraclass correlation coefficients (ICC), $\rho = \tau_{00} / (\tau_{00} + \sigma^2)$, were also computed to estimate the proportion of total variance between schools, intervention, and control groups.

All statistical procedures were performed using SAS PROC Mixed models by Statistical Analysis Systems software (SAS Institute, Cary, NC). All p -values were two-tailed, and values of less than 0.05 were considered to indicate statistical significance.

Results

After the exclusion of 76 participants (e.g., missing pretest or posttest values or covariates), participants included 633 students ($n=331$ intervention; $n=302$ control) who were enrolled in the 5 intervention and 5 control schools.

Teacher Fidelity

There were a total of ($N=128$) observations that occurred during the study. Physical education teachers in the intervention group were observed 80.6% of the time during the intervention. It was documented that the intervention physical education teachers were taking on average approximately 12.49 minutes to complete the KIA fitness segments. Total mean percentage of teachers implementing all components of the KIA fitness segments totaled 77.9%. All teachers were observed teaching the segment in some fashion, however a few teachers were observed to be not implementing all components (e.g., introductions of new concepts, checking for understanding during transitions, closure at the end of the lesson). The control teachers were observed as well, and found there to be no documented use of the KIA fitness segments in their classes, however instruction of HBK was conducted at a limited rate. See Figure 1 for the intervention teacher fidelity scores during the KIA intervention.

HBK Measures

Descriptive statistics (M , SD) for the HBK scores across gender and treatment (intervention vs. control) categories are presented in Table 3. The Cronbach α coefficients for the pretest and posttest HBK questionnaires were 0.67 and 0.74, respectively.

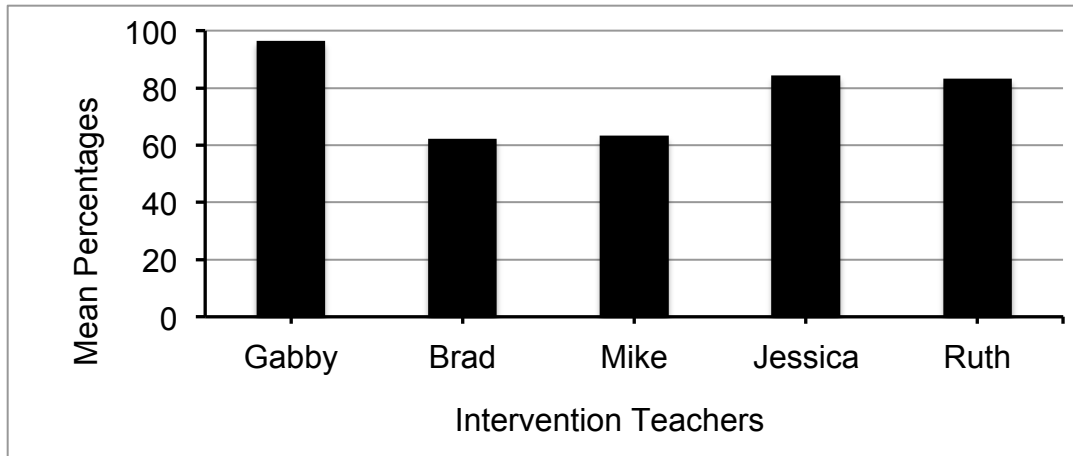


Figure 1. Teacher Fidelity. This figure shows the intervention teachers fidelity to the KIA fitness segments during the course of the seven-week study

As shown in Table 3 (student-level), students in the intervention group had a 3.1(20%) greater mean improvement in HBK than did students in the control group ($\Delta = 0.6[5\%]$) ($p < 0.001$). Boys in the intervention group had a greater improvement in HBK ($\Delta = 3.4[22\%]$) compared with their control counterparts ($\Delta = 0.8[6\%]$) ($p < 0.001$). Girls in the intervention group also had a greater improvement in HBK ($\Delta = 2.8[18.3\%]$) than did their control counterparts ($\Delta = 0.5[4\%]$) ($p < 0.001$). See Figure 2 for mean pre and post HBK scores for each intervention and control teacher.

Estimated parameters and standard errors for the fixed and random effects for models 1 and 2 are shown in Table 4 (level-2). Students in the intervention group had a 2.5(16%) greater mean improvement in HBK than did the control group students after adjustment for gender and gender*treatment interaction ($p < 0.001$) (model 1). There were no statistical differences by gender ($p = 0.33$) or cross-level interaction (treatment*gender) ($p = 0.69$) (model 1).

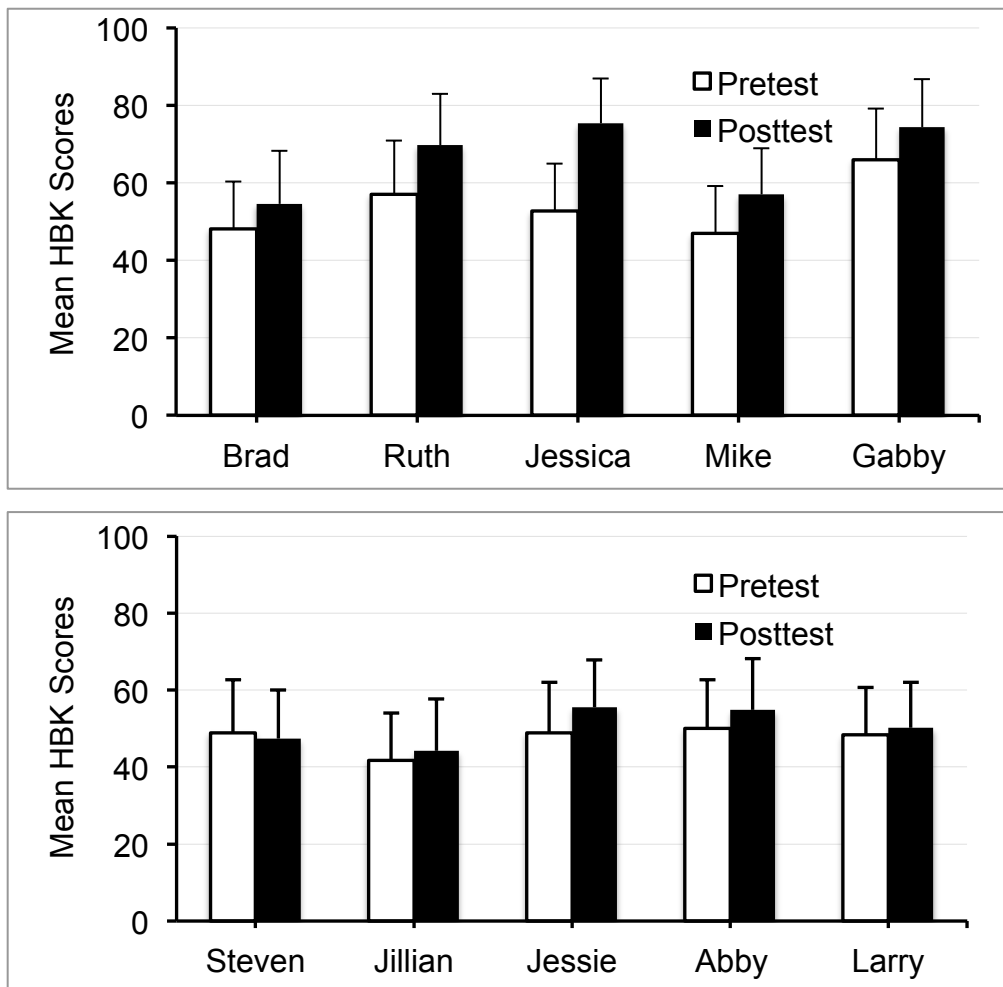


Figure 2. HBK Mean Score Comparison. HBK scores are illustrated across pre and posttest assessment.

Researchers also tested the effect of the intervention after further adjustment for baseline HBK scores. As shown in Table 4 (model 2), we observed similar findings as model 1 after further adjustment for baseline HBK scores ($p=0.51$, for treatment by HBK interaction, ANCOVA assumption justified that students in the two groups were not significantly different in terms of knowledge). Students

with the intervention had a 3.4(22%) greater improvement in HBK scores when compared with their control counterparts ($p < 0.001$) (model-2).

The variance of the random effects (gender and treatment groups) among schools was 0.91 (model 2). The intraclass correlation coefficient (ICC) for schools, $\sigma^2_{\text{school}} / (\sigma^2_{\text{school}} + \sigma^2)$, was 0.11 indicating that approximately 11% of the total observed variance in changes in HBK was explained by school mean differences (i.e., minimum differences in variance among the schools). Approximately 89% of the variance is attributable to differences between intervention and control students within their schools. The ICCs for intervention and control groups was 0.108 and 0.107, respectively, indicating minimal differences in variance among the schools across intervention and control groups.

Physical Activity Measures

Students ($n=145$) in the intervention group had more steps ($M=871.20$, $SD=140.15$) than students ($n=102$) in the control group ($M=762.38$, $SD=158.52.04$). Students also in the intervention group had more time in MVPA ($M=3.78$, $SD=.89$) than the students in the control group ($M=3.25$, $SD=1.17$). See figure 3 and 4 for the comparison of mean steps and time in MVPA across the seven lesson segments.

At level-1, ANOVA results indicated student mean steps were significantly different across groups ($f(245) = 32.38$, $p < .001$). Moreover, level-1 MVPA time was significantly different across groups ($f(245) = 16.18$, $p < .001$).

At level-2, mean difference for MVPA was also tested across groups as assessed by accelerometer between intervention and control groups. Although

students in the intervention group had an overall average of 0.6 minutes more of MVPA, there was no statistical difference between intervention and control groups ($p=0.33$) in MVPA time (level-2).

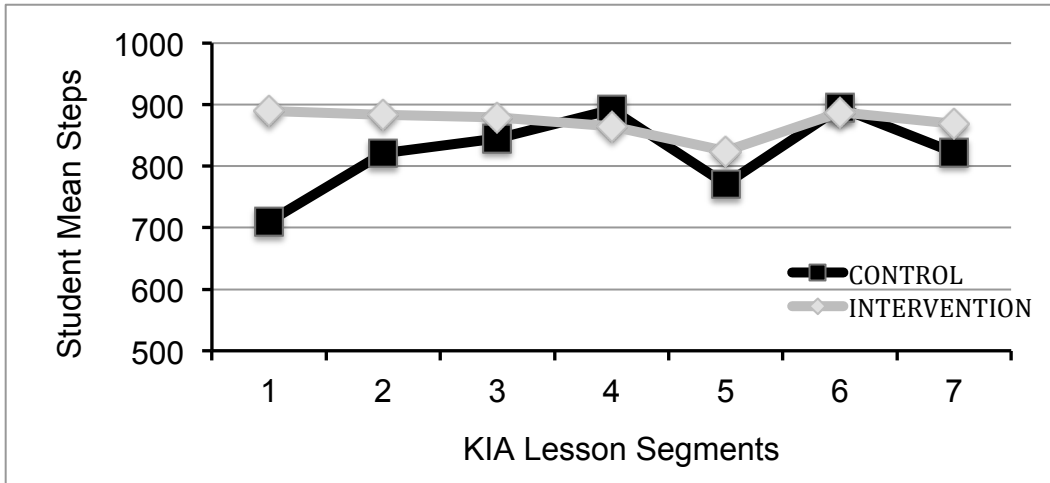


Figure 3. Mean Step Count Across KIA Lesson Segments

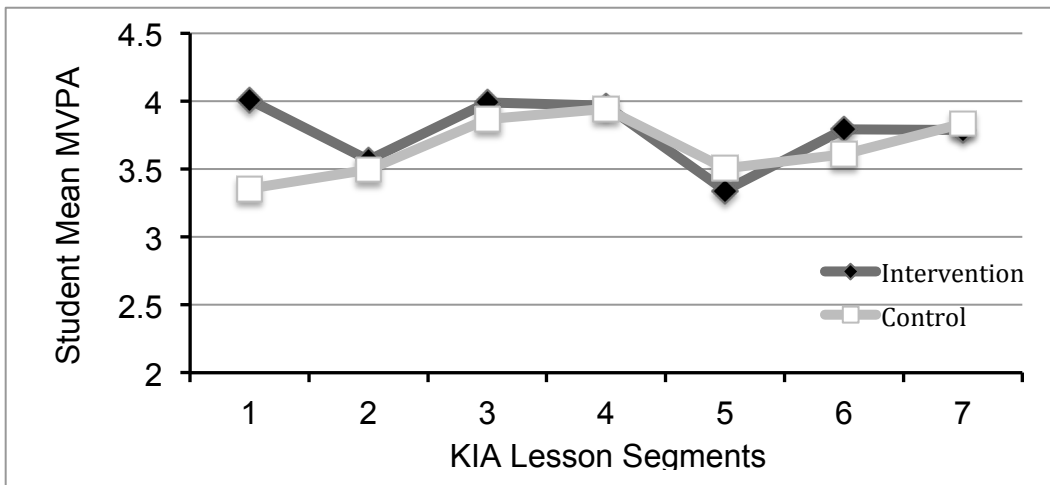


Figure 4. Mean MVPA Time Across KIA Lesson Segments

Discussion

This study uncovered the effectiveness (i.e., increasing HBK and maintaining physical activity) of the newly created KIA fitness segments. The current study showed that conceptual knowledge could be taught in 12-minute intervals through

fitness activities leading to significant improvements in student learning outcomes. The major findings discovered in this study showed that: (a) 5th grade students in the KIA fitness segments had significantly improved HBK scores at posttest, and (b) students from the intervention group maintained physical activity levels as compared to the control group students.

HBK Increased Among 5th Grade Intervention Students

Fox and Biddle (1998) explained that HBK is important and provides individuals with a foundation for intelligent decision-making. DiLorenzo and colleagues (1998) found this to hold true when they conducted a longitudinal study on elementary students and discovered knowledge to be a key determinant to the students' physical activity participation. Only a few intervention studies have tried to increase HBK in schools. Dale et al. (1998) and Palmer et al. (2005) both showed significant increases in HBK from their intervention program, however these programs were conducted outside of the physical education classes. Teachers are in need of strategies to teach HBK efficiently and effectively as physical education class time is limited and students' HBK has shown to be extremely lacking (Brusseau et al., 2011; Kulinna, 2004; Hopple & Graham, 1995; Petersen et al., 2003; Placek et al. 2001; Stewart and Mitchell, 2003).

Comparing the first KIA lesson pilot study (Hodges et al., in review), the modified KIA fitness segments led to higher posttest HBK scores ($M=18.58$, $SD=3.48$) compared with the pilot study students ($M=16.20$, $SD=4.22$). A number of assumptions can be made from these results; although, the most obvious is that the

updated segments are more effective and aligned better with the assessment tool. Another positive outcome from the current study was that gender differences were insignificant whereas the previous study showed females to have significantly higher scores (Hodges et al., in review).

Cognitive mediation theory was considered during the creation of the KIA fitness segments. Doyle (1977) explained that students' need to be fully immersed in the curriculum in order to facilitate learning. The KIA fitness segments were designed to do just that. Students' engaged in the concepts and principles being taught, while instructors were holding them accountable with checking for understanding during transition periods. Other mediating factors suggested by Byra and Jenkins (1998) was task difficulty, which was considered during all activities that allowed students the opportunity to participate at their own ability level. Task difficulty set forth was challenging yet achievable as it seen that students' self-efficacy the likelihood to exert effort would be minimal if the students viewed the opportunity of success as unlikely.

Based on the fidelity checklist and observational notes, the checking for understanding during the 30-second transition was commonly missed by two of the five teachers. This procedure is considered to be very important by the researchers, as students during this time will refocus their attention to learning of the concepts from each activity. According to Chen (2001) students that were fully engaged needed activities to be new, mentally challenging, and offer immediate enjoyment. Therefore, if teachers would have included all components and teaching processes

as described in the KIA fitness segments, students' HBK may have increased much more at posttest.

Physical Activity Maintained

Students in the intervention accumulated significantly more steps than students in the control group ($p<.001$). Furthermore, MVPA was found to be slightly more in the intervention group as well. Based on the MVPA results of 3.

In addition, according to the level-2 HLM results, MVPA engagement was not significantly different across treatment groups ($p=0.44$). These results defend the use of KIA fitness segments to not cause a decrease in student physical activity during implementation. This is key as physical activity levels have been found to be limited among many elementary students during their physical education classes (Fairclough & Stratton, 2005a; Fairclough & Stratton, 2005b; van Beurden, et al., 2003).

Scruggs (2007b) examined step count among 7th and 8th grade students with the goal to determine the cut points for 50% of MVPA engagement of a 30-minute physical education lesson. Results indicated that students needed 82 to 87 steps per minute to reach 50% of MVPA. Based on descriptive results from this study students engaged in a moderate ($M=871$, $SD=140.15$) amount of step steps during the 12 minutes of physical education class time. This comes to approximately 72 steps per minute. Despite missing the cutoff for 50% of MVPA students from the intervention group were on pace (estimated 2,160 steps for 30 minutes of class time) to reach the recommended 2,000 steps that has been suggested to be a

reasonable amount of activity for a 30 minute physical education lesson (Pangrazi et al., 2002; Pangrazi, Beighle, Vehige, & Vack, 2003).

Research members were unable to obtain inter-rater reliability. This could have caused some inaccuracies on the teacher fidelity data, as research members could believe to be observing different results. The baseline HBK scores were significantly different at pretest across both treatment groups.

Conclusion

As teachers continually struggle to 'get everything in,' the KIA fitness segments provide one method of teaching HBK during the fitness segment of the physical education lesson that maintains physical activity. It has been said that HBK is the foundation for people to engage in more physical activity (Spiegel & Foulk, 2006; Zhu et al., 1999), however this notion still remains unclear as the number of students and adolescent's fully informed on HBK is limited. Nonetheless, HBK may be the missing factor needed to change the unflinching amount of children inactive and sedentary.

Chapter 4

KNOWLEDGE IN ACTION: PHYSICAL EDUCATION TEACHER PERCEPTIONS ON TEACHING KNOWLEDGE

The USDHHS (2009) and NASPE (2004) recommend at least 60 minutes of moderate-to-vigorous physical activity (MVPA) per day for children and adolescents. This includes muscle-strengthening and flexibility bouts of at least three or more times per week. Unfortunately, national accelerometer data from the 2003-2004 National Health and Nutritional Examination Survey (NHANES) discovered only half of children ages 6 through 11 years old (48.9% boys and 34.7% of girls) and very few adolescents ages 12 through 15 years old (11.9% boys and 3.4% girls) met this recommendation (Troiano et al., 2008). Subsequently, researchers have suggested school-based programs to be an effective method for raising daily physical activity levels and promoting lifelong physical activity (CDC, 2011; McKenzie, 2007). Recently however, physical education and other avenues of physical activity (e.g., recess) have been decreased or in some cases entirely removed due to an increased emphasis on statewide tests and budget cuts (NASPE, 2012; Thomas, 2004). Therefore, with the limited time allotted for physical education, instructors are in need of more efficient strategies to teach quality physical education.

As stated by NASPE (2004), quality physical education programs should provide student outcomes that develop physically educated individuals who are knowledgeable and skillful enough to live a lifetime of healthful healthy behaviors.

Oftentimes, physical education classes are not able to achieve this goal, due to limited time with students. In addition, physical education teachers may not provide the goal of 50% of class time spent in MVPA (USDHHS, 2009). Further, physical education teachers may not focus on content knowledge related to healthy behaviors and hold students accountable for learning it (Brusseau et al., 2011). For that reason, researchers in the current study have come up with an innovative strategy to address this issue and teach HBK while keeping students highly active in physical education classes.

Physical Activity in Physical Education Classes

One main objective for physical education and grounded in every NASPE standard is to get students physically active (e.g., Standard 1-demonstrates competency in motor skills, Standard 2-apply learning and performance of physical activities, Standard 3-participates regularly in physical activity; NASPE, 2004). According to many recent studies, most physical education programs are not reaching the 50% of class time spent in MVPA (McKenzie et al., 2000; Fairclough & Stratton, 2005a; Fairclough & Stratton, 2005b). For example, McKenzie et al., (2006) examined girls' activity levels in middle school physical education during the U.S. Trial for Activity in Adolescent Girls (TAAG) study. Results indicated that 6th grade girls spent an average of 37.9% of physical education class engaged in MVPA. Similarly, Cardon et al. (2004) examined students' activity levels of fourth and fifth graders using System for Observing Fitness Instruction Time ([SOFIT] Mckenzie,

2009). They found that students in non-swimming classes were engaging in 40% MVPA versus 52% MVPA in swimming classes.

Many curriculum developers have focused their attention on effectively raising the amount of MVPA conducted in the classroom and other important student outcomes. Kahn et al. (2002) conducted a systematic review of all literature from 1980-2000 that examined the interventions aimed to remedy the low physical activity levels during physical education classes. Out of ninety-four published studies, most of the interventions were successful at increasing students' MVPA with an average net increase of 10% in MVPA, although the majority of interventions showed students were still missing the 50% MVPA cut point at posttest (Kahn et al., 2002). Programs such as Sport Play and Active Recreation for Kids ([SPARK]; e.g., McKenzie, Sallis, & Rosengard, 2009), Child and Adolescent Trial for Cardiovascular health ([CATCH]; e.g., Leupker et. al., 1996) and recommendations for programs, such as, Health Optimizing Physical Education ([HOPE]; e.g., Sallis et al., 2012) have focused on increasing students' activity, among many other positive student learning outcomes related to the NASPE standards.

Physical education teachers need to be vigilant when attempting to reach the recommendation of MVPA time, however, this cannot be the only objective in a physical education class. For the reason that instructors may instruct students to only engage in a series of vigorous and repetitive fitness activities (i.e., running laps around the track) or even just one long recreational game (i.e., capture the flag). At times, both examples may be useful, except these activities alone will not satisfy all

NASPE standards for a quality physical education class and developing a physical educated person. Pate et al., (2006) explained that more efforts from physical education programs are needed to help combat the many health problems caused by the abundant amount of child sedentary living. In order for physical education programs to be effective they need to teach motor skills, impart knowledge needed for a physically active lifestyle, and encourage regular participation in physical activity (Rink, 2008).

It has been found that past interventions has aimed to increase students' HBK; however, this has been often targeted separately from physical activity participation in classes. With the many budget cuts and minimal time allotted for subjects unrelated to the statewide test, the incorporation of such programs is just not feasible. Therefore, researchers in the current study have developed a series of KIA fitness segments that include instruction of HBK while maintaining physical activity participation in physical education classes.

Students Healthy Behavior Knowledge

The need for instruction of HBK has been evident, as past research has indicated that students of all ages do not possess basic amounts of HBK (Keating et. al., 2010; McCormick & Lockwood, 2006; Miller & Housner, 1998). Stewart and Mitchell (2003) examined students' knowledge using a written test modified from the statewide assessment in physical education and found only 43% of students were able to identify the correct fitness components associated with the given physical activity. Placek et al. (2001) interviewed 40 urban 6th grade students on

their conceptions of fitness components and discovered that 82% of students could not accurately explain what muscular endurance looked like or meant. Furthermore, the researchers found that students believed that physical fitness meant that someone was looking good, and thin (Placek et al., 2001), a major misconception. Further studies have examined HBK to also be lacking across ethnic groups (e.g., African American and Native American populations; Brusseau et al., 2011; Keating et al., 2009a). These findings are far from unprecedented as nearly a decade ago Hopple and Graham (1995) found elementary students to lack HBK when they discovered that they did not have a clear understanding of why they needed to take the mile-run fitness test. These findings are disheartening given that HBK has been found to be associated with physical activity and the adoption of healthy behaviors (DiLorenzo et al., 1998; Liang, et al., 1993; Thompson & Hannon, 2012).

Process of Teacher and Perceptual Change

When attempting to implement something novel or change the curriculum taught in classrooms, researchers have found that the change process can be a relatively challenging (Guskey, 1986), although teachers may be open to this change. In order to better explain the teacher change process in the adoption of new curriculum materials, the GMTC (Guskey, 2002) served as the foundational theory for the current study.

GMTC uses three main principles to explain the process of teacher change. The first principle explains that professional development and training is necessary to

initiate any change to teaching behaviors. Next, there needs to be an attempt from the teacher to include this novel curriculum into the classroom. This step has been suggested to take much time and effort when attempting to alter the rituals and practices of an experienced classroom teacher (Guskey, 2002). The third principle is a key element to significant change in teachers' attitudes and beliefs, that is, student responses providing clear evidence of improvement in the learning outcomes (Guskey, 1986). As explained by Guskey (2002), "They [teachers] believe it works because they have seen it work, and that experience shapes their attitudes and beliefs" (p. 383). The last principle stated by Guskey (2002) is follow-up and support provided to the teacher. This leads to teacher change and is considered a necessary component to ensure proper ongoing use of the innovation.

Many studies have examined the process of teacher change and teachers' perceptions of change. In physical education, studies focusing on teacher change became prevalent beginning in the 1990's. Ennis, Mueller, and Hooper (1990) found noteworthy discoveries when attempting to inform teachers of an innovative approach to teaching (e.g., Sport for Peace curriculum). Results showed that teachers' orientation toward the traditional approach constrained their acceptance of the new approach and they were reluctant to consider adopting the novel approach during one-time professional development training. Kirk (1998) was one of the first researchers to examine instructors' prior knowledge and experiences' effect on the implementation of an innovative curriculum in physical education. Results from the two-year study indicated that even though the teachers'

participated in the creation of the innovative curriculum, researchers found that teachers' prior knowledge and past experiences influenced their actions and the adoption of the curriculum, which the researchers declared 'residual ideologies' (Kirk, 1998). Curtner-Smith (1999) also found that teachers past experiences, gender, and familiarity with sport and teacher education had a large effect on teacher interpretations and beliefs about a newly implemented curriculum (e.g., Sport Education). Cothran (2001) found similar results to Guskey's second principle when the author reported teachers had more favorable perceptions towards the model and showed willingness to continue the implementation after witnessing positive student learning.

In the current study, the goal was to better understand teachers' perceptions of the instruction of HBK and their perceptions of the series of KIA fitness segments. Closely following the principles of GMTTC by: (a) providing proper training and professional development prior to the commencement of the study, (b) having teachers attempt the newly trained segment with students, and (c) ensuring teachers the opportunity to observe positive student outcomes, the following questions were explored:

1. What are physical education teachers' perceptions of teaching HBK in physical education classes?
2. What are physical education teachers' perceptions on the KIA fitness segments taught related to instructional considerations and student learning?

Methods

Study Settings

The present study was conducted in a rural school district in the Southwestern U.S. The physical education district had adopted a 6th day 'specials' schedule, which resulted in students engaging in physical education classes twice a week every six days, for 30 minutes each.

Teacher Participants

Recruitment of teachers occurred via email, phone, or in-person. Once nine teachers were recruited, teachers were randomly assigned into either the implementation ($n=5$) or control group ($n=5$). The years of teaching physical education experience of the teachers varied from 3 to 27 ($M=10.89$, $SD=8.0$). Ethnic backgrounds reported were Caucasian ($n=8$) and Hispanic ($n=1$). For confidentiality purposes, pseudonyms were used for schools, and physical education teachers.

Informed Consent and Approval

This study was approved by the University's IRB and the School District research committee. Informed consent forms were collected prior to commencement of the study from participating teachers.

KIA Lesson Description

The overarching goal of the KIA fitness segments was to promote high levels of physical activity for all students while informing individuals on HBK using only one segment of the physical education lesson (e.g., fitness segment 12 minutes). The knowledge used to develop the KIA fitness segments was closely aligned with the PE

Metrics (NASPE, 2010b) Standards 3 & 4, fifth grade cognitive assessment tool.

There were a total of seven KIA activities and seven KIA fitness segments. Each lesson contained a different series of four KIA activities ensuring that each segment and activity during the course of the seven segments was taught four times.

For example, the first lesson may have consisted of activities called “W,” “X,” “Y,” and “Z.” The next lesson would then include a new activity, “A.” The new activity would be in place of first activity “W”. The following lesson would then include activity “B,” and replace activity “X.” Therefore, on lesson three there would be activities “Y,” “Z,” “A,” and “B.” This design continued over the course of the seven segments and the activities such as “X” and “W” that were removed after the first two segments would come back during week 6 and week 7 ensuring all activities were taught four times.

The *Physical Best Activity Guide* (NASPE, 2005) and the *Dynamic Physical Education* curricular model (Pangrazi & Beighle, 2013) informed a small number of KIA fitness activities. See Table 2 for a complete description of activities taught in the KIA fitness segments. Each KIA fitness segment was designed to last no more than 12 minutes, which included a brief description of activities (2 minutes), four 1 minute and 45 seconds stations (7 minutes), three 30-second transitions between stations (1 minute and 30 seconds), and a brief closure recapping the HBK concepts (1 minute).

The activities were placed in the four corners of the gym with participating teachers encouraged to play pre-set music of 1 minute and 45 second activity

period. The purpose of the music was to serve as motivation for students and a guide for teachers ensuring uniformity. During the 30-second transition period instructors were also encouraged to check for student understanding with a quick question on the concepts students were engaging in across each of the activities.

All instructional signs, equipment, lesson plans, and video recordings for each lesson were provided to all implementation teachers one week prior to the start of the project. YouTube video recordings contained a member of the research team teaching each of the KIA fitness segments to mock students (i.e., college students in the physical education teacher education program).

Observations

A trained research assistant observed each physical education teacher during the implementation of the KIA fitness segments. A total of ($N=128$) observations occurred during the implementation of the KIA fitness segments resulting in approximately 80.6% of all classes observed. Researchers transcribed all field notes and included this in the corpus of the data.

Interviews

This study focused on teacher experiences, beliefs, and thoughts about teaching HBK, and their perceptions of KIA fitness segments. A member of the research team interviewed the participating physical education teachers three times throughout the course of the study. The pre interview ($n=9$) occurred with both intervention and control group teachers prior to the start of the implementation in order to understand their previous experiences and perceptions of teaching HBK.

The second interview (mid) was conducted with implementation teachers ($n=5$) only in order to examine their perceptions of implementing the KIA fitness segments during the project to determine if their perceptions about HBK instruction had changed. The final interview (post) occurred one-two months after the completion of the study with the implementation teachers once again ($n=4$). A total of ($n=18$) interviews were conducted throughout this intervention study from pre, mid, and post time occurrences.

Semi-structured interviews were used to allow the interviewer the flexibility to react and add new ideas as well as prompt further discussion. The research team used a General Interview Guide for each interview (pre, mid, and post) each contained approximately 15 questions. Interviews lasted approximately 20-25 minutes in order to fit into the teachers' time availability. All interviews were recorded in order to ensure accuracy and quality of interviews. A member of research team transcribed all of the interview data and typed field notes.

Data Analysis

The process to used analyze the data was based on “constant comparative” method (CCM) originally described by Glaser and Straus (1967), and further modified by LeCompte & Preissle (1993) for qualitative data analysis in education.

The transcripts of the interview data were organized using the online computer program Dedoose (2012). This allowed the researchers to initially, independently code the data for common themes.

Data analysis began with a particular incident found from one interview and that was compared with another incident from the same corpus. In the first cycle, two researchers established their individual personal coding scheme and initial themes separately. The research team members then compared their initial coding and themes and negotiated findings (collapsed and reduced themes). In the second cycle of the analyzing the data, comparison among interview time points were investigated in order to identify changes in perceptions over time.

Data Trustworthiness. To ensure trustworthiness of the data, the research team used member checking with the teachers, peer examination, and negative case searches. Two member checks were conducted during this study. The first consisted of returning all interview transcripts to interviewed teachers. The teachers made only editorial and semantic changes at this time. The second member check involved a member of the research team sending the participants a draft of the findings in the manuscript, asking for verification of interpretations. A search for disconfirming evidence was then conducted by searching for negative cases to that could provide an alternative viewpoint or disprove set categories by the research team members.

Results

Findings from the interview data yielded several common themes. The first research question was, what are physical education teachers' perceptions of teaching HBK in physical education classes? Two common themes emerged from the data: (a) 'Favorable Perceptions Toward HBK' and (b) 'Time Constraints'. Based

on the second research question, what are physical education teachers' perceptions on the KIA fitness segments taught, three common themes were found, (a) Effective Teacher Training of the Segments, (b), Teachers Learned a Novel Strategy, and (c) Teachers Recommended Modifications. We will be unfolding the results based on the research questions.

Research Question #1

What are physical education teachers' perceptions of teaching HBK in physical education classes?

Favorable Perceptions Towards HBK. Teachers had favorable perception toward HBK. This was the first theme that emerged from pre interviews. Physical education teachers regardless of their assigned group perceived HBK to be important content. In fact, teachers explained that HBK had long-term effects on future engagement in healthy behaviors. Brad (male, nine years of teaching experience, 1st interview) explained,

Yea, it's like everything you do, if you understand why you are doing something then it's easier to do it. Because if you understand why you are exercising and the importance of it, and why you are eating correctly, then it is easier to follow that lifestyle.

Ruth (female, 16 years of teaching experience, 1st interview) agreed and suggested that HBK is important for, "I mean just life in general so they have an understanding and hopefully they don't get obese because they understand that 'okay, I go get up and move'. It just helps them and be better in real life." Jessie a control teacher (female, six years of teaching experience, 1st interview) explained why she believed instruction of HBK was important.

Yes, it [teaching HBK] is critical. Critical especially for the students who aren't getting it anywhere else. But for the ones who are getting it, it's just reinforcement and hopefully reinforcement from another voice and a likeable voice; of course elementary PE, usually you are well liked, whether you are a good PE teacher or not. So they are going to like hearing it from us.

Abby (female, eight years teaching experience, 1st interview) confirmed that HBK was important when she stated, "Because that is the knowledge you need to know to live a healthy lifestyle. So I think it is very important that they walk away with an understanding of it."

Time Constraints. This was the second theme found among all participating teachers during pre interviews. Despite teachers favorable perceptions to HBK, teachers explained that time constraints affected their instruction of HBK in physical education classes. Teachers reported they had minimal time with each class and were unwilling to give up valuable physical activity time. Jessica (female, twenty years of teaching experience, 1st interview) explained that she had a too much to teach in such little time,

So the contact time of really feeling like what you are going to do with them is going to make a difference...It's hard because we are required to teach them so much. Unlike the classroom teacher who has them everyday all day and we see them every third day for 30 minutes and we have to make an impact. That's the hardest part I think.

Teachers' previous instructional strategies to the teaching of HBK in their classes contributed to their perception of time being a constraint. Teachers explained that (and assumed) HBK required students to sit and listen. Brad (1st interview) stated,

I just wish we had more time in the classroom. It's kinda like taking a biology class. You learn about biology and then you go to lab. PE would be the lab, and learning the [healthy] knowledge would be in the classroom.

Jillian (female, five years teaching experience, 1st interview) explained similar strategies when considering teaching HBK with her diverse students. She mentioned,

Being that they are English language learners it's so hard to teach them. And everybody is like, 'oh you should go to the computer lab, and you could research during this time.' Again we only have them 1 time every three days for 30 minutes. So it's kinda like...a catch 22.

Jessie (1st interview) confirmed that even her students did not want to sit and listen, which showed to play an influential role on her decision to not include HBK instruction. She proclaimed,

Because we are limited here in Clearfield [school district] we only see them once for 30 minutes every three days, you want to get them as active as possible. A lot of these kids are used to getting entertained with team sports and the parents are paying for that, so they just want to get in here and play.

Research Question #2

What are physical education teachers' perceptions on the KIA fitness segments taught?

Effective Teacher Training. The opening reactions when asked about the preparation of the KIA lesson were immediately positive, explaining that the ongoing YouTube training videos, lesson plans, and materials provided were helpful. Teachers in the implementation group from the mid and post interviews felt they knew what was to be taught and had very little (if any) confusion. Brad (2nd interview) explained,

Yeah, I mean every time you sent the lesson plans I would read through it and I would watch the videos they're real helpful. I like being able to see exactly what you want us to do. And as close as it was on the lesson plan. I

could probably have it done with just the lesson plan but it's definitely nice to see it in action and how it should be doing.

Mike (male, six years teaching experience, 2nd interview) concurred, "Yes, yes. The videos were beneficial because I am a visual learner so it is easier for me to watch it happen and then incorporate it." Gabby (female, 27 years teaching experience, 2nd interview) explained,

I liked seeing the videos. I printed out the lessons too because it gave me all the objectives and I kind of like that. So just in case, I had to say, oh that is the key word I am going to use today in my lesson. So, it helped me to see it both on paper and on videos.

Gabby (2nd interview) further explained that the training was effective,

I think it was well planned out. I think you did a good job planning it out. I think it was good with the videos giving us the development of knowing what to do, and if we used it, it helped.

Learned a Novel Strategy. This theme emerged from the two interviews (mid and post) with only the implementation group teachers. Various descriptions from the physical education teachers were included into this theme, such as teachers: (a) observed students engaging in high amounts of physical activity, (b) noticed students' gaining HBK, and (c) revealed that they were planning on to use the KIA activities in the future.

Teachers explained that the KIA fitness segments were a successful instructional strategy to teach HBK because students were staying active. This was a common response from the implementation teachers. Ruth (3rd interview) explained,

All the stations kept them active I mean even the questioning station, I know the most active they are here is just walking but it's a good change of pace.

Because by questioning them they actually have to cognitively understand it more, so I actually kinda liked it.

Jessica (3rd interview) added,

I felt like the project was a good balance of them getting the fitness and motor skills stuff as well as getting them the knowledge. I do feel like it was a good combo, and they didn't get one more than the other, it was pretty equal.

Others explained that they observed a change in students' knowledge and even their perceptions of what physical education actually entailed. Ruth (3rd interview)

concurred, "I just really like the fact that they're gaining knowledge and learning and I can see it now. Like I'm always focused on getting them to move but I didn't realize

that they didn't know very much." Further Jessica (3rd interview) described,

I do feel like they became more aware after doing this, and the knowledge that can be gained when engaging in PE. It's not just go play. That you can definitely learned knowledge from doing it and reading it and figuring it all out at the same time. I think they look at it in a different light now, and may be jumping rope they are now thinking this can benefit their heart and things.

Lastly, physical education teachers explained that they learned an innovative strategy and would continue the use of the KIA fitness segments in the future.

Gabby (3rd interview) concluded, "Yes, it gave me new ideas so that I can use them now, and it could be used from 3rd through 6th [grades]. Things like that." Brad (3rd

interview) stated, "I plan on using them with the same way as we did before, just

with out the [accelerometers]. The same way." Jessica (3rd interview) concurred, "I

teach the concepts already and having been teaching for 20 years, but I think it's

nice to have new ideas to teach these things."

Teachers Recommended Modifications. The last theme that emerged from the mid and post interviews was that many teachers hinted that some of the KIA activities needed modifications. Some of the most prominent modifications that teachers suggested were: (a) to make visuals of activities easier to read and 'less wordy,' (b) to reconstruct the Scavenger Hunt activity to make it less confusing in order to enhance learning as well as student physical activity levels, and (c) to minimize teacher responsibility during the Check Your Heart Rate activity.

Many teachers explained that some of the activities and the visual aides had a too much wording and could use a larger font. Further asserting that this would offer students information quick and require minimal 'down time.' Mike (2nd interview) explained, "The other ones you would kind of have to read you know and the dice throw you had to read a little bit too much. If those were simplified into more visual less steps and on-task." Jessica (2nd interview) echoed,

I think just make the a little more kid friendly not give you, you know they need to get the vocabulary but like I said before get more visual bigger font things like that. More noticeable and easier to pull away. Poster size you know where they don't have to get down and look at the little sign on the count. I think we really only have 30 minutes to do stuff get down and make the signs as to see as best as possible.

Suggestions to change the Scavenger Hunt activity were unanimous among the implementation teachers. Students were described by the teachers to be confused and spent most of their time reading the signs, instead of engaging in the activities. Mike (2nd interview) explained,

I think the one thing that I would change are that some of the stations are a bit wordy. The treasure hunt one ...there would be a better way to make it

with less reading and more activity when they are at the station I think that would be more positive.

Bill (3rd interview) concurred,

The two things that I would modify is definitely the scavenger hunt. I would make it more specific. It is difficult to follow exactly what the answer is on the card because some of them don't match up. I would just make with the scavenger hunt make them more specific you know with them trying to find the answer. I think the activities are great on there if they finally find it.

Only a few had concerns about the Check Your Heart Rate activity explaining that it required too much teacher responsibility. Teachers in this activity are to notify students when the halfway point was completed and then remind students to check their heart rate before switching to the next exercise in that activity. Gabby (3rd interview) explained,

The hard part was with the checking your heart rate and being there to remind them to take it. So maybe, like today, when I said jump 50 times and then take your heart rate and then switch. So it was a definite stopping/start point. With like the soccer dribbling, maybe if we had a distance, go once or twice around, and then take your heart rate. That was the only thing if I was not there to remind them to take your heart rate, and the switch, that was the only thing.

Discussion

The themes that emerged from the data supported Guskey's principles for teacher change. This process of change seemed evident in this study as teachers were found: (a) receiving appropriate training on the KIA fitness segments, (b) attempting to implement the segments in classes, and (c) observing positive student outcomes.

Professional Development and Training

Effective teacher training was one common theme that emerged from the data, which directly correlates with GMTC first principle. This principle states that professional development and training is necessary to initiate change in teaching behaviors (Guskey, 2002). Although there was only one training session in this study, teachers explained that the training session was sufficient coupled with the inclusion of the teaching materials (i.e., equipment, signage). The YouTube videos of a research member teaching the segments along with the written lesson plans were useful. Teachers proclaimed that the training approach provided a good understanding of how the segments were to be structured and minimized any confusion. According to Guskey (2002), "Change brings a certain amount of anxiety and can be very threatening" (p. 385). Therefore, the researcher team sought out to provide physical education teachers with the most seamless implementation during this study. As Guskey (2002) further noted however, neither training nor training followed by implementation would be sufficient for change. Nonetheless, appropriate teacher training was evident and based on the GMTC it greatly contributed towards the teachers' decision on whether or not to wholeheartedly implement the segments in their classes.

Physical Education Teachers' Implementation

During the pre interviews most of the participating teachers thought instruction of HBK was important, however several teachers explained that they were only occasionally, if at all teaching HBK in their classes. This finding is not uncommon, as research studies have indicated minimal relationship between

teachers' beliefs and their instructional practices exist (Romar, Akademi, & Siedentop, 1995; Silverman, Kulinna, & Keating, 2000). All teachers mentioned that HBK was an important component for students' future engagement in physical activity and defined HBK to encompass all physical activity concepts and the 'why' students should be active for a lifetime.

'Time Constraints' emerged as another common theme as participating teachers at the pre interview unanimously explained time to be a factor on their inclusion of HBK. Teachers initially were unwilling to sacrifice valuable physical activity time based on their current perspectives and instructional approaches to teaching HBK. Subsequently, after the introduction and random selection of groups teachers were expected to teach KIA fitness segments despite their personal viewpoints on instruction of HBK in physical education classes. Based upon teacher observation results, participating physical education teachers included all of the KIA fitness segments and most instructional components (e.g., checking for understanding during transitions, encouragement during activities, etc.). According to Guskey, attempting the lesson was an achievement in itself, notwithstanding teachers requirement based group placement.

To change or try something new means to risk failure. Not only would this be highly embarrassing, but it also runs counter to most teachers' strong commitment to student learning. To change means to chance the possibility that students might learn less well than they do under current practices. (Guskey, 2002, p. 386)

Bolster (1983) further explained that even when teachers are presented with evidence from well-documented research, they do not easily discard their practices

they have created and refined over time. Despite the suggested modifications for the KIA activities, the participating teachers were unquestionably pleased with the KIA method of instruction.

Positive Student Outcomes

Most of the teachers had explained that they enjoyed seeing their students physically active, learning, and gaining an appreciation for HBK during the KIA fitness segments. All participating teachers during mid and post interviews explained noticeable change in students' knowledge. Further, physical education teachers were positive with the level of physical activity students were engaged in during KIA activities. According to the GMTC (Guskey, 2002), significant change in teachers' attitudes and beliefs occurs mainly after they gain evidence of improvements in student learning. This study held true to GMTC with teachers indicating they intended (if not already) on using of KIA fitness segments in the future because of the success it had in engaging students in high amounts of physical activity as well as teach HBK. Similar to past studies (Doyle, 1977; Templin, 1979), students were found to be an influential factor on the teachers' instructional practices. With the increase in HBK instruction, this may positively affect children's perceptions towards activity resulting in more activity at a young age. This could halt the increase of sedentary behaviors and physical inactivity as both girls and boys grow older (Corbin et al., 2004; Morrow et al., 2010).

A few limitations included that findings from this study were associated with teachers' perceptions, which may limit the results to represent views rather than

outcomes. Surprisingly all teacher participants thought teaching HBK was important to teach. However, this produced little change across the program regarding the value expressed by the teachers regarding teaching HBK. Since the research team completed the final interview two months after the implementation study, only short-term effects were documented.

Conclusions

It is more important than ever before for schools to provide quality physical education programs. With minimal contact time in physical education, physical education teachers are challenged to make difficult decisions about the content of most worth. With the role HBK has in helping students adopt healthy lifestyles, both students and teachers should be held accountable for student learning of HBK. Although, it is unjust to expect teachers to provide quality instruction of HBK when they have never been formally educated on efficient pedagogical strategies. According to the participating teachers in this study, the KIA fitness segments were found to be one successful strategy. It is hoped that this study will inform curriculum developers and researchers to develop more strategies to teach HBK without sacrificing physical activity in classes. Future studies should examine student perceptions of the KIA fitness segments as well as longitudinal effects of this type of intervention study.

Chapter 5

DISCUSSION/CONCLUSION

The KIA fitness segments were shown to be a successful strategy in teaching HBK to 5th grade students during physical education classes. The KIA fitness segments were able to teach HBK to students in a four-station student-centered lesson design, and maintain high levels of levels of student physical activity. This was confirmed when the intervention physical education teachers' perceptions were positive toward the KIA fitness segments as a method of teaching HBK effectively. As physical education teachers continue to struggle to find ways to 'fit everything in,' this strategy poses as one option to get HBK included in their lessons. The results from this study are groundbreaking as it informs physical education teachers, curriculum developers, physical education teacher education professors, and researchers in physical education a method to increase HBK during physical education classes. While knowledge by itself is not enough to change behaviors (Ennis, 2007; Placek, et al., 2001), improving HBK could be the first step in the establishment of healthy physical activity behaviors.

Further research should be conducted. After modifications to the KIA activities are completed, further examination of these lesson segments in a new environment and different subpopulation of 5th grade students would be appropriate. Longitudinal studies are another area of scrutiny. Looking to see if students are grasping the concepts and retaining the knowledge after a period of time (e.g., 3-6 months). Examination of the PE Metrics assessment tool is another

area this study that the researchers may explore. Specifically looking at individual items on the assessment tool using factor analysis and determine if all items are appropriate and necessary. Additional examination of the lesson segment duration and the time teachers spent in each component should be analyzed. This could be accomplished using SOFIT while the implementation is occurring in a different environment.

Subsequent research studies should also examine the use of fitness segments in isolation of teacher instruction (e.g., transition checking for understanding, and closure). This should offer insight on if the KIA fitness segments activities and if the signage and activities alone will be capable of student learning to occur without a strong teacher contribution.

Lastly, researchers could further examine specific items students were not scoring highly and compare results to teacher fidelity of the KIA fitness segments. This would offer insight on the quality of the KIA fitness segments and if additional activities should be added or were the concepts simply not being taught. Thus, this could extend the seven lesson segments to eight or nine depending on how many additional activities would need to be added.

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Table 2

Description of activities in the KIA fitness segments

1. Scavenger Hunt: Following a map, students are to get with a partner and hunt for different activities scattered around the gym. Once at the found activity students perform the task before moving on. Find all activities to answer the final riddle.

2. Body Composition Avengers: Students are divided and positioned at opposing hula-hoops spaced approximately 20ft apart. The hoops contain 6 yellow (fat) and 6 red bean bags (muscle). Students run and grab 1 red bean bag at a time and bring it back to their hoop. Students' can also grab a fat bean bag from their hoop and run and place it in the other teams hoop. Get more red bags and win.

3. Take your Heart Rate: Students immediately choose either a moderate (i.e., walking, playing catch) or vigorous (i.e., jump roping, or agility run) activity that is positioned at the station. Students are to engage in their chosen activity for half the duration of the station then check their heart rate then switch to the other activity.

4. Benefit Surprise: Students will grab one benefit card from several that are scattered face down inside a hula-hoop. Each card has a benefit and an activity to perform. Once the student reads the benefit card he or she is to put the card back face down and perform the activity. Once completed the student will go and grab another activity and continue this process as many times as they can.

5. Roll the Dice: Students quickly begin by rolling the big foam dice. If the dice lands as an odd number, the roller decides from either an aerobic or muscular endurance exercise. If the dice lands on an even number, the roller chooses a weight bearing or flexibility exercise.

6. Bearing the Weight: Students are to read the sign (tasksheet) and perform the task listed. All activities listed on the sign are weight bearing type activities (i.e., sit-ups, performing a softball pitch, wall jumps). Information regarding weight-bearing activity can be found on throughout the sign.

7. Quiz your Partner: Students are to partner up and walk while reading and quizzing each other from the given question on the cards.

Table 3.

Descriptive statistics ($\bar{X} \pm SD$) for HBK scores across gender and treatment.

Variable	Intervention				Control				P-value
	n	Pretest	Posttest	Δ	n	Pretest	Posttest	Δ	
Boys (n = 324)	166	15.57 (3.78)	18.99 (3.84)	3.4	158	12.94 (3.97)	13.74 (3.94)	0.8	<0.001
Girls (n = 309)	165	15.33 (4.13)	18.16 (4.18)	2.8	144	13.69 (3.37)	14.17 (3.59)	0.5	<0.001
Total (n = 633)	331	15.45 (3.96)	18.58 (4.03)	3.1	302	13.30 (3.71)	13.94 (3.77)	0.6	<0.001

Note: Δ = posttest-pretest.

Table 4

Estimated effects of KIA on changes in HBK in the fifth grade students.

	Model 1		Model 2			
	Estimate	SE	P-value	Estimate	SE	P-value
Fixed-Effect Parameter						
Intercept (γ_{00})	0.9005	0.40	0.042	0.3734	0.48	0.454
Treatment (γ_{01})						
(Int vs. Control)	2.5135	0.57	<0.001	3.4418	0.68	<0.001
Gender (γ_{10})						
(Female vs. Male)	-0.3443	0.35	0.33	-0.048	0.32	0.88
Treatment* Gender	-0.0941	0.49	0.69	-0.5745	0.44	0.19
Baseline HBK				-1.4650	0.12	<0.001
Covariance Parameter						
$\sigma^2_{\text{school}} (\tau_{00})$	0.4732	0.5014	0.3110	0.054		0.9078
		0.028				
$\sigma^2_{\text{Intervention}}$	0.5865	9.4162	0.7388	<0.001		7.4791
		<0.001				
$\sigma^2_{\text{Control}}$	0.6235	9.3161	0.7638	<0.001		7.6038
		<0.001				
$\sigma^2_{\text{Residual}}$	0.4273	9.3684	0.5312	<0.001		7.5388
		<0.001				

APPENDIX A
RESEARCH STUDY DESIGN

12-Sep						
S	M	T	W	T	F	S
						1
2	3	4/2	5/3	6/4	7/5	8
9	10/6	11/1	12/2	13/3	14/4	15
16	17/5	18/6	19/1	20/2	21/3	22
23	24/4 Pre	25/5 Pre	26/6 Pre	27/1 Free	28/2 Free	29
30						

12-Oct						
S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17/3 Les. 1	18/4 Les. 1	19/5 Les. 1	20
21	22/6 Les. 2	23/1 Les. 2	24/2 Les. 2	25/3 Les. 3	26/4 Les. 3	27
28	29/5 Les. 3	30/6 Les. 4	31/1 Les. 4			

12-Nov						
S	M	T	W	T	F	S
				1/2 Les. 4	2/3 Les. 5	3
4	5/4 Les. 5	6/5 Les. 5	7/6 Les. 6	8/1 Les. 6	9/2 Les. 6	10
11	12	13/3 Les. 7	14/4 Les. 7	15/5 Les. 7	16/6 FREE	17
18	19/1 Post	20/2 Post	21/3 Post	22	23	24

APPENDIX B
TEACHER FIDELITY CHECKLIST

Teachers Name: _____ School: _____ Lesson #: _____

(Directions: Please circle one of the answers provided based upon your observation)

- 1. The necessary equipment is out prior to the start of class and there are four easily identifiable stations.**

Yes No Not Applicable

Comments _____

- 2. Students placed the accelerometer immediately on upon entry and immediately off after completion of the healthy behavior knowledge lessons (including closure- if applicable) or after 15 minutes of class time (comparison classes).**

Yes No Not Applicable

Comments _____

- 3. The teacher's instruction/demonstration of all activities lasted no more than 4 minutes.**

Yes No Not Applicable

Comments _____

- 4. The teacher used strategies of checking for understanding (Q&A, visual representation, etc.) at least once during transitions from one station to the other.**

Yes No Not Applicable

Comments _____

- 5. The teacher provided a time for reflection and closure after the completion of the four stations.**

Yes No Not Applicable

Comments _____

- 6. The length of the lesson was approximately 12-15 minutes in length (including closure-if applicable).**

Yes No Not Applicable

Comments _____

7. The appropriate lesson concepts were taught and visited many times during this fitness lesson.

Yes No Not Applicable

Comments _____

APPENDIX C
KIA LESSON PLAN

KIA LESSON PLAN #1- Oct 17th-Oct 19th

NASPE Physical Education Standard(s): 1, 2, 3, 4, 5, 6

Arizona State Physical Education Standard(s): Strand 1 Concept 1: PO1, PO2. Strand 2, Concept 2: PO1, PO3, PO7, PO8. Strand 3 Concept 1: PO1, PO2. Strand 4 Concept 1: PO3. Strand 5 Concept 1: PO1- PO5. Strand 6 Concept 1: PO3

Objective (Explicit): (Benefit Pick Up)- Students will be able to explain the benefits physical activity (aerobic and anaerobic) has on the body.

(Take your HR)- Students will be able to verbally articulate the difference moderate and vigorous physical activities are, and the different effects each have on the heart.

(Body Composition Avengers)- Students will learn through movement the components that make up our body composition and the energy balance (calories in and calories out).

Key vocabulary: Heart Rate, Aerobic, body-composition, calorie, stress, vigorous activity

Equipment and Set-Up:

Station #1 (Bean Bags)= 8-9 bean bags and 1 hula hoop.

Station #2 (Benefit Pickup)= 7 mini signs and 1 hula hoop

Station #3 (Take your HR)= 1 sign, 1 hula hoop with 2-3 soccer balls

Station #4 (Body Composition Avengers) = 1 sign, 3 hula hoops, 10 yellow bean bags, 10 red bean bags

Organization – 4 stations placed in each corner.

Student groupings: Students are divided evenly.

Station Procedures

#1 Bean Bags- Students in this station will have their own bean bag and perform toss and catch activities; Clap and catch, under leg and catch, toss, spin and catch are all accepted.

#2 Benefit Pickup- Students will grab a benefit pickup card; read and set activity card back FACE DOWN then perform the activity. Students are encouraged to try and do as many as they can for the time allotted.

#3 Take Your HR- Students will quickly choose an activity from either a vigorous (soccer dribbling) or moderate (walking) activity to perform in a specified space. They will switch halfway thru the station time to the other activity; however before starting the new activity they need to quickly checking their pulse at their wrist to see how that activity affected their heart.

#4: Body Composition Avengers- Three hula hoops are set up in a triangle at this station. Students quickly divide themselves among the three hoops. Object of the game is to have the most red (muscle) bean bags than yellow (fat) bean bags. You can take ONLY ONE muscle bean bag at a time from another hula hoop or GIVE ONE



fat bean bag to someone elses.

Assessment/Evidence of Mastery (Include a variety of methods of checking for understanding): Between station rotation time (15 seconds); instructor can use Q & A of concepts taught in each station, or use visual representation (thumbs up if engaging in soccer is more vigorous than walking).

Closure/Lesson Extension: Encourage students to be active and strengthen their heart by engaging in 60 minutes of moderate-vigorous activities a day. Recap the concepts taught; such as, components that comprise body composition and how to maintain a good body composition score (calories in and calories out), 1 or 2 benefits to aerobic fitness, and what a vigorous/moderate activity is.

KIA LESSON PLAN #2- Oct. 22nd – 24th

NASPE Physical Education Standard(s): 1, 2, 3, 4, 5, 6

Arizona State Physical Education Standard(s): Strand 1 Concept 1: PO1, PO2. Strand 2, Concept 2: PO1, PO3, PO7, PO8. Strand 3 Concept 1: PO1, PO2. Strand 4 Concept 1: PO3. Strand 5 Concept 1: PO1- PO5. Strand 6 Concept 1: PO3

Objective (Explicit): (Benefit Pick Up)- Students will be able to explain the benefits physical activity (aerobic and anaerobic) has on the body.
(Take your HR)- Students will be able to verbally articulate the difference moderate and vigorous physical activities are, and the different effects each have on the heart.
(Body Composition Avengers)- Students will learn through movement the components that make up our body composition and the energy balance (calories in and calories out).

(Bearing the Weight)- Students will be able to explain what weight-bearing activities are and the health benefits for engaging in these.

Key vocabulary: Heart Rate, Aerobic, body-composition, calorie, stress, vigorous activity, weight-bearing.

Equipment and Set-Up:

Station #1 (Benefit Pickup)= 7 mini signs and 1 hula hoop

Station #2 (Take your HR)= 1 sign, 1 hula hoop with 2-3 soccer balls

Station #3 (Body Composition Avengers) = 1 sign, 3 hula hoops, 10 yellow bean bags, 10 red bean bags

Station #4 (Bearing the Weight) = 1 Sign, 1 hula hoop

Organization – 4 stations placed in each corner of the gym.

Student groupings: Students are divided evenly throughout.

Station Procedures

#1 Benefit Pickup- Students will grab a benefit pickup card; read and set activity card back FACE DOWN then perform the activity. Students are encouraged to try and do as many as they can for the time allotted.

#2 Take Your HR- Students will quickly choose an activity from either a vigorous (soccer dribbling) or moderate (walking) activity to perform in a specified space. They will switch halfway thru the station time to the other activity; however before starting the new activity they need to quickly checking their pulse at their WRIST to see how that activity affected their heart.

#3: Body Composition Avengers- Three hula hoops are set up in a triangle at this station. Students quickly divide themselves among the three hoops. The object of the game is to have the most red (muscle) bean bags than yellow (fat) bean bags. You can take ONLY ONE muscle bean bag at a time from another hula hoop or GIVE ONE fat bean bag to someone else's.

#4: Bearing the Weight- Students will read and perform the tasks activities as

stated on the sign.

Assessment/Evidence of Mastery (Include a variety of methods of checking for understanding): Between station rotation time (15 seconds); instructor can use Q & A of concepts taught in each station, or use visual representation (thumbs up if engaging in soccer is more vigorous than walking) to verify if students are learning. This also holds them accountable to not only be active in the station but also learn something.

Closure/Lesson Extension: Recap the concepts taught; such as, components that comprise body composition and how to maintain a good body composition score (calories in and calories out), 1 or 2 benefits to aerobic fitness, different types of vigorous activities, and some weight-bearing activities (softball, running, etc.)

KIA LESSON PLAN #3 Oct. 25th-Oct 27th

NASPE Physical Education Standard(s): 1, 2, 3, 4, 5, 6

Arizona State Physical Education Standard(s): Strand 1 Concept 1: PO1, PO2. Strand 2, Concept 2: PO1, PO3, PO7, PO8. Strand 3 Concept 1: PO1, PO2. Strand 4 Concept 1: PO3. Strand 5 Concept 1: PO1- PO5. Strand 6 Concept 1: PO3

Objective (Explicit): (Take your HR)- Students will be able to verbally articulate the difference moderate and vigorous physical activities are, and the different effects each have on the heart.

(Body Composition Avengers)- Students will learn through movement the components that make up our body composition and the energy balance (calories in and calories out).

(Bearing the Weight)- Students will be able to explain what weight-bearing activities are and the health benefits for engaging in these.

(Scavenger Hunt)- Students will be able to demonstrate an understanding of healthy behavior knowledge through answering questions in the format of a game.

Key vocabulary: Heart Rate, body-composition, calories, stress, vigorous activity, weight-bearing. **Overload, muscle endurance.**

Equipment and Set-Up:

Station #1 (Take your HR)= 1 sign, 1 hula hoop with 2-3 soccer balls

Station #2 (Body Composition Avengers) = 1 sign, 3 hula hoops, 10 yellow bean bags, 10 red bean bags

Station #3 (Bearing the Weight) = 1 Sign, 1 hula hoop

Station #4 (Scavenger Hunt) = 1 cone, 1 hula hoop, signs

Organization – 4 stations placed in each corner of the gym.

Student groupings: Students are divided evenly throughout.

Station Procedures

#1 Take Your HR- Students will quickly choose an activity from either a vigorous (soccer dribbling) or moderate (walking) activity to perform in a specified space. They will switch halfway thru the station time to the other activity; however before starting the new activity they need to quickly checking their pulse at their WRIST to see how that activity affected their heart.

#2: Body Composition Avengers- Three hula hoops are set up in a triangle at this station. Students quickly divide themselves among the three hoops. The object of the game is to have the most red (muscle) bean bags than yellow (fat) bean bags. You can take ONLY ONE muscle bean bag at a time from another hula hoop or GIVE ONE fat bean bag to someone else's.

#3: Bearing the Weight- Students will read and perform the tasks activities as stated on the sign.

#4: Scavenger Hunt- Students will break into three hunting teams. Grab one of the

three (A, B, or C) maps, read the questions, and search for the answers. Once the answer is found, they will perform the activity stated and collect the letter from each answer to complete the riddle.

Assessment/Evidence of Mastery (Include a variety of methods of checking for understanding): Between station rotation time (15 seconds); instructor can use Q & A of concepts taught in each station, or use visual representation (thumbs up if engaging in soccer is more vigorous than walking) to verify if students are learning. This also holds them accountable to not only be active in the station but also learn something.

Closure/Lesson Extension: Recap the concepts taught; 1 or 2 benefits to aerobic fitness, and different types of vigorous activities, weight-bearing activities (softball, running, etc.) and benefits (increase bone strength), need to overload your muscles in order to build them (partner resistance, strength training).

KIA LESSON PLAN #4 Oct. 30th-Nov. 1st

NASPE Physical Education Standard(s): 1, 2, 3, 4, 5, 6

Arizona State Physical Education Standard(s): Strand 1 Concept 1: PO1, PO2. Strand 2, Concept 2: PO1, PO3, PO7, PO8. Strand 3 Concept 1: PO1, PO2. Strand 4 Concept 1: PO3. Strand 5 Concept 1: PO1- PO5. Strand 6 Concept 1: PO3

Objective (Explicit): (Body Composition Avengers)- Students will learn through movement the components that make up our body composition and the energy balance (calories in and calories out).

(Bearing the Weight)- Students will be able to explain what weight-bearing activities are and the health benefits for engaging in these.

(Scavenger Hunt)- Students will be able to demonstrate an understanding of healthy behavior knowledge through answering questions in the format of a game.

(Roll the Dice)- Students will be able to identify activities for each health related fitness component.

Key vocabulary: body-composition, calories, stress, vigorous activity, weight-bearing, overload, muscle endurance, aerobic, muscular strength, muscular endurance, flexibility

Equipment and Set-Up:

Station #1 (Body Composition Avengers) = 1 sign, 3 hula hoops, 10 yellow bean bags, 10 red bean bags

Station #2 (Bearing the Weight) = 1 Sign, 1 hula hoop

Station #3 (Scavenger Hunt) = 1 cone, 1 hula hoop, signs

Station #4 (Roll the Dice)= 1 cone, 1 set of foam dice, and roll the dice sign.

Organization – 4 stations placed in each corner of the gym.

Student groupings: Students are divided evenly throughout.

Station Procedures

#1: Body Composition Avengers- Three hula hoops are set up in a triangle The object of the game is to have the most red (muscle) bean bags than yellow (fat) bean bags. You can take ONLY ONE bean bag at a time.

#2: Bearing the Weight- Students will read and perform the tasks activities as stated on the sign.

#3: Scavenger Hunt- Students will break into three hunting teams. Grab one of the three (A, B, or C) maps, read the questions, and search for the answers. Perform the activity found.

#4: Roll the Dice- Students will immediately roll the dice as a group. If the dice lands on an odd number then students will choose from either Muscular endurance or Aerobic exercises, and perform the number rolled. If the dice lands on an even number then students will quickly choose from either muscular strength or

flexibility exercises and perform the amount of number rolled.

Assessment/Evidence of Mastery (Include a variety of methods of checking for understanding): Between station rotation time (15 seconds); instructor can use Q & A of concepts taught in each station, or use visual representation (thumbs up if engaging in soccer is more vigorous than walking) to verify if students are learning.

Closure/Lesson Extension: Recap the concepts taught; such as, components that comprise body composition and how to maintain a good body composition score (calories in and calories out), weight-bearing activities (softball, running, etc.) and benefits (increase bone strength), need to overload your muscles in order to build them (partner resistance, strength training). Recap the new station and an activity that is aerobic or muscular strength, etc.

KIA LESSON PLAN #5 – Nov 2nd – 6th

NASPE Physical Education Standard(s): 1, 2, 3, 4, 5, 6

Arizona State Physical Education Standard(s): Strand 1 Concept 1: PO1, PO2. Strand 2, Concept 2: PO1, PO3, PO7, PO8. Strand 3 Concept 1: PO1, PO2. Strand 4 Concept 1: PO3. Strand 5 Concept 1: PO1- PO5. Strand 6 Concept 1: PO3

Objective (Explicit): (Bearing the Weight)- Students will be able to explain what weight-bearing activities are and the health benefits for engaging in these. (Scavenger Hunt)- Students will be able to demonstrate an understanding of healthy behavior knowledge through answering questions in the format of a game. (Roll the Dice)- Students will be able to identify activities for each health related fitness component.

(Quiz your Partner)- Students will be able to work together answering questions on healthy behavior knowledge.

Key vocabulary: weight-bearing, overload, muscle endurance, muscular strength, flexibility, aerobic

Equipment and Set-Up:

Station #1 (Bearing the Weight) = 1 Sign, 1 hula hoop

Station #2 (Scavenger Hunt) = 1 cone, 1 hula hoop, signs

Station #3 (Roll the Dice)= 1 cone, 1 set of foam dice, and roll the dice sign.

Station #4 (Quiz your Partner)= 1 cone, QYP signs

Organization – 4 stations placed in each corner of the gym.

Student groupings: Students are divided evenly throughout.

Station Procedures

#1: Bearing the Weight- Students will read and perform the tasks activities as stated on the sign.

#2: Scavenger Hunt- Students will break into three hunting teams. Grab one of the three (A, B, or C) maps, read the questions, and search for the answers. Once the answer is found, they will perform the activity stated and collect the letter from each answer to complete the riddle.

#3: Roll the Dice- Students will immediately roll the dice as a group. If the dice lands on an odd number then students will choose from either Muscular endurance or Aerobic exercises, and perform the number rolled. If the dice lands on an even number then students will quickly choose from either muscular strength or flexibility exercises and perform the amount of number rolled.

#4: Quiz your Partner- Students will immediately pair up and grab 1 sign each. They must be different colors (orange and yellow for one group). They are expected to ask each other questions while walking. You can incorporate more activity such as jumping jacks for getting the answer correct.

Assessment/Evidence of Mastery (Include a variety of methods of checking for understanding): Between station rotation time (15 seconds); instructor can use Q & A of concepts taught in each station, or use visual representation (hands up if you can build muscle through aerobic activity. Okay, hands up if you can build muscle through overloading) to verify if students are learning. This also holds them accountable to not only be active in the station but also learn something while in the station.

Closure/Lesson Extension: Recap the concepts taught; weight-bearing activities (softball, running, etc.) and benefits (increase bone strength). Need to overload your muscles in order to build them (partner resistance, strength training). Recap of some questions from the new station.

KIA LESSON PLAN #6 – Nov. 7th – 9th

NASPE Physical Education Standard(s): 1, 2, 3, 4, 5, 6

Arizona State Physical Education Standard(s): Strand 1 Concept 1: PO1, PO2. Strand 2, Concept 2: PO1, PO3, PO7, PO8. Strand 3 Concept 1: PO1, PO2. Strand 4 Concept 1: PO3. Strand 5 Concept 1: PO1- PO5. Strand 6 Concept 1: PO3

Objective (Explicit): (Scavenger Hunt)- Students will be able to demonstrate an understanding of healthy behavior knowledge through answering questions in the format of a game.

(Roll the Dice)- Students will be able to identify activities for each health related fitness component.

(Quiz your Partner)- Students will be able to work together answering questions on healthy behavior knowledge.

(Take your Heart Rate)- Students will feel the effects moderate and vigorous activities have on the body.

Key vocabulary: weight-bearing, overload, muscle endurance, muscular strength, flexibility, aerobic, vigorous, moderate.

Equipment and Set-Up:

Station #1 (Scavenger Hunt) = 1 cone, 1 hula hoop, signs

Station #2 (Roll the Dice)= 1 cone, 1 set of foam dice, and roll the dice sign.

Station #3 (Quiz your Partner)= 1 cone, QYP signs

Station #4 (Take your Heart Rate) = 1 cone, 6 jump ropes, 3 footballs

Organization – 4 stations placed in each corner of the gym.

Student groupings: Students are divided evenly throughout.

Station Procedures

#1 Scavenger Hunt- Students will break into three hunting teams. Grab one of the three (A, B, or C) maps, read the questions, and search for the answers. Once the answer is found, they will perform the activity stated and collect the letter from each answer to complete the riddle.

#2: Roll the Dice- Students will immediately roll the dice as a group. If the dice lands on an odd number then students will choose from either Muscular endurance or Aerobic exercises, and perform the number rolled. If the dice lands on an even number then students will quickly choose from either muscular strength or flexibility exercises and perform the amount of number rolled.

#3: Quiz your Partner- Students will immediately pair up and grab 1 sign each. They must be different colors (orange and yellow for one group). They are expected to ask each other questions while walking. You can incorporate more activity such as jumping jacks for getting the answer correct.

#4: Take your Heart Rate- Students will immediately find a jump rope or a partner

to throw the football with. Engage in that activity chosen then switch half way through. The jump roping should indicate more vigorous activity and been felt by students checking their pulse at their wrist.

Assessment/Evidence of Mastery (Include a variety of methods of checking for understanding): Between station rotation time (15 seconds); instructor can use Q & A of concepts taught in each station, or use visual representation (hands up if you can build muscle through aerobic activity. Okay, hands up if you can build muscle through overloading) to verify if students are learning.

Closure/Lesson Extension: Recap the concepts taught; Need to overload your muscles in order to build them (partner resistance, strength training). Vigorous activities effects the heart more.

KIA LESSON PLAN #7 – Nov. 13th – 15th

NASPE Physical Education Standard(s): 1, 2, 3, 4, 5, 6

Arizona State Physical Education Standard(s): Strand 1 Concept 1: PO1, PO2. Strand 2, Concept 2: PO1, PO3, PO7, PO8. Strand 3 Concept 1: PO1, PO2. Strand 4 Concept 1: PO3. Strand 5 Concept 1: PO1- PO5. Strand 6 Concept 1: PO3

Objective (Explicit): (Roll the Dice)- Students will be able to identify activities for each health related fitness component.

(Quiz your Partner)- Students will be able to work together answering questions on healthy behavior knowledge.

(Take your Heart Rate)- Students will feel the effects moderate and vigorous activities have on the body.

(Benefit Pick Up)- Students will be able to explain the benefits physical activity (aerobic and anaerobic) has on the body.

Key vocabulary: weight-bearing, overload, muscle endurance, muscular strength, flexibility, aerobic, vigorous, moderate.

Equipment and Set-Up:

Station #1 (Roll the Dice)= 1 cone, 1 set of foam dice, and roll the dice sign.

Station #2 (Quiz your Partner)= 1 cone, QYP signs

Station #3 (Take your Heart Rate) = 1 cone, 6 jump ropes, 3 footballs

Station #4 (Benefit Pick Up) = 7 mini signs and 1 hula hoop

Organization – 4 stations placed in each corner of the gym.

Student groupings: Students are divided evenly throughout.

Station Procedures

#1: Roll the Dice- Students will immediately roll the dice as a group. If the dice lands on an odd number then students will choose from either Muscular endurance or Aerobic exercises, and perform the number rolled. If the dice lands on an even number then students will quickly choose from either muscular strength or flexibility exercises and perform the amount of number rolled.

#2: Quiz your Partner- Students will immediately pair up and grab 1 sign each. They must be different colors (orange and yellow for one group). They are expected to ask each other questions while walking.

#3: Take your Heart Rate- Students will immediately find a jump rope or a partner to throw the football with. Engage in that activity chosen then switch half way through. The jump roping should indicate more vigorous activity and been felt by students checking their pulse at their wrist.

#4: Benefit Pickup- Students will grab a benefit pickup card; read and set activity card back FACE DOWN then perform the activity. Students are encouraged to try and do as many as they can for the time allotted.

Assessment/Evidence of Mastery (Include a variety of methods of checking for understanding): Between station rotation time (15 seconds); instructor can use Q & A of concepts taught in each station, or use visual representation (hands up if you can build muscle through aerobic activity. Okay, hands up if you can build muscle through overloading) to verify if students are learning.

Closure/Lesson Extension: Recap the concepts taught; Need to overload your muscles in order to build them (partner resistance, strength training). Vigorous activities effects the heart more, aerobic activities strengthens your heart, and reduces stress.

APPENDIX D
POST TEST INTERVEIW GUIDE

POST Interview

-How have you used the fitness knowledge stations since the project ended?

How do you plan to use these stations in the future?

-What did you learn about your students' fitness/wellness knowledge from this project? What surprised you? How has this changed your curricular priorities?

-What is the curricular model used in the school district?

-Would there be any opportunities to incorporate this type of fitness lessons into your already existing curriculum?

-How do you make decisions about content to teach? (textbook)

VOI Activity-Here are outcomes for PE, please place them in order from your top priority to your least priority.

1. Personal/Social development
2. Self-development
3. Motor skill
4. Fitness
5. Ecological (all equally important outcomes)
6. Fitness/Wellness Knowledge

Why did you put fitness/wellness knowledge as X? Why is X your top priority?

PAST RESULTS

What did your students learn from the healthy behavior stations?

Based on my preliminary results your students scored XXXX on the pre test and XXXX on the posttest out of a possible score of 28. What are your immediate thoughts when hearing this?

-If we were to repeat this project, (say at my next university) what would you do differently to aid students in scoring better on the exam?

-What would be needed in order for the majority of students to score a 90% or better?

SHOW TOP 3 questions their students got wrong on the exam.

-Here are some specific questions they got wrong are (give 3 different questions that the majority (80% of students got wrong).

-How could we help them increase knowledge in these areas? Activities? Thoughts?

PE Metrics-

-I'm going to switch gears a little bit, and ask you a few questions about the assessment tool; PE Metrics.

Do you currently have access to the PE Metrics book?

-What sort of concepts and questions were asked on the exam?

-How familiar were you with the items on the exam while the project was taken place?

-How have you used the PE Metrics since the completion of the study?

What was your experience like? Any issues?

-What other suggestions do you have for me in efforts for increasing students' healthy behavior knowledge?

APPENDIX E

PE METRICS ASSESSMENT TOOL

Performance Descriptor: Chooses to be physically active outside of school

1. The best choice for a vigorous physical activity after school is:

- A. Shooting baskets.
- B. Throwing and catching with a friend.
- C. Riding a bike.
- D. Going for a long walk.

2. Jane wants to do something after school to help her be good on the soccer team. She should:

- A. Ride her bike for 30 minutes.
- B. Play a soccer video game for 30 minutes without stopping.
- C. Practice dribbling a soccer ball at a fast pace around the yard for 30 minutes.
- D. Play on the trampoline for 30 minutes.

Performance Descriptor: Describes personal responses to physical activity

3. When you exercise vigorously:

- A. You start to breathe more slowly.
- B. Your heart keeps a slow, steady rhythm.
- C. It is more difficult to find your pulse.
- D. You increase your pulse.

Performance Descriptor: Describes characteristics of health-enhancing physical activity

4. Bill likes to run, which is called a/an _____ activity:

- A. Flexibility.
- B. Aerobic.
- C. Competitive.
- D. Sport.

5. Which of the following is the most vigorous activity?

- A. Playing kickball.
- B. Running.
- C. Riding a bike.
- D. Playing softball.

6. Soccer and swimming both require a lot of:

- A. Flexibility.
- B. Muscle strength.
- C. Teamwork.
- D. Aerobic endurance.

7. If Jane can pass a flexibility test, she is more likely to:

A. Participate in a long-distance race.

B. Lift a heavy weight.

C. Do well in gymnastics.

D. Lift light weights many times.

8. What will best improve your aerobic fitness?

A. Kickball.

B. Dodgeball.

C. Golf.

D. Soccer.

9. Which of the following is a moderate physical activity?

A. Running.

B. Walking briskly.

C. Inline skating.

D. Playing soccer.

10. Which of the following is a weight-bearing activity?

A. Riding your bicycle.

B. Walking.

C. Doing curl-ups.

D. Swimming.

11. Softball is a good:

A. Flexibility-improving activity.

B. Vigorous activity.

C. Weight-bearing activity.

D. Aerobic activity.

Performance Descriptor: Achieves criterion-referenced standards

12. When you measure the distance that you can stretch. You are testing:

A. Muscle strength.

B. Flexibility.

C. Muscle endurance.

D. Strength in your arms.

13. A good score on a health-related fitness test tells you that:

A. You can perform skills at a high level.

B. You are not sick.

C. You have a healthy level of fitness.

D. You are an athlete.

Performance Descriptor: Identifies personal health-related weaknesses/strengths

14. If you are fit, you:

- A. Are good at many skills,
- B. Are good at running but are not flexible,
- C. Have more choices to be physically active.
- D. Are bigger than everyone else your age.

15. Fitness tests are good because they:

- A. Identify areas of fitness that need improvement.
- B. Identify the fit person in the class.
- C. Tell you what activity that you need to join.
- D. Give you a lot of activity when you take them.

16. Your heart beat creates your pulse, which is best checked at your:

- A. Wrist.
- B. Ankle.
- C. Chest.
- D. Thumb.

Performance Descriptor: Describes how to improve personal fitness

17. If you score low on an aerobic endurance test, you should:

- A. Increase the number of push-ups you do.
- B. Increase the amount of time resting.
- C. Participate more in strength-building activities.
- D. Increase the amount of vigorous activity you get.

18. To keep a good body-composition score:

- A. Do stretching exercises every day.
- B. Sleep 8 to 10 hours each day.
- C. Eat and burn the same number of calories every day.
- D. Do push-ups and sit-ups each week.

19. If Juan wants to become more flexible, he should:

- A. Decrease the amount of stretching he does.
- B. Exercise a muscle until it starts to feel tired.
- C. Increase the amount of stretching he does.
- D. Work through the pain stage of an exercise.

20. Which of the following will benefit your heart the most?

- A. Stretching your chest after exercise.
- B. Drinking lots of water.
- C. Eating lots of fruits and vegetables.
- D. Daily physical activity.

Performance Descriptor: Identifies the principles (guidelines) associated with improving physical fitness.

21. To lift a weight many times, you need:

- A. Muscle endurance.
- B. Aerobic endurance.
- C. Muscle strength.
- D. Cardiovascular endurance.

22. In the fitness test, running a mile is used to determine:

- A. How fast you are.
- B. The fitness of your heart.
- C. The coordination of your legs and arms.
- D. How much effort you can demonstrate.

23. The amount of muscle, bone and fat you have in your body determines your:

- A. Aerobic endurance.
- B. Muscle endurance.
- C. Flexibility.
- D. Body composition.

24. If Sara passes all five components of a health-related fitness test, she should:

- A. Keep the same goals and continue what she is doing.
- B. Set new goals and continue what she is doing.
- C. Set new goals to maintain or improve her fitness level.
- D. Keep the same goals and increase what she is doing.

25. When you want to become stronger, you should:

- A. Overload your muscles.
- B. Make sure that your exercise is aerobic.
- C. Flex your muscles as you watch TV.
- D. Avoid stretching the muscle.

Performance Descriptor: Identifies specific benefits associated with each component of health-related physical fitness.

26. People who are physically fit:

- A. Are older than others in the class.
- B. Feel better.

- C. Are underweight.
- D. Spend all their time playing.

27. When your muscles get stronger:

- A. You can stretch further.
- B. You get hungry more often.
- C. You will lose weight.
- D. You can throw farther.

28. You should participate in weight-bearing activities because they help:

- A. Strengthen your bones.
- B. Improve your flexibility.
- C. Improve your appetite.
- D. Control how much you weigh.

APPENDIX F
IRB APPROVAL

To: Pamela Kulinna
ASU at the

From: Carol Johnston, Chair *CJ*
Biosci IRB

Date: 09/10/2012

Committee Action: Expedited Approval

Approval Date: 09/10/2012

Review Type: Expedited F7

IRB Protocol #: 1207008017

Study Title: Knowledge in Action: Effectively Teaching Health-Related Content in Physical Education Classes

Expiration Date: 09/09/2013

The above-referenced protocol was approved following expedited review by the Institutional Review Board.

It is the Principal Investigator's responsibility to obtain review and continued approval before the expiration date. You may not continue any research activity beyond the expiration date without approval by the Institutional Review Board.

Adverse Reactions: If any untoward incidents or severe reactions should develop as a result of this study, you are required to notify the Biosci IRB immediately. If necessary a member of the IRB will be assigned to look into the matter. If the problem is serious, approval may be withdrawn pending IRB review.

Amendments: If you wish to change any aspect of this study, such as the procedures, the consent forms, or the investigators, please communicate your requested changes to the Biosci IRB. The new procedure is not to be initiated until the IRB approval has been given.

Please retain a copy of this letter with your approved protocol.