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PHYSICAL EDUCATORS' KNOWLEDGE OF
EXERCISE-INDUCED ASTHMA

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PHYSICAL EDUCATORS' KNOWLEDGE OF EXERCISE-INDUCED ASTHMA

By

Laura Kay Kennett

A THESIS

Submitted to
Michigan State University
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AN ABSTRACT OF A THESIS

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Professor Jeanne Foley

ABSTRACT

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Laura Kay Kennett

Exercise-induced asthma (EIA) is a topic of concern among school administrators, educators, and staff. Prevalence rates of EIA as high as 31% have been reported among particular populations (Larsson et al., 1993). Such a high prevalence of EIA presents a challenge for school personnel, who oftentimes are called upon to assist with the management of the disease. The purpose of this research sought to examine the current level of knowledge of exercise-induced asthma among physical educators. In addition, the study examined whether or not physical educators are interested in improving their level of knowledge of EIA and related issues. This research design utilized a questionnaire, which was chosen because it was the best means to gather data on physical educators on a large scale. The participants of the study were all physical education teachers from two Intermediate school districts. Several t-tests were conducted to see if significant differences existed among sub-groups of participants. There was a significant difference found in mean knowledge scores among those who have had training on asthma or EIA and those who have not had training on asthma or EIA. The knowledge gained from this study may serve as the foundation for future hypothesis testing and the improvement in future teacher education programs.

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Chapter 1

Introduction

Exercise-induced asthma (EIA) is a topic of concern among school administrators, educators, and staff. They are often called upon to help students manage their disease. Physical educators in particular must interact with students who have EIA, often times assisting them with administering their medication. They must also make decisions on whether the student can participate in physical activity while in school. A sound understanding and knowledge of EIA is necessary to make appropriate decisions that affect the health and welfare of students who have EIA.

Asthma accounts for an annual loss of 10 million school days per year in the United States and more hospitalizations than any other childhood disease. Children with asthma spend an estimated 7.3 million days per year restricted to bed due to complications from asthma and EIA. EIA is a disease that affects 12% to 15% of the United States population (Wilkerson, 1998), and there is currently a lack of data among U.S. schoolchildren.

Although the exact prevalence among students between grades one and twelve is unknown, it has been suggested that the rate could be as high as 29% (Rupp, Guill, & Brudno, 1992). These reports establish that a considerable number of youth suffer from EIA. Although the prevalence rates vary, and data on U.S. youth are scarce, there is still cause for concern. With so many school-aged children having EIA, the situation calls for enhanced understanding of the disease in order to help students manage their disease and live a healthy life.

EIA has been shown to limit the activity of school-aged youth. This has serious implications for the individual's overall wellness. Lack of physical activity has been shown to be deleterious to one's health and increases the risk of obesity, heart disease, stroke, diabetes, and several other chronic diseases (U.S. Department of Health and Human Services, 1996).

There has not been a study conducted in the U.S. that examines educators' knowledge of EIA specifically. Rather, many of the studies that look at general asthma knowledge dedicate only a portion of their data collection to EIA and related topics. Therefore, it is anticipated that the information gathered from this research will serve as a basis for future research and hypothesis testing.

A cross-sectional survey was distributed to gather a snapshot of the current level of knowledge among the physical educators within the sample chosen. The purpose of this study was to investigate the current level of knowledge physical educators have of EIA and determine whether or not physical educators are interested in improving their level of knowledge of EIA.

Hypothesis Testing

There were two hypotheses tested, and three research questions that were investigated. Those hypotheses and questions were as follows: (a) Those participants who are asthmatic (and those who have asthmatic children) will score significantly higher than those who are not asthmatic (and do not have children with asthma); (b) Those participants who have had training on asthma and/or exercise-induced asthma will score significantly higher than those who did not receive training on asthma and/or exercise-induced asthma; (c) Is there a significant difference between the mean knowledge scores

of those who have taught health education in addition to physical education and those who have not taught health in addition to physical education; (d) Is there a significant difference between the mean knowledge scores of those who supervise children when using their inhalers and those who do not supervise children when using their inhalers; and (e) Is there a significant difference between the mean knowledge scores of those who have obtained more formal education (completed a master's degree, beyond a master's degree, or doctoral work) and those who have obtained less formal education (completed a bachelor's degree, some master's work).

Chapter 2

Literature Review

The review of literature on the topic of exercise-induced asthma with respect to physical educators yielded very little information. To date, there has not been a study that has systematically researched this topic. Therefore, this literature review seeks to examine explanations of what exercise-induced asthma is, the prevalence of the disease, and other research that has been conducted on similar topics in order to serve as a foundation for the current study.

Exercise-Induced Asthma

Definitions and Criteria

The literature presents several different definitions of exercise-induced asthma (EIA) and which criteria should be used to determine whether or not someone has the disease. EIA is defined by McFadden and Gilbert (1994) as a condition in which vigorous physical activity triggers acute airway narrowing in people with heightened airway reactivity. Gibson, Henry, Vimpani, and Halliday (1995) define EIA as having been diagnosed by a physician, as well as having had an asthma attack in the last 12 months. The definition that offers the most clarity, and is the most widely accepted in the literature, is presented by Wilkerson (1998). This author states that EIA is a clinical syndrome characterized by transient airflow obstruction, typically 5 to 15 minutes after physical activity. This increased airway resistance produces a 15% decrease in the 1 second, forced expiratory volume or peak expiratory flow rate.

To determine if an individual has EIA, forced expiratory volume and peak expiratory flow rate are both measured after exercise. The most widely used and

accepted exercise test conducted prior to these measures being taken is the free running test. This test consists of running for six to eight minutes under standardized conditions at a workload equal to 60 to 80% of the subject's predicted maximum aerobic power (Tsanakas, Banniser, Boon, & Milner, 1986).

To better familiarize the reader with the technical measurement terms, a brief overview shall be presented. Forced expiratory volume (FEV) measures the amount of gas, in liters, that is expired during a given time interval. This measurement is most commonly expressed in the amount expired in one second (FEV_1), and is typically measured during a forced vital capacity test. Decreased FEV values are common for obstructive airway diseases, such as with asthma. Overall, FEV values provide an indication of expiratory power and overall resistance to air movement in the lungs (McArdle, Katch, & Katch, 1996). Normal values are based upon population studies and vary according based upon the individual's age, gender, body height, and race.

Forced vital capacity (FVC) is the maximum volume of air, in liters, exhaled as rapidly, forcefully, and completely as possible from the point of maximum inhalation. This measurement is used in conjunction with FEV values to determine whether someone has EIA. A healthy person can expire approximately 85% of his or her FVC in one second. The criteria for exercise-induced asthma is a drop in FEV_1 of 15% or more from pre-exercise levels.

Peak expiratory flow rate (PEFR) is another method of measuring airway obstruction. This measurement can also be obtained during a FVC breathing maneuver and is expressed in liters per second (Monash University, 2000). PEFR can also be measured using small inexpensive devices called peak flow monitors. These appliances accepted

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are used to follow gross changes in airway function on an outpatient basis. Their primary application is used to follow asthmatics who are susceptible to changes in airway function. Normal values for healthy young people typically exceed 10 liters per second. However, these values can vary with age, sex, gender, and body height. Both FEV_1 and PEFR are the most common measurements physicians use to supplement the history and physical exam when diagnosing exercised-induced asthma.

Volcheck (2000) stresses the fact that complete history and physical examination should accompany the aforementioned diagnostic tests. Volcheck emphasizes the fact that oftentimes the aforementioned diagnostic tests are not available in a family physician's office, and therefore enhances the need for an accurate history and exam. EIA is characterized by cough, wheeze, dyspnea, and/or chest tightness during or after exercise (Volcheck, 2000). However, the author notes that atypical symptoms can occur, such as fatigue, chest pain, and headache. EIA can occur in individuals who are otherwise healthy. Typically, symptoms of EIA begin
5 minutes or more after a strenuous exercise has been performed (Volcheck, 2000).

Causes of Exercise-Induced Asthma

The terms "exercise-induced asthma" and "exercise-induced bronchospasm" are often times used interchangeably in the literature. Homnick and Marks (1998) state that pathophysiologically, there may or may not be evidence of airway inflammation or increased airway hyperresponsiveness, each of which guide two of the most prominent theories about causes of EIA. (Clarification of technical terms will be presented elsewhere in this review.) Therefore, terms may or may not be clearly defined or

differentiated due to the fact that there is still controversy as to the true pathology of the disease.

Several mechanisms have been hypothesized for the cause of EIA. There will be two theories presented in this literature review. Although there have been several theories proposed, these two theories will be presented here because they both stress the role that the environment and situation plays in the cause and exacerbation of the disease. The first of the two most prominent theories that guide the research of EIA is the water loss theory. This theory, as described by Storms and Joyner (1997), contends that water is lost through the bronchial mucosa by means of the air that is exhaled during the heavy breathing often associated with exercise. This water loss causes changes in the epithelium of the airway, which, lead to bronchospasm. These changes include temperature fluctuation, pH variation, and osmolarity changes. It is believed that any or all of these physiological variations can trigger the onset of EIA.

The second of the two central theories on EIA is the thermal expenditure theory. Storms and Joyner (1997) conjecture that it may be heat transfer from the pulmonary vascular beds into the air, either during or after exercise, that results in the onset of EIA. Rewarming takes place after exercise is complete, and this heat is believed to cause hyperemia and dilation of the blood vessels within the bronchi. It is the hyperemia which ultimately leads to EIA.

Several different stimuli have been found to exacerbate the frequency and severity of EIA. These stimuli include but are not limited to various respiratory illnesses, excessive physical training, emotional stress, and a variety of pollutants (Wilkerson, 1998). The role of inflammatory mediators in the pathogenesis of EIA is controversial

(McFadden & Gilbert, 1994). There have been conflicting results of various studies that have examined the various compounds in blood and bronchoalveolar-lavage fluids before and after exercise.

Other supplemental theories that seek to explain the cause of EIA have been presented in the literature. It has been reported that the type of exercise, the intensity of the exercise, the environmental conditions while exercising, and the duration of the exercise can all contribute to EIA (Wilkerson, 1998). The reasons for this wide range of factors include differences in the intensity of the exercise, lack of uniformity in the methods used to detect the response, and the failure to standardize the environmental variables that control the magnitude of the obstruction (McFadden & Gilbert, 1994). Therefore, much of the research that is being conducted on the cause of EIA explores the role these variables play in triggering the onset of an asthma attack.

Prevalence of the Disease

Reported prevalence rates of EIA have varied. However, asthma rates in general are readily available from the National Institute on Health, The Centers for Disease Control and Prevention, and the American Lung Association. Figure 1 summarizes recent asthma trends in the United States (American Lung Association, 2001). Each data point reported is an estimate of the true population value and is subject to sampling variability.

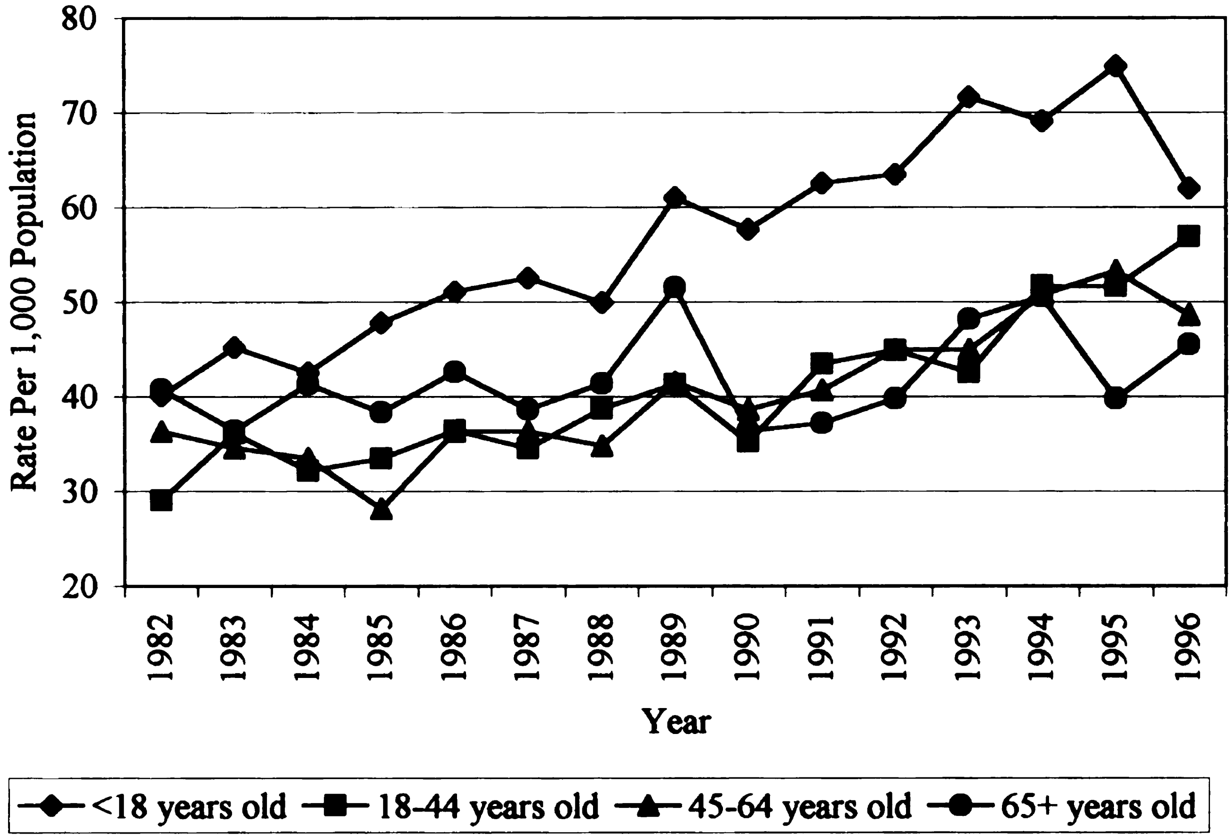

Figure 1. Asthma Trends: 1982-1996

Prevalence rates of EIA as high as 31% have been reported among particular populations (Larsson et al., 1993). This rate was reported based on a study of cross-country athletes belonging to an elite club and exemplifies the fact that most of the research conducted that examines the rate of EIA involves adults at the elite or Olympic level of competition. For the scope of this paper, examination of the prevalence rates of EIA shall be confined to school children in grades 1 through 12.

EIA is a disease that affects a 12% to 15% of the United States population (Wilkerson, 1998), and there is a lack of data among U.S. schoolchildren. There have been few studies that have examined the occurrence of this disease among school-aged youth. Although the exact prevalence among students between grades one and twelve is unknown, it has been estimated that the rate could be as high as 29% (Rupp, Guill, & Brudno, 1992).

Bransford, McNutt, and Fink (1991) conducted a study in a population of 12 to 13 year old schoolchildren in the context of their regular gym class using the free running test as their method of screening. The researchers found that 9% of the 201 children they tested had at least a 15% decrease in their peak expiratory flow rate, thus meeting their diagnostic criterion for EIA.

Croft and Lloyd (1989) interviewed 100 asthmatic children. They found that 62 out of the 69 asthmatic students aged 8-15 experienced EIA. Further, 41 indicated that their participation in circumscribed games was avoided or seriously disrupted. An additional 38 noted they suffered from mild EIA and that games were not seriously affected.

Secondary school adolescents were questioned about their asthma knowledge, attitudes, and quality of life by Gibson, Henry, Vimpani, and Halliday in 1995. The findings of this study pertaining to quality of life indicated that 23% of students had experienced mild to moderate quality of life impairment, particularly regarding strenuous exercise (Gibson, Henry, Vimpani, & Halliday, 1995).

A study conducted by Kukafka et al. (1998) examined the prevalence of EIA among high school athletes who had no reported history or diagnosis of asthma. They discovered that 18% of those athletes who participated had at least a 15% decrease in their peak expiratory flow rate, and thus met the study criteria for EIA. The authors argued that the substantial rate of unrecognized EIA does exist in high school athletes, and suggested that screening is required to help those individuals properly manage their disease (Kukafka et. al, 1998).

As noted earlier, there is little data on the prevalence of EIA in the United States. A study conducted in Jamaica focused on the prevalence among primary and secondary schoolchildren to identify those students who unknowingly suffer from the disease. There were originally 214 students that were surveyed. From this group, 84 children were subjected to stress testing based on their questionnaire results, which indicated they might be at risk. Of the 84 who were subjected to the stress testing, 21% met the study criterion for EIA (Nichols & Longsworth, 1995).

Four hundred and thirty adolescents aged 14-17 in Vancouver, British Columbia, participated in a study to determine if increased air pollution or lifestyle changes were associated with EIA. A second group of 219 adolescents aged 14-17 from Prague, Czech Republic, also participated in the study. The free running asthma screening test was performed and a post running peak expiratory flow rate was measured. A positive response for EIA was considered to be a 15% decrease in peak expiratory flow rate. The study reported a prevalence of 12% among the high school students (Vacek, 1999).

Perhaps the most comprehensive study of school-aged youth conducted in the United States was done by Rupp, Guill, and Brudno (1992). Their study examined 1,241 middle and high school students in Richmond County, Georgia. The researchers' main purpose was to look for risk factors, signs, and symptoms of unrecognized EIA. The subjects who, based on a questionniare and interview, were found to be at risk for EIA underwent exercise challenge tests to determine if they met the criteria to be considered an exercise-induced asthmatic. There were 348 students who were determined to be at risk, however only 232 completed the exercise challenge testing. Of the 232 who completed the exercise testing, 66 athletes met the criteria for EIA, resulting in a

prevalence rate of 28%, and an overall risk percentage of 5%. A follow-up study conducted by Rupp, Brudno, and Guill (1993) found an unrecognized EIA rate of 13% among middle school and high school athletes.

Table 1 summarizes results from various studies that have investigated EIA prevalence rates. Each of the studies previously discussed is listed in ascending order by the year in which the author conducted the study. The column entitled "location" refers to the country in which the study was conducted. The next two columns note the gender of the sample, as well as the age range of the participants of each of the studies. The column entitled "other" gives a brief description of other identifying factors of each study sample. Lastly, an EIA prevalence rate is reported in terms of the percentage of the sample population who was found to have EIA.

These reports establish that there is a considerable number of youth who suffer from EIA. Although the prevalence rates vary, and data on U.S. youth are scarce, there is still cause for concern. With so many school aged children having EIA, the situation calls for enhanced understanding of the disease so teachers can help students manage their disease and live a healthy life.

Table 1. Summary of Exercise-Induced Asthma Prevalence Studies

Author(s) Year	Location	Age	Other	Criteria for determining EIA	Prevalence among sample
Croft and Lloyd 1989	England	5 to 15 years	Asthmatic Students	FEV1 measures	90%
Bransford, McNutt, and Fink 1991	United States	12 to 13 years	Adolescent gym class students at a middle school	15% or more decrease in PEFR measures following the free running test	9%
Rupp, Guill, and Brudno 1992	United States	10 to 16 years	Students taking a pre-season sports physical	15% or more decrease in FEV1 measures after an exercise challenge	29%
Larsson et al. 1993	Sweden	16 to 50 years	Elite cross-country skiers	15% or greater decrease in FEV1 values after exercise	31%
Rupp, Guill, & Brudno 1993	United States	12 to 18 years	Volunteer students in sports	15% or greater decrease in FEV1 measures after exercise	13%
Nichols and Longsworth 1995	Jamaica	8 to 15 years	Primary and secondary school aged children	Questionnaire and stress testing	21%

Table 1 (cont'd).

Author(s) Year	Location	Age Range	Other	Criteria for determining EIA	Prev-alence among sample
Vacek 1999	B.C. and Czech.	14 to 17 years	Students with unrecognized EIA	15% or greater decrease in PEFR	12%

Medication and Treatment

A brief overview of the medications used to treat EIA will serve to introduce the reader to the different types, as well as the role they play in managing the disease. The medications of choice for treating EIA are known as beta$_2$-agonists. These drugs are otherwise known as albuterol (Ventolin, Proventil), terbutaline (Brethaire), pributerol acetate (Maxair), mesylate (Tornalate), and salmeterol sinafoate (Serevent). These beta-adrenergic agents serve to relieve acute symptoms of EIA by relaxing the smooth muscle surrounding the airway thus keeping them from constricting (Rau, 1994). They are typically administered with the use of a meter-dosed inhaler; however, they can be administered orally.

Albuterol, terbutaline sulfate, pributerol acetate, and bitolterol mesylate usually last 4 to 6 hours. Metaporteremol only lasts approximately 2 to 4 hours. Albuterol, terbutaline, pirbuterol, and bitolterol are administered 5 to 30 minutes before exercise. Salmeterol needs to be administered at least 30 to 60 minutes prior to activity. Onset of action for all of these B$_2$-agonists (other than salmetrerol) is 5 minutes, with peak bronchodilation in 15 to 60 minutes (Wilkerson, 1998).

Cromolyn sodium (Intal) and nedocromil sodium (Tilade) are alternatives to the B$_2$-agonists. Both are administered via a meter-dosed inhaler and should be taken 15 to

30 minutes prior to exercise. They serve as a preventative medication, however, they are not as effective in reversing an acute asthma episode. Their mechanism of action is not as completely understood as the B_2-agonists. Proposed theories suggest several different methods of action. This class of drugs does, however, serve as an effective preventative alternative medication to B_2-agonists (Wilkerson, 1998).

Although it cannot be expected that teachers know every drug that is used by every asthmatic student, it is important that they have a general idea of which drugs should be used in certain situations. This lack of knowledge of asthma medication is indicative that children may not be receiving adequate medication while at school. It also seems to be contradictory that such a low level of knowledge is being reported, yet there is a high rate of teachers who are supervising medication. This could have an overall harmful effect on the students' asthma management.

Management of EIA in Schools

School-Related Issues

Several studies have sought to investigate the amount of school absenteeism due to asthma-related health complications. Although there are no statistics for EIA specifically, according to the Asthma and Allergy Foundation of America (2001), asthma-related illness is the leading cause of school absences. In the United States, asthma accounts for an annual loss of 10 million school days per year and more hospitalizations than any other childhood disease. Children spend an estimated 7.3 million days per year restricted to bed due to complications from asthma and EIA (Asthma and Allergy Foundation of American, 2001).

Gibson et al. (1995) found that the mean days missed among asthmatic adolescents per school year due to asthma-related problems was five days. Additionally, almost half of the participants experienced an asthma attack while at school. However, the study did find that the school environment of the study participants was quite supportive of the issues regarding asthma management at school (Gibson et al., 1995).

The data from the 1988 U.S. National Health Interview Study was used in a study conducted by Fowler, Davenport, and Garg (1992) to examine asthma-related issues and school performance. While the authors considered several different research questions, their most remarkable finding involved the amount of school missed by asthmatic children versus well children. Ten percent of children with asthma were reported to have missed 11 through 15 days and 11% missed 16 or more days in the previous year (Fowler et al., 1992). The well children had a rate of 1% missing 11 to 15 days and 2% missing 16 or more days.

Preventing exercise-induced asthma attacks. EIA attacks are prevented with the use of pharmacological and non-pharmacological treatment. Non-pharmacological treatment includes physical conditioning, and proper warm-up prior to physical activity. If the athlete is in poor physical condition, an exercise regimen performed in the proper environmental conditions is one of the first steps in treatment and management of EIA (Wilkerson, 1998).

Proper warm-up has been shown to reduce EIA in children (deBisschop, Guenard, Desnot, & Vergeret, 1999). The researchers conducted two studies to look at the effect of a warm-up schedule on EIA. Their first study included only 16 asthmatic children. The participants had their peak flow measured during and after three short, repeated warm-up

schedules. Each of the warm-up sessions was identical in form but varied in the level of intensity. The second study took the best three warm-up schedules and applied them to a new group of 30 asthmatic children. Overall, the researchers found that a short, repeated warm-up session lessened the drop of peak flow for 24 of the 30 children (deBisschop, Guenard, Desnot, & Vergeret, 1999).

The preferred pharmacological treatment before exercise is an inhaled quick-acting beta-agonist (Storms, 1999; Wilkerson, 1998). If this treatment is not adequate, cromolyn or nedocromil can be added to this pretreatment. As discussed earlier, these cromolyn and nedocromil are good in terms of prevention, however, they are not as effective in relieving acute symptoms. Both of these can also be administered with a meter-dosed inhaler (Wilkerson, 1998). The long acting beta-agonist Theophylline can also be given several hours before exercise (Storms, 1999).

It should be noted that although symptoms of EIA can be reduced, they cannot always be eliminated (Smith & LaBotz, 1998). In addition, the efficacy of the medication may vary depending on the environment in which it is used. In order to enhance the pharmacological regimen, patients must be educated on the factors that may vary the response, which could prove to optimize their use of the prescribed medication (Smith & LaBotz, 1998).

<u>Management and treatment of an asthma attack.</u> Individuals who have EIA and are prescribed medication will oftentimes require their medication if or when they begin to experience bronchospasm or an asthma attack. As stated earlier, medication is ideally meant to be used prior to physical activity in order to prevent an attack. However,

if a student should begin to experience an asthma attack, proper planning should ensure that proper steps are taken and appropriate medical personnel are called upon.

As explained earlier, educators and staff at schools are frequently unaware of a protocol or policy that they are to follow in the event of an asthma attack. The American Lung Association (2001) recommends that all affected students provide their school with an asthma action plan, so that all staff will know what medication the student needs and who to contact in the event of an emergency. Unfortunately, many students do not provide their school with an asthma action plan, and many schools do not require that students provide such information.

According to the American Medical Association (2001), there are varied levels of severity of an asthma attack. The levels include mild, moderate, and severe. Recommended initial treatment of an asthma attack includes inhaled, short acting beta$_2$-agonist drugs. If symptoms are not subsiding after initial medication administration, continued beta$_2$-agonists should be given every 3 to 4 hours and a physician should be contacted.

If after the first administration of medication the symptoms decrease, but return within 3 hours, corticosteroids are recommended in addition to the beta$_2$-agonist. Urgent contact should be made with student's physician. If the initial dose of the medication does not help, or if symptoms worsen, immediate transport to the hospital is necessary (American Medical Association, 2001).

The National Heart, Lung, and Blood Institute (2000) has developed a guide for educators to learn more about asthma. They have created this guide to help educators assist students control their asthma. The guide also includes a list of asthma triggers,

instruction on how to follow an asthma management plan, and actions to consider in order to help the student take control of their disease. An emergency action plan is also included if a physical educator should need it to use as a guideline.

Shah, Gibson, and Wachinger (1994) conducted a community seminar to educate parents and school staff on the problems with emergency management of asthma at school, and their plans for addressing the problem. They developed a pilot emergency management plan for asthma and implemented it into 12 schools. Their comprehensive plan included each school having an asthma first aid kit, as well as workshops to educate school staff. In addition, all students had to fill out an asthma-screening questionnaire. The final component of their program was a school crisis plan. This crisis plan was completed by the asthmatic student's physician, and stored at school. Upon completion of the evaluation portion of the pilot program, the results revealed that one in 10 students who had crisis plans at school required emergency treatment.

Mellis et al. (1994) authored a position paper on a national policy for Australia on asthma management for schools. In it, the authors explain the elements of their proposed policy, which includes a school "first aid kit" for asthma. It also includes an emergency treatment plan, as well as an explanation to assess the severity of an attack from asthma and treatment during an attack. Their recommendations for prevention and management of an attack go one step further than those presented by the American Medical Association (2001), The National Heart, Lung, and Blood Institute (2000), and American Lung Association (2001). Their recommendations include: (a) improved asthma training for teachers at the undergraduate and postgraduate levels; (b) improved recognition from schools of those students who have asthma; (c) schools should encourage exercise for all

students with asthma; (d) medications should be readily available to all students who have asthma; and (e) early introduction of "lung health" education should be encouraged (Mellis et al., 1994).

It is clear that in the event of an asthma attack, it is essential for a school staff member to know what action to take. A student's life could depend on whether appropriate steps are taken to manage the situation. However, it is clear that some educators feel they need to be educated on the topic.

Medication at school. Another school related issue that students with asthma have to be concerned about is the availability of their medication. The State of Michigan has passed Public Act Number 10 (2000), which allows school children to possess and use their meter-dosed inhaler with proper authorization from their health care provider and parent. The Bill states that the pupil may use the inhaler to alleviate asthmatic symptoms or before exercise to prevent the onset of asthmatic symptoms. He or she may also use his/her inhaler at school, on school-sponsored transportation, or any activity, event, or program sponsored by or in which the pupil's school is participating (Public Act 10, 2000). The Bill also states that the principal or other chief administrator who is aware that a pupil is in possession of an inhaler should notify each of the pupil's classroom teachers.

The State of Michigan also passed Public Act 9 in March of 2000, which addresses the issue of liability for school teachers and administrators. The Bill states that a school administrator, teacher, or other school employee designated by the school administrator, who in good faith administers medication to a pupil in the presence of another adult or in an emergency that threatens the life or health of the pupil, is not liable

in a criminal action or for civil damages as a result of an act or omission in the administration of the medication, except for an act or omission amounting to gross negligence or willful and wanton misconduct (Public Act 9, 2000). The legislature in Michigan has taken an important step by recognizing the importance of medication availability for students who have asthma. However, it is not known whether or not all schools are supporting this act, and not all states have passed an act like this.

The results of several different studies that examined the handling and administration of medication for asthmatic children revealed very different results based on the policy of the school being examined. Several of the schools that have had teachers surveyed indicated that their school did not even have a policy concerning medication handling and administration (Atchison & Cuskelly, 1994; Bevis & Taylor, 1990; French & Carroll, 1997; Henry, Hazell, & Halliday, 1994; Hussey, Cahill, Henry, King, & Gormley, 1999).

Due to the fact that most of the studies that are cited within this review were not conducted in the United States, it may be argued that the statistics reported here may not be accurate or applicable for the U.S. school population. However, it must be noted again, there are few data available on this topic in the United States. Therefore, discussion on the varying school or national policies will be presented with the various study results.

In London, a group of teachers was surveyed on several different issues related to asthma and EIA (Bevis & Taylor, 1990). The researchers distributed their questionnaire to 98 primary school teachers from eight schools. Their results concerning asthma medication and handling revealed that 39% of teachers did not allow children to keep

their inhalers with them, and 68% said they supervise children when they are using their inhalers. However, the group's overall knowledge of medication was very poor. When asked about the use of antibiotics, 67% did not know if they were the right type of medication used to treat asthma.

Bevis and Taylor (1990) also found that school policy varied. The article cited that most of the teachers were unaware of their school policy; however, it did not provide an exact number or percentage. One of the schools forbade the use of medication at school and in the event of illness the student was sent home or a parent had to bring his or her medication to school. Other schools had a designated teacher who was responsible for keeping medications.

Evidence of the lack of availability of inhalers to school children was presented by Hill, Britton, and Tattersfield (1987). They examined 29 schools in Nottingham, England. They found that the responsibility of supervising pupils who were asthmatic lay almost entirely with the primary school teacher. School policy varied, with 65% of the primary schools reporting that the students were required to hand in their inhaler to a school staff member. Unfortunately, 40% of all the teachers surveyed reported they were worried that they were not prepared to deal with a student experiencing an asthma attack and were concerned about the extra time it would take to ensure the child received their medication.

Based on the findings of Hill, Britton, and Tattersfield (1987), asthma management and medication handling were examined in British school children by Croft and Lloyd (1989). Their study proposed to explore whether or not inhalers are available to children with EIA prior to physical activity. Of the 100 children they surveyed, 56

said they had to hand their inhaler over to a school staff member, and any delay in getting medication when needed was caused by the inability to find the person in charge of their inhaler. Eighteen students surveyed were not allowed to use their inhaler while at school. Out of the 62 children that indicated they had EIA, 48 took bronchodilators before exercising. However, half reported they had to leave the game to go find the staff member who was responsible for their inhaler.

One hundred sixty-four primary school teachers from Perth, Australia, were surveyed on their knowledge of asthma. Forty-five percent indicated they did not know what medications are given to children with EIA prior to exercise. Over 95% of the teachers questioned said they allow children to keep their medicine with them in school. Seventy-six percent have to remind children to take their medication. Despite the fact that 150 of the 164 teachers felt they did not know enough about asthma, 63% supervise asthmatic children when taking their medication.

School teachers in Dublin, Ireland, were questioned about their knowledge of asthma and its management (Hussey et al., 1999). Data were collected based on the responses of 147 teachers from the primary and secondary school level. Eighty-four percent of the teachers reported that their school did not have a specific policy or protocol in the event of an asthma attack. When asked about their confidence in dealing with an attack, 88% said they were not confident. Although 70% of the total population surveyed said they are responsible for supervising medication administration for asthmatic students, 49% said they are not familiar with the correct technique for use of inhalers.

<u>Physical activity.</u> EIA has been shown to limit the activity of school-aged youth. Croft and Lloyd (1989) performed a study including children in London and found that

41% of the student population they surveyed had their physical activity seriously disrupted or prohibited completely due to EIA. This has serious implications for the individual's overall wellness. Lack of physical activity has been shown to be deleterious to one's health and increases the risk of obesity, heart disease, stroke, diabetes, and several other chronic diseases (U.S. Department of Health and Human Services, 1996).

A study performed by Thio, Nagelkerke, Ketel, vanKeeken, and Dankert-Roelse (1996) was conducted to determine whether or not cardiovascular fitness could be beneficial for the prevention of EIA. Their findings revealed that children with severe EIA can attain normal cardiovascular fitness. In addition, they were able to demonstrate that normal cardiovascular fitness in itself does not prevent severe EIA (Thio, et al., 1996).

Gibson, et al. (1995) examined asthma knowledge, attitudes, and quality of life in adolescents from 32 Catholic secondary schools in New South Wales, Australia. They found that asthma had limited the activities of 35% of the 796 asthmatic students they surveyed. Further, the most frequently limited activity due to asthma was participation in sport.

Hussey et al. (1999) asked teachers how many of their students used or required medication in order to participate in physical activity or physical education class. They found that 5% of the teachers' students required medication prior to activity. An additional 3% of their students required medication during class. Further, an added 13% of their students required medication after physical education class. Thus, a total of 21% of their students required medication either before, during, or after physical education class.

Students who suffer from EIA should not have to refrain from physical activity. With the proper education and management plan, anyone with EIA should be able to participate with little interference in their desired sport or activity. However, a comprehensive approach to managing EIA is necessary to minimize any health related problems. This comprehensive approach requires guidance from a physician, education, proper medication, and avoiding potential triggers. The components of comprehensive EIA management shall now be discussed.

Teacher Issues

Current knowledge of educators. Virtually all of the research that has investigated teachers' knowledge of asthma has been conducted outside of the United States (Atchison & Cuskelly, 1994; Bevis & Taylor, 1990; French & Carroll, 1997; Henry, Hazell, & Halliday, 1994; Hussey et al., 1999). Further, there has not been a study that examines educators' knowledge of EIA specifically. Rather, many of the studies that look at general asthma knowledge dedicate a portion of their data collection to EIA and related topics. Therefore, it is the information offered from segments of questionnaires and surveys, which will serve as the basis for the current level of knowledge of educators with respect to EIA.

Bevis and Taylor (1990) conducted a study in the Paddington area of London with the purpose of finding out what teachers know about asthma. Within their questionnaire, they were able to gather some information on EIA and related issues. Over 60% of the teachers knew that swimming was the best sport for asthmatics, and 79% felt asthmatic children should be encouraged to participate in sport.

French and Carroll (1997) issued a questionnaire which tested primary teachers' knowledge of asthma. It included only a few questions that were devoted to EIA. They found that 97% of the teachers surveyed knew that children with asthma should be encouraged to participate in games and sport. In addition, 89% knew that swimming is the best sport for asthmatic youth.

Knowledge deficits among educators. The results of several studies which questioned teachers on their knowledge of asthma consistently reported that teachers' knowledge in the area of EIA is lacking moreso than any other aspect that was surveyed (Bevis & Taylor, 1990; French & Carroll, 1997; Gibson et al. 1995; Hussey et al., 1999). Various topics surrounding EIA that have been explored include sport participation, prevention, and medication.

Shah, et al. (1994) developed an asthma crisis plan to be implemented into schools. One component of their plan involved workshops to help educate teachers. During the 12 workshops they conducted, they were able to gather some information on the current level of knowledge of the teachers. While the authors' workshop was able to significantly improve overall knowledge, a deficit still remained. At completion of the workshops, 54% of the teachers still were unable to identify ways of preventing EIA.

Bevis and Taylor (1990) found that only 33% of the teachers they surveyed knew that pre-medication before physical activity should prevent EIA, and 47% were not sure if it would harm or help the student. Nearly half of those surveyed did not know if children with asthma were more competent or less competent in physical sports than students who did not suffer from asthma or EIA. Over 60% did not know that wheezing after exercise suggests asthma (Bevis & Taylor, 1990).

French and Carroll (1997) found that 42% of the teachers they surveyed felt it is not the responsibility of the teacher to ensure that necessary drugs should be taken before physical exercise. In addition, 45% of their participants did not know that asthma medication prior to physical activity should prevent an asthma attack. Playing games in the wind or cold wind increases the likelihood of an asthma attack, which 63% of the teachers did not know (French & Carroll, 1997).

Teachers surveyed by Hussey et al. (1999) indicated that 80% were aware that asthma has an exercise-induced component. However, few take appropriate measures for their students prior to physical activity. Although symptoms of EIA may be prevented if a child takes a relieve bronchodilator before beginning exercise, only 17% of the subjects knew this when asked (Hussey et al., 1999).

Confidence of educators. Several teachers in Bevis and Taylor's (1990) study commented on their lack of confidence when an asthmatic child became ill and when there is no other help available, resulting in anxiety for the teacher and student. The authors of this study argued that, with proper education, teachers will be more likely to feel confident and be able to distinguish when a child is becoming unwell, and what actions must be taken. Hussey et al. (1999) found that 70% of the teachers in their survey administered medication during school hours, yet only 39% felt they knew the proper technique to administer the mediation. Further, only 19% felt they were or would be, confident in managing an asthma attack while 80% felt they were not or would not be confident. The authors also indicated that teachers who are uninformed felt their intervention could jeopardize the child's health, rather than help it (Hussey et al. 1999).

Accurate knowledge about proper medication and its effects could prove to save a child's life. A well-informed teacher who is confident in his or her knowledge and actions can ensure that a child is self-medicating correctly and proper management is taking place. A discussion on training educators shall be explored as the final issue in this literature review.

Educators' feelings toward education. While education may by needed, it is also important to determine if educators feel as though they need it, or if they would take advantage of it if it were offered to them. This has been examined by several researchers, with a consensus that teachers feel as though they need more education on asthma, and need more information to help improve their level of understanding of the disease (Bevis & Taylor, 1990; French & Carroll, 1997; Henry et al., 1994; Hussey et al., 1999). French and Carroll (1997) reported that 91% of the teachers surveyed did not feel they knew enough about asthma. Hussey et al.'s (1999) results on this were similar, noting that 88% were not satisfied with their current knowledge of asthma.

Training. Widescale attempts to educate teachers about EIA specifically have not been made. Studies that have been conducted on asthma knowledge in general have been able to gather some data on approaches that may serve to educate teachers on EIA and related issues (Bevis & Taylor, 1990; French & Carroll, 1997; Gibson et. al 1995; Hussey, et al., 1999). As stated earlier, it is the information offered from segments of questionnaires and surveys on asthma in general, which will serve as the basis for the current level of knowledge of educators with respect to EIA.

There are several aspects that must be considered when attempting to educate teachers about asthma. Atchison and Cuskelly (1994) intended to explore a method of

educating teachers on asthma. They prefaced their study with the presentation of the areas that must be addressed in designing an educational program. They emphasized the need for teachers to understand asthma, know how and when to give medication to an asthmatic, when to seek assistance from parents or medication professionals, and when to call an ambulance (Atchison & Cuskelly, 1994). In addition, educating teachers about triggers and prevention are key to minimizing asthma attacks. Each of these subjects shall be discussed in order to realize the need for education on this disease.

Atchison and Cuskelly (1994) sought to determine whether an informational session on asthma in conjunction with providing teachers with material on asthma symptoms and management would produce a significant change in their level of knowledge of asthma. They issued a questionnaire with five subscales addressing the topics of medication, preventing asthma attacks, when to call an ambulance, and general facts. The last subscale included questions about the relationship of stress and asthma, causes of asthma, mortality, and morbidity. Their study separated participants into an experimental group and a control group. The experimental group received an information session, while the control group did not. The information session consisted of a lecture on asthma and an exhibition of the different types of asthma medication and devices used to treat asthma (Atchison & Cuskelly, 1994). The medications included Ventolin, Becotide, Becloforte, and Intal. The devices demonstrated included puffers, spacers, and peak flow monitors. Brochures were also given out, and included "Asthma First Aid for Schools" and "What Teachers Should Know About Asthma."

Each group was given a pre-test and post-test to see if the session improved the level of knowledge of those who attended. The results revealed that teachers in both

groups had very little knowledge, particularly in the area of prevention. This method of educating teachers failed to produce any significant change in teachers' knowledge of asthma. The authors go on to criticize this method of education and the regular use of this approach to disseminate information.

In opposition, Henry, et al., (1994) were able to demonstrate that a two-hour seminar was able to produce significant differences in asthma knowledge among school staff. The researchers were able to gather baseline data on the participants prior to attending the seminar. The results of the baseline data indicated that the level of knowledge was insufficient for proper disease management (Henry, et al., 1994). Only one school staff person was able to name two ways to prevent EIA before this seminar. This number increased to 20 (29%) after attending the seminar.

Bevis and Taylor (1990) found that only 4% of the teachers they surveyed had ever been educated on the topic of asthma. French and Carroll (1997) found that only 10% of the teachers they surveyed had ever had any education on asthma topics. Only 12% of those surveyed by Hussey et al. (1999) felt confident in their current level of knowledge on asthma.

Conclusions

It has been clearly demonstrated that EIA is a health concern for students. Management of the disease is a challenge for all who have it. It has also been illustrated that while educators desire more training on asthma, they continue to play an important role in helping school children manage their disease.

Because EIA is triggered specifically by physical activity, it is assumed that physical educators could play a crucial role in preventing unnecessary complications

caused by this disease. Therefore, it would serve to be beneficial for school administrators to find out what physical educators know about the disease, and whether they are equipped to handle emergency situations. In addition, it would be useful to know if physical education teachers would take advantage of educational opportunities if they were to be made available for them.

Physical educators have access to a large population of school aged children who participate in physical activity. Improving their knowledge would only serve to improve the health and welfare of their students. There is no question that a comprehensive program to educate teachers on this topic is necessary. Future programs using the appropriate method of instruction could serve to better prepare physical educators. The better prepared our teachers are, the better the choices they can make concerning their students.

Chapter 3

Methods

The basic design that was used in this investigation was a descriptive research design. The purpose of choosing this design was to gather basic information on the current level of knowledge among physical educators on the topic of exercise-induced asthma (EIA). There were two research questions explored: (a) what is the current level of knowledge of exercise-induced asthma among physical educators?, and (b) are physical educators interested in improving their level of knowledge of EIA and related issues?

Research Design

This research design was used because it has been demonstrated to be an effective means to gather information on asthma knowledge among educators (Atchison & Cuskelly, 1994; Bevis & Taylor, 1990; French & Carroll, 1997; Henry, et al., 1994; Hussey et al., 1999). It also allowed for the examination of some demographic variables and their relationship to the level of knowledge among physical educators. As shown in the previous chapter, research of this kind has not been conducted in the United States. Therefore, the information gathered from this research will serve as a basis for future research and hypothesis testing.

A cross-sectional survey (see Appendix C), which is a survey conducted at one point in time, was distributed to gather a snapshot of the current level of knowledge among the physical educators within the sample chosen. This method was utilized because it is the quickest and least expensive method of gathering information on multiple variables. It also allowed for anonymity of those who participated.

While this method does not allow for cause and effect relationships to be determined, it served to gather unique baseline data. Because this topic of research is new to the United States, advancing the current level of knowledge must start with some basic information on the population of interest. This design does not allow for a historical perspective or maturation analysis on this issue; however, an effort to decrease these potential threats was made by randomly selecting a sample of teachers from two intermediate school districts. This procedure was done in order to attempt to get a representative sample of the entire population of teachers in the two school districts while minimizing the potential of any historical event that may affect the potential outcomes of the measurements taken.

The criteria for inclusion were none other than being a physical education teacher on staff at a school that was chosen. Informed consent was received from all study participants and will be discussed in more detail in the data collection portion of the methods section. The potential sample of physical education teachers were those physical education teachers who worked within two intermediate school districts that was comprising 340 schools. There were 170 elementary schools, 90 middle schools, and 80 high schools within the two intermediate school districts. A total of 300 physical education teachers worked at these schools; some physical education teachers serve more than one school.

Participants

The population examined in this study included physical education schoolteachers who taught physical education in at least one public school within the two intermediate school districts. The elementary schools out numbered the middle and high schools by a ratio of approximately 2:1. In order to get a representative sample from

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each level, approximately 65% to 70% of the schools at each level were sent surveys. Therefore, survey packets inviting physical education teachers to participate were sent 65 middle schools, 55 high schools, and 118 elementary schools.

A total of 238 questionnaires addressed to the physical education teacher were sent out to randomly selected schools in the two chosen districts. There were 72 completed surveys returned. This is the equivalent to a response rate of at least 30%. It must be noted that because some of the teachers represent more than one school, the response rate could actually be higher.

Randomization was done with the schools rather than teachers because there are more schools than physical education teachers, and addresses of the physical education teachers were not available. Based on the findings of the literature review that was conducted on this topic, a response rate of approximately 30% was expected (Atchison & Cuskelly, 1994; Bevis & Taylor, 1990; French & Carroll, 1997; Henry, et al., 1994; Hussey et al., 1999). In order to generalize the findings of this study to the 300 physical educators in the two districts, 162 completed surveys were needed (Krejcie & Morgan, 1970). There were only 72 completed surveys returned, thus the findings of this study cannot be generalized to the two districts' entire cohort of physical education teachers.

Instrumentation

The research conducted within this study sought to explore two basic questions. These questions were examined using a survey comprised of several sections (see Appendix C). The first question addressed the current level of knowledge that physical educators have of EIA. The first section of the survey consisted of a series of multiple choice questions to test participants' fundamental knowledge of exercise-induced asthma. The knowledge portion of the instrument served as a means to determine the number of

correct and incorrect answers submitted by the participants. The answers were tallied and are presented in aggregate form as an objective index of the current level of knowledge of the participants of this study.

The second research question posed in this study addressed whether or not physical educators would like more education on this topic. This information was gathered using additional survey questions, as well as statements that allowed the participants to express their opinions on topics related to EIA using a Likert scale. This section also allowed them to indicate whether they feel they know enough about EIA, and if they would take advantage of continuing education on the topic if it were offered. Demographic information on gender, years of teaching experience, age, health status (i.e., asthmatic or non-asthmatic), and level of education were also collected in the third section of the survey.

Survey Development

Virtually all of the research that has investigated teachers' knowledge of asthma has been conducted outside of the United States (Atchison & Cuskelly, 1994; Bevis & Taylor, 1990; French & Carroll, 1997; Henry, et al., 1994; Hussey et al., 1999). The international literature has demonstrated the need for education in the area of exercise-induced asthma. However, little is known about the current state of EIA knowledge of U.S. physical educators specifically. Therefore, before research and education in this area can advance, an assessment of the individuals in question must first be conducted.

There are several general asthma questionnaires that have been designed and used on educators; however, these questionnaires only have small sub-categories with a few questions on the topic of exercise-induced asthma. The survey instrument used in this

study includes questions in seven categories (see Appendix C). Those categories include (a) general knowledge of EIA; (b) prevention of EIA; (c) medications used for EIA: (d) school policy on EIA; (e) emergency management of an asthma attack; (f) feelings on education in the area of EIA; and (g) demographic information. The survey consisted of 37 questions in all.

The questions for this survey were adapted from other asthma surveys that had sub-categories that included questions relevant to exercise-induced asthma. The survey used in this study contained 14 knowledge questions having only one correct answer. The remaining questions were either demographic questions or asked the participants about their feelings on various issues related to EIA.

Validity

This survey instrument has never been used before, and it was developed and validated in stages. The first draft was submitted to the primary investigator's thesis committee to assess content validity and to get feedback on potential changes that needed to be made. The survey was then issued to graduate level kinesiology students at Michigan State University who were enrolled during the spring semester, 2001. After discussion to gather feedback on various items within the survey, an item analysis was conducted and the survey was finalized for a pilot test.

Reliability

Permission from the University Committee on the Research of Human Subjects (UCRIHS) was obtained prior to the pilot testing of the instrument. Because this tool does not have a criterion with which it can be compared, the survey was piloted to senior

physical education students at Grand Valley State University during the spring semester, 2001, to measure reliability.

The participants in the pilot test were issued the survey during a 400 level capstone class. The survey was issued the first week of class and then exactly two weeks later at the same time of day, in the same classroom, and on the same day of the week. There were 30 completed pre- and post-tests collected. A paired t-test was conducted on the data to determine a correlation coefficient for the reliability of the applicable items in the survey.

Pilot Test Results

In order to assess reliability of the survey, the instrument was pilot tested with senior physical education students. A paired t-test was conducted on each item of the survey to measure individual differences. The significance level and Pearson correlation coefficient for each answered item in the survey can be seen in Table 2. Some of the questions were not applicable to the senior students, as they had to do with years of experience and other questions that could not be answered. These questions (items E1, T1-4, B1, B4, B5) are therefore not included in the analysis (Table 2).

Table 2. Pilot Test Results for Paired t-test and Pearson Correlation

Question	p value	Correlation coefficient
What is exercise-induced asthma?	.18	.82
Swimming is the only exercise that is suitable for individuals with asthma of exercise-induced asthma.	.50	.89
Full participation in sport should not be encouraged to individuals with asthma or exercise-induced asthma.	.16	.87

Table 2 (cont'd).

Question	p value	Correlation coefficient
Teachers of elementary aged children should be responsible for ensuring that proper medications are taken by their students with asthma prior to engaging in physical activity.	.78	.87
Which of the following is most likely to inflame an asthma attack in an asthmatic child?	.23	.93
Which of the following activities should not be undertaken by children with controlled, mild asthma?	.50	.65
Which is the most likely to bring about an asthma attack in children with controlled asthma?	.80	.64
Wheezing after exercise suggest that a person has asthma.	.16	.88
Asthmatic students are generally less competent at sports.	.35	.81
What factor(s) indicate that a child is experiencing a bad attack of asthma?	.35	.80
What is the most obvious feature associated with asthma?	.66	.90
Antibiotics are the most important part of treatment for most children with asthma.	1.00	.94
Taking medication for EIA as prescribed before physical activity/games should reduce the likelihood of an asthma attack.	.26	.85
Prior to physical activity, beta-adrenergic medications are the most effective type of medications used by individuals with exercise-induced asthma.	.16	.86
Do you supervise asthmatic children when they use their inhalers?	.54	.72
Which of the following medications is the most effective at preventing an exercise-induced asthma attack?	.08	.96

Table 2 (cont'd)

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Table 2 (cont'd).

Question	p value	Correlation coefficient
When should an ambulance be called for an asthmatic child?	.33	.93
When a child has a sever attack of asthma and the asthma has not improved after several doses of medication, which is the most crucial procedure that needs to be implemented?	.31	.75
Do you have an asthmatic child?	1.00	1.00
Are you currently CPR certified?	1.00	1.00
What is your gender?	1.00	1.00
Are you aware of Public Act 9 in the state of Michigan?	.08	.47
A school administrator, teacher or other school employee designated by the school administrator, who in good faith administers medication to a pupil in the presence of another adult or in an emergency that threatens the life/health of the pupil is not liable in a criminal action.	.57	.79

In order to assess within-group differences, a significance level of p = .05 was used to predict the probability of a Type I error. There were no reported p-values less than .05, which resulted in the failure to reject the null hypothesis in all cases. Therefore, there were no detectable differences in the answers given from the pre-test to the post-test. A correlation coefficient was also calculated to determine the mathematical relationship between the two variables. The correlation between items ranged from moderate to very high, except in one case. Item B8 (Are you aware of Public Act 9 in the state of Michigan?) had what would be considered to be a low correlation (Munro, 1997). In summary, there was no significant difference within the groups on the measured survey items. Given these results, there were no changes made to the questionnaire, and it was distributed to the study population.

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Data Collection Procedures

Surveys were mailed out on May 2nd, 2001, after UCRIHS approval was granted. The surveys were sent to the schools addressed to the attention of the physical educator. An addressed, stamped return-envelope was included in order to improve response rate. Participants were instructed to place the completed survey in the provided envelope and place it in the mail no later than May 31, 2001. A cover letter (see Appendix A) was sent with the survey to explain the nature of the study. Directions for the instrument can be found at the top of survey itself (see Appendix C).

A separate informed consent form (see Appendix B) was included and was necessary only if individuals wanted to send in their name and contact information so as to receive information on the study results, or be included in a prize drawing. Informed consent was implied if the participant sent in a completed questionnaire without an accompanying informed consent. The participants were assured that their informed consent form would be immediately separated from their survey responses so as to maintain anonymity.

The drawing was done at the completion of the study. The names of all participants who sent in their contact information were put together in a bowl and one name was randomly drawn. The prize for the individual whose name was drawn was a $50.00 gift certificate to a sporting goods store.

Data Analyses

Each question posed in the survey was first analyzed individually. Demographic data were reported in terms of frequencies and percentages. The demographic questions involving age and years teaching were reported in terms of mean age, mean years the participants have taught physical education, and the range of responses.

There were 14 questions presented in the survey that were used to measure the overall knowledge each participant had of EIA. They were of nominal level and carry a value of one point when a correct answer is given. A mean score for all participants was calculated.

Knowledge means for various subgroups of participants were compared using t-tests as described below. One-tailed tests were used for those comparisons for which a directional difference could be hypothesized. A statistical significance level of p = .05 was used to predict the probability of a Type I error for all tests conducted in this study.

A one tailed t-test was performed to investigate whether or not there was a difference in the mean knowledge scores of those individuals who have asthma and/or an asthmatic child versus those who do not have asthma and/or an asthmatic child. It was hypothesized that the mean knowledge score for those who have asthma and/or children with asthma would be significantly higher than those who do not have asthma and/or children with asthma.

A two tailed t-test was conducted to explore if a difference in the mean knowledge scores exist for those who have taught health education (in addition to physical education) versus those who have not taught health education (in addition to physical education). A one tailed t-test was also run to see if a difference exists between the mean knowledge scores of those who have had training on the topic versus those who have not had training on the topic. It was hypothesized that the mean scores for those who have had training would be higher for those who have not had training.

A two tailed t-test was conducted to examine whether a difference exists in the mean knowledge scores of those who supervise children using their inhalers and those

who do not supervise children using their inhalers. Lastly, a two-tailed t-test was used to determine if there was a difference in the mean knowledge score of those who have obtained more formal education (a master's degree, beyond a master's degree, or doctoral work) versus those who have obtained less formal education (a bachelor's degree or some master's work).

Chapter 4

Results

Study Results

Descriptive Results

There were 238 surveys sent out, and 72 surveys were returned, resulting in a 30% response rate. There were three surveys that did not have a response to item B8, which asked participants if they were aware of Public Act 9. There was one survey respondent who did not indicate his/her age in response to item B12.

The data collected revealed that there were 41 (57%) male respondents and 31 (43%) female respondents. The descriptive statistics for the age of the participants can be found in Table 3. The mean age for the participants was 41 years. The survey participants spanned a wide range of teaching experience (Table 3). There was a 39-year range of experience, with a 13-year mean of teaching physical education.

Table 3. Sample Descriptives

Variable	Response
Gender	
Male	57%
Female	43%
Age	41.2±9.7 years
Highest Level of Education Completed	
Bachelors from a 4-year college	18%
Some graduate work	10%
Master's degree	26%
Beyond Master's degree	44%
Doctoral work	1%
Years of Physical Education Teaching Experience	13.1±10.3years

Table 3 (cont'd).

Variable	Response
Those Who Have Taught Health Classes	34%
Grades Taught	
Grades K-6	49%
Grades 7-8	15%
Grades 9-12	19%
Combination Assignments	17%
CPR Certified	58%
Personal Involvement with EIA	
Teacher with EIA	6%
Teacher who has child with EIA	13%
Teacher has no personal involvement with EIA	81%
Experience with EIA in Schools	
Teacher has/had asthmatic child in class	100%
Teacher allows children to keep inhalers with them	81%
Teacher supervises children when they use their inhalers	42%
School has policy on how to handle an asthma attack	71%
Knowledge about EIA	
Teacher is satisfied with knowledge of EIA	12%
Teacher has received training on asthma or EIA	31%
Aware of Public Act 9 in the State of Michigan	32%
Would attend training on this topic if it were offered	91%
Total Correct on Knowledge Questions (out of 14)	8.79±2.87

The participants included teachers who teach physical education at levels ranging from kindergarten to twelfth grade (Figure 2). Most respondents replied with a range of grades that they teach and therefore needed to be placed into categories. The categories were as follows: (a) grades K-6; (b) grades 7-8; (c) grades 9-12; and (d) grades that span two or more of the groups. There were 35 participants who taught K-6, 11 who taught grades 7-8, 14 who taught grades 9-12, and 12 who taught some combination of two or more of the categories.

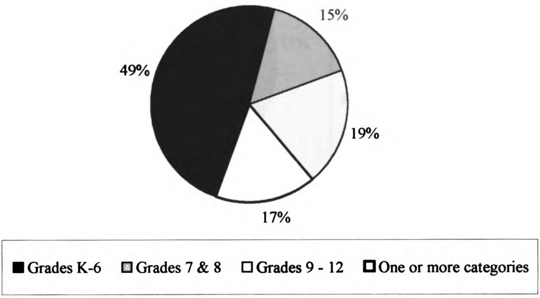


Figure 2. Grade Levels Taught

All of those surveyed were physical education teachers. Of those, 34 (47%) have also taught health classes in addition to physical education. There were also 42 participants who indicated they were certified in cardio-pulmonary resuscitation, making up 58% of the sample. All participants had a minimum of a bachelor's degree from a four-year college. The formal educational level of the participants ranged from bachelor's degree only to having some doctoral work (Figure 3).

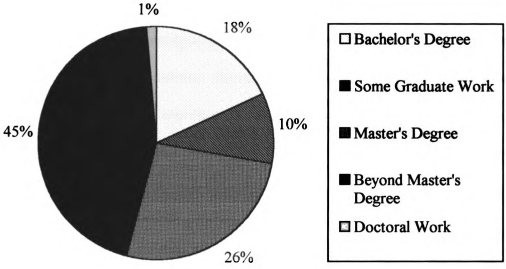


Figure 3. Highest Level of Formal Education Earned

When asked if they had ever had an asthmatic child in their class, 71 responded that they had an asthmatic child in their class at some point during their teaching career. The remaining respondent did not reply to the question. Therefore, 100% of those who responded to the question have had an asthmatic child in their class at some point.

Almost half of the participants (42%) supervise children when they use their inhalers, yet 57% of all of the participants could not identify the most effective medication for preventing an exercise-induced asthma (EIA) attack. A total of 29% of the respondents said that their school did not have a policy for handling an asthma attack. An additional 22% replied that they did not know if their school had a policy or not.

When asked about their knowledge of Public Act 9 (which concerns the administration of medication to students), 68% indicated that they were not even aware of such an Act. The survey that was used in this study included a question presenting

participants with a statement taken directly from the Act. Twenty-one percent of the participants labeled the statement as false.

Only 14 of the respondents either had exercise-induced asthma or parented a child who had exercise-induced asthma; therefore 19% of the survey sample have had some personal involvement with the disease. Figure 4 gives a summary of the number of participants who had asthma or a child with asthma, and those who did not have asthma or a child with asthma.

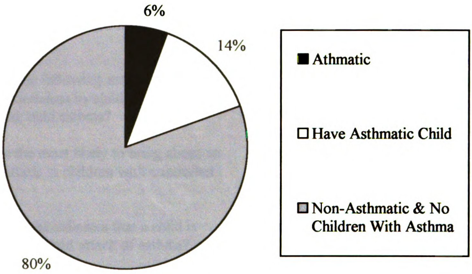
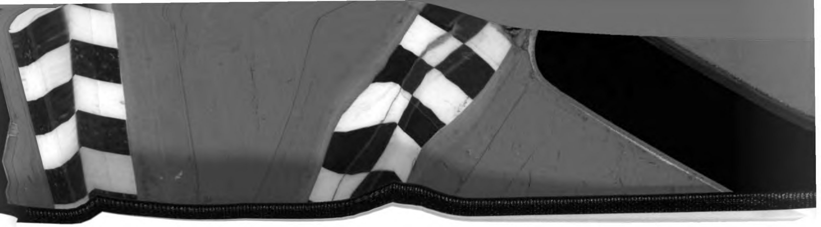


Figure 4. Health Status of Participants

Of all of the study participants, 31% had some type of training on the topic. The data revealed that 88% (63 people) indicated that they were not satisfied with their current level of knowledge of exercise-induced asthma. Furthermore, 90% said that they would attend training on the topic if it were offered.

There were 14 questions posed in the survey that tested the participants' knowledge of exercise-induced asthma. Table 4 presented below summarizes the results of the responses given to each of those 14 questions. The mean for the total number



correct out of 14 was 8.79, or 62%. The standard deviation for the mean score was 2.87 with a sample variance of 8.25.

Table 4. Summary of Knowledge Question

Question	% Who answered correctly	% Who didn't know	% Who answered incorrectly
What is exercise-induced asthma?	54%	12%	34%
Playing games/physical activity in the cold wind increases the likelihood of an asthmatic having an asthma attack. (T/F)	60%	22%	18%
Which of the following is MOST likely to inflame an asthma attack in an asthmatic child?	69%	24%	7%
Which of the following activities should not be undertaken by children with controlled, mild asthma?	93%	4%	3%
Which is the most likely to bring about an asthma attack in children with controlled asthma?	46%	13%	41%
What factor(s) indicates that a child is experiencing a bad attack of asthma?	72%	2%	26%
What is the most obvious feature associated with asthma?	61%	2%	37%
Antibiotics are the most important part of treatment for most children with asthma?	68%	18%	4%
Taking medication for exercise-induced asthma as prescribed before physical activity/games should reduce the likelihood of an asthma attack. (T/F)	90%	7%	3%

Table 4 (cont'd).

Question	% Who answered correctly	% Who didn't know	% Who answered incorrectly
Prior to physical activity, beta-adrenergic medications are the most effective type of medications used by individuals with exercise-induced asthma. (T/F)	26%	68%	6%
Which of the following medications is most effective at preventing an exercise-induced asthma attack?	40%	57%	3%
When should an ambulance be called for an asthmatic child?	72%	18%	10%
When a child has a sever attack of asthma and the asthma ha not improved after several doses of medication, which is the MOST crucial procedure that needs to be implemented. (T/F)	54%	8%	38%
A school administrator, teacher, or other school employee designated by the school administrator, who in good faith administers medication to a pupil in the presence of another adult or in an emergency that threatens the life/health of the pupil is not liable in a criminal action.	75%	0%	25%

Subgroup Knowledge Comparisons

A one tailed t-test was used to compare the mean knowledge scores of those participants who have asthma and/or have an asthmatic child and the mean scores of those who do not have asthma and/or an asthmatic child. It was hypothesized that asthmatics and/or those with asthmatic children would score significantly higher than those without asthma and/or without asthmatic children. Asthmatics and/or those who have children with asthma and those who do not have asthma and/or children with asthma did not differ significantly on their mean knowledge scores. See Table 5 for the results.

Table 5. T-test Results for Subgroup Comparisons on Knowledge Scores

Subgroup Comparison	N	Mean (SD)	t	Df	p
Asthmatic	13	8.34 (3.18)	0.56	71	0.29
Non-asthmatic	59	8.88 (2.82)			(one-tailed)
Health Teacher	34	8.79 (3.00)	-1.46	71	0.15
Non-Health Teacher	38	8.79 (2.79)			(two-tailed)
Trained	22	9.68 (2.80)	1.77	71	0.04*
Untrained	50	8.40 (2.84)			(one-tailed)
Supervise	30	8.83 (2.53)	0.10	71	0.92
Do Not Supervise	42	8.76 (3.12)			(two-tailed)
More Educated	45	8.42 (2.87)	1.303	71	0.20
Less Educated	27	9.35 (2.88)			(two-tailed)

*Statistically significant at the .05 level

A two tailed t-test was conducted to compare those survey participants who have taught health classes (in addition to physical education) and those who have not taught health classes (in addition to physical education) on knowledge scores. Health teachers and non-health teachers did not differ significantly on knowledge scores. See Table 5 for results.

A one tailed t-test was also used to compare mean knowledge scores of those survey participants who have received training on exercise-induced asthma and those who have not received training on EIA. It was hypothesized that those who have received training would score significantly higher than those who have not received training. Those who had been trained and those who had not been trained differed significantly on their knowledge scores, with trained individuals scoring significantly

higher than those who had never attended training. The null hypothesis was thus rejected. See Table 5 for results.

A two tailed t-test was conducted to compare mean knowledge scores of those who supervise children when they use their inhalers and those who do not supervise children while they use their inhalers. Those who supervise children while they use their inhalers and those who do not supervise children while they use their inhalers did not differ significantly on their knowledge scores. See Table 5 for results.

Lastly, a two-tailed t-test was used to determine if there was a difference in the mean knowledge score of those who have obtained more formal education (a master's degree, beyond a master's degree, or doctoral work) versus those who have obtained less formal education (a bachelor's degree or some master's work). Those who are more educated and those who were less educated did not differ significantly on their knowledge scores. Although no statistically significant difference was detected, the mean score for the less educated was 9.4 versus 8.4 for the more educated. See Table 5 for results.

Chapter 5

Discussion

This study sought to investigate the knowledge that physical education teachers have of exercise-induced asthma (EIA). This small-scale study provided some baseline information on an issue never before systematically examined in the United States. While the sample size was not quite large enough to generalize to all of physical education teachers in the two sampled school districts, it did present useful data and provided information to substantiate a rationale for future investigation in this area.

The response rate for this study was 30%, which is similar to the average of 30% response rate found in other studies that have questioned teachers on asthma (Atchison & Cuskelly, 1994; Bevis & Taylor, 1990; French & Carroll, 1997; Henry, et al., 1994; Hussey et al., 1999). This could be due to the fact that the respondents were provided with a stamped return envelope and/or because they had the opportunity to enter a drawing. This response rate could also have been due to the fact that the participants had a vested interest in the topic (80% of the survey participants indicated they wanted results from the study).

Results of Hypothesis Testing

Several t-tests were conducted to see if a mean difference existed between groups. The only groups found significantly different on mean knowledge scores were those individuals who have had some training on the topic and those who have not had training on the topic. The remaining t-tests did not find significant differences between the following groups: (a) those teachers who have taught health classes other than physical education and those who have not taught health classes other than physical education; (b)

those individuals who supervise children while using their inhalers and those who do not supervise children while using their inhalers; those who supervise students when they are using their inhalers and those who don not supervise students when they are using their inhalers (c); and (d) those who have obtained more formal education (master's degree, beyond master's degree, some doctoral work) versus those who have obtained less formal education (bachelor's degree, some master's work).

Hypothesis One

There were no significant differences found in asthmatics and/or parents of asthmatics versus non-asthmatics and/or those without asthmatic children. It was hypothesized that asthmatics would score significantly higher. It should be noted that the sample size for the asthmatics was disproportionately smaller (n=13) than the group who was non-asthmatics (n=59). This falls within the estimated percentage 12%-30% of the world's population, as cited in the literature review of this study. It should be noted that there is a large standard deviation among the asthmatic group, which may have affected the ability to detect a difference if it did in fact exist.

The literature review conducted for this study did reveal that significant differences in knowledge of asthma have been found between asthmatics and non-asthmatics in some studies (Atchison & Cuskelly, 1994). Bevis and Taylor (1990) did not find significant differences in knowledge of asthma between those who have had exposure (personal, relative, or having had a student) and those who have not had exposure. The findings in this study may have uncovered another problem, in that it may suggest that those individuals who have asthma and or a child with asthma may not be very knowledgeable about their disease. In turn, they may not have a sound understanding of precautions that need to be taken when modifying students' physical education activities. Educating these individuals could also allow them to make better decisions concerning their own personal asthma management.

Hypothesis Two

There are some potential explanations for the findings from the comparison among the teachers who have taught health education in addition to physical education and those who have not. Many physical education teachers are forced to teach health education classes with minimal or no other training than their physical education curriculum they studied in college. In addition, the Michigan Model for Comprehensive School Health Education does not call for expertise of physical education teachers in the area of asthma and exercise-induced asthma.

These findings are noteworthy because they suggest that asthma and exercise-induced asthma may not be looked at as a serious health issue in the schools where these physical education teachers are working. If those individuals who are teaching health education are no more knowledgeable about the topic than those who are not teaching health classes, it raises a question as to whether there is an awareness about issues such as asthma and exercise-induced asthma. Lastly, it suggests that there may be a lack of knowledge of the ways in which asthma and exercise-induced asthma is affecting the health and welfare of students who are living with the disease. In other words: Are teachers who are teaching health education aware of the absences and quality of life issues caused by the disease? These are health issues that arguably could belong in education curriculum to address the needs of students.

Future hypothesis testing is needed to determine whether students are getting information on childhood diseases that are affecting them. Also, examining the training of those individuals who are teaching health education is schools would answer some of the questions that have been raised. Assessing the training and qualifications of teachers who are teaching health education would be the first step in deciding whether they should or could teach students about diseases that are affecting them on such a wide scale. Lastly, health education teachers may prove to be an untapped resource in teaching students about disease management and recognizing when a child needs to seek medical attention when experiencing symptoms of an illness such as asthma or exercise-induced asthma.

Hypothesis Three

The third t-test conducted compared mean knowledge scores between those who have been trained on this topic and those who have not been trained on this topic. It was hypothesized that those who have had training on the topic would score significantly higher than those who have not had training. This hypothesis was supported. The trained group scored significantly higher than the untrained group.

The literature review supported the findings of this study. Henry, et al. (1994) were able to demonstrate improved knowledge in asthma scores in all areas tested except management and medication following a two-hour seminar. The significance of these findings is that they have demonstrated that training can improve knowledge in particular topics related to asthma and exercise-induced asthma. This demonstrated success also provides a rationale for future research in this area.

Hypothesis Four

Another comparison that was examined was the difference in mean knowledge scores between those who supervise children while they use their inhalers and those who do not. The results of the two-tailed t-test revealed that there was no significant difference in mean knowledge scores of the two groups. These findings may have been impacted by the law in Michigan. This law allows children to handle their own medication if given permission to do so by a parent or health care provider.

Teachers may feel differently about the necessity of supervising elementary aged students versus high school aged students. In other words, teachers supervising older children may not feel as great a need for such knowledge, or have the expectations that these students are mature and responsible enough to take the medication regardless of whether or not they are being supervised. Another possible explanation for these findings can be found in the response given to question P2 of the survey which asked whether or not elementary teachers should be responsible for ensuring that proper medications be taken by their asthmatic students prior to engaging in physical activity. The entire survey group average for this question was 3, or "not sure". Hussey, et al. (1999) found that school-teachers in England were concerned that their intervention or handling of medication could jeopardize the child's health rather than help it. Bevis and Taylor (1990) found that the teachers that they surveyed had concerns over the supervision of children when using their inhalers due to overdoses, loss of the inhaler, or the children having an unhealthy attachment to it.

These findings could have important implications. They suggest that those who are supervising and handling medications are not knowledgeable about them, and thus

Hypothesis Four [illegible]

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can be found [illegible]
not elementary [illegible]
taken by their [illegible]
group average [illegible]
school-teacher [illegible]
medication [illegible]
(1990) found that [illegible]
children when [illegible]
having an unhealthy [illegible]

These findings [illegible]
are supervising and [illegible]

could potentially make uneducated decisions. As the findings of the literature review reveal, some teachers feel as though their lack of knowledge could actually jeopardize the child, rather than help. Further, a physical education teacher who is supervising a student who is not using their medication properly needs to be aware of the fact that the student is not using the medication the way it was intended to be used. This could potentially cause liability issues, and thus reinforces the need for knowledge in this area, as well as standardized policies for handling asthma and other health related issues.

Hypothesis Five

The last comparison made was a two tailed t-test between those who have obtained more formal education and those who have obtained less formal education. There was no significant difference in mean knowledge scores between the two groups. A potential explanation in this finding could be the difference in the education that older teachers received. For example, exercise physiology has evolved over time. The research findings and knowledge on illnesses like exercise-induced asthma progress over time. Therefore, those participants who have been teaching for a longer period of time may not have had the same information made available to them as more recent graduates did.

Another possibility that needs to be considered is what type of education those in the more educated group have obtained. Even though they have completed a master's degree or beyond, it doesn't necessarily mean that the advanced study is in the physical education realm. Bevis and Taylor (1990) conducted a similar comparison and found no significant difference between groups of teachers who had obtained more formal education and those who had obtained less formal education. These findings are

significant in that it exemplifies the need for teachers of all educational levels and experience to be educated on the topic of exercise-induced asthma.

In summary, the only variable examined in this study that seems to make a difference in terms of mean knowledge scores is the training, supporting the rationale that training and formal education on the topic can help a teacher to better understand prevention, management, medication, and emergency action with respect to the disease. It should be noted that the individuals who chose to return their surveys are more likely to find this topic to be worthy and important than those who failed to participate in the study. Every person who responded indicated that they had had a student with EIA or asthma. Therefore these respondents may have an interest in the topic versus those who may never have had a student with EIA or asthma.

Limitations in Teacher Knowledge

The results of the questions that made up the medication sub-topic of the survey highlighted the greatest knowledge deficit of participants. The literature review summarizes results from many surveys that cover asthma in general. Responses to these surveys typically showed that EIA was the sub-topic area where knowledge was most lacking (Bevis and Taylor, 1990; French & Carroll, 1997; Gibson et al., 1995; Hussey et al., 1999). The current study revealed while 42% of the participants supervise children while they use their inhaler, 60% could not identify the name of the most effective medication for preventing an exercise-induced asthma attack. Further, 74% did not know that beta-adrenergic medications are the most effective type of medications used by individuals with EIA. These results are of interest as they indicate that the teachers involved in this study are supervising children while they are using medication, yet they

may not be very knowledgeable about the medication or method of administration. If physical education teachers are being left to supervise students and their medication, they need to have the resources and training so they can help children manage their disease and not inadvertently cause problems that could have been prevented.

The literature review conducted for this study presents the two more prominent theories on mechanisms and triggers of EIA. The type of exercise, the intensity of the exercise, the environmental conditions while exercising, and the duration of the exercise can all contribute to EIA (Wilkerson, 1998). However, the results of the survey issued in this study indicate that 53% of the respondents did not know that exercise is the most likely trigger of an asthma attack in children with controlled asthma. Another question in the survey asked whether or not participating in physical activities in the cold wind would increase the likelihood of an asthmatic having an asthma attack. While the correct answer to this question is yes, 40% of the teachers who answered this survey did not know that fact. This has potential repercussions in that teachers make decisions on gym class activities on a daily basis. If they are not aware that holding physical education classes outside on a cool day could be very dangerous for an asthmatic student, it could potentially cause otherwise preventable problems for the student.

The medical criteria for EIA were also discussed in the review of literature. Those criteria included clinical measures for determining whether or not someone has asthma. However, the literature also emphasized the need for field practitioners to have an understanding of signs and symptoms of asthma because oftentimes diagnostic tests are not available and undiagnosed asthmatics may be among the student population. The participants of this study were asked if they knew what factors indicate that a child is

experiencing a bad attack of asthma. The responses for this question indicated that 28% could not recognize the symptoms of an asthma attack. Further, 39% could not determine what were the most obvious features associated with asthma. These findings could also be considered alarming in that teachers may not even be able to recognize when a student is in distress or experiencing an asthma attack.

The overall knowledge of the participants was measured in terms of a mean score on the core 14 questions, each of which had only one correct answer. On average, respondents answered less than two-thirds of the questions correctly. There is not a criterion measure with which to compare this score; however, it certainly indicates a relatively low overall knowledge level of this study sample. As mentioned before, these results cannot be generalized to all teachers; however these data could serve as part of the rationale for conducting a similar study on a larger scale. This low level of knowledge is disturbing because these teachers must make decisions on the type of physical activities in which children with asthma and exercise-induced asthma must participate. Making decisions without the proper knowledge of the disease may cause otherwise preventable problems for students with EIA.

Implications for School Administrators

Medication Availability

There are many school-related issues concerning students with asthma or EIA. During the school year, youth spend a large percentage of their time at school, thus increasing the likelihood of experiencing an asthma-related emergency while at school. One topic of concern for students with respect to school is the availability of their inhaler. When asked if they allow asthmatic children to keep their inhalers with them, 81% of the

participants indicated that they did allow children to do so. However, 20% indicated that they did not allow children to keep their inhaler with them. This rate is lower than the rate found in the literature review, which cited that 39% of the teachers surveyed in London did not allow children to keep their inhalers with them (Bevis & Taylor, 1990). Another study conducted in England found that 65% of the 29 schools reporting said that students were required to hand in their inhaler to a school staff member (Hill et al., 1987). The disparity in rates could be due to the fact that Michigan has passed Public Act 10, which allows school children to possess and use their meter-dosed inhaler with proper authorization from their health care provider and parent. Although only 20% did not allow children to keep their medication, it is not known if the parent chose that option or if the teacher decided to hold the medication. In this case, teachers need to be aware of the law as well as make sure that the medication is available or that there is no delay in the student accessing the medication if a situation should arise where the student needs it.

Medication Supervision

Another issue relevant to school is the supervision of the youth when using their medication. The literature reviewed for this study found varying rates. Of the 147 schoolteachers in Ireland who were surveyed on this topic, 70% indicated that they were responsible for supervising medication administration (Hussey et al., 1999). In addition, 63% of the 164 teachers surveyed in Australia supervised asthmatic children when taking their medication. Only 42% of the respondents of the current study indicated that they supervise children while using their inhaler. This, too, may be attributed to the passing of Public Act 10, thus leaving the responsibility with the student rather than the teacher.

Teachers' attitudes concerning their responsibilities. The survey participants were also asked their feelings on the whether or not elementary teachers should be responsible for ensuring that proper medications are taken by their students prior to engaging in physical activity. The response rate illustrates that 50% either disagree or strongly disagree with that statement, thus indicating that half of the teachers do not feel as though they should be responsible for supervising students' medication. The literature review on this topic found that 42% of the teachers surveyed in Australia by French and Carroll (1997) also felt that it is not the responsibility of the teacher to ensure that the necessary drugs be taken prior to physical exercise. This is notable because it suggests that teachers may not feel as though this type of responsibility should be left to them. This raises an interesting question for future policy research: Should this type of responsibility be left to teachers?

Policy. Michigan Public Act 9 concerns liability of school personnel and administration of medication. This Act states that a school administrator, teacher, or other school employee designated by the school administrator, who in good faith administers medication to a pupil in the presence of another adult or in an emergency that threatens the life/health of the pupil, is not liable in a criminal action. When asked about this Public Act, 22% did not answer correctly and 32% were not even aware of the Act. This, too, is of concern in that some of the participants in this study were not even aware of the law concerning the issue, or were incorrect in their understanding of it.

In addition to the law concerning the administration of medication, school policy is another standard that teachers need to be more aware of in order to properly administer medication and handle asthma related emergencies. The literature review for this study

revealed that many schools surveyed (which were located in other countries) did not even have a policy concerning medication handling and administration or emergency protocol (Atchison & Cuskelly, 1994; Bevis & Taylor, 1990; French & Carroll, 1997; Henry et al., 1994; Hussey et al., 1999). The respondents to this study indicated that 49% worked at a school that had a policy for handling an asthma attack. Therefore, 51% either did not have a policy or were unaware of whether a policy existed or not. A standard of care must be established to ensure the proper steps are taken in handling medication or an asthma emergency. Without a school policy, a teacher is left to make decisions without having an established plan to best help the student.

Need for Training About EIA

While the results of this survey indicate that more education may be needed, a question was also presented in the survey to see if teachers would take advantage of the education if it were available. The literature has indicated that teachers feel as though they need more education on asthma in general, but there is not literature that has looked at EIA specifically. However, this study did ask that question, and 88% of respondents reported that they are not satisfied with their current level of knowledge on the topic. Thirty one percent of the participants had received some training on the topic; however, 91% said they would attend training on the topic if it were offered. These results are consistent with those of French and Carroll (1997) who found that 91% of the Australian school-teachers they surveyed did not feel they knew enough about asthma. Hussey et al. (1999) found similar results, noting that 88% of the teachers they surveyed in Ireland were not satisfied with their knowledge of asthma.

The fact that the survey was returned indicates that the study participants may have a higher level of interest in the topic compared to nonrespondants. However, with such a large percentage indicating that they were not satisfied with their current knowledge, combined with their willingness to attend training, the result further supports the rationale for developing some type of training for physical education teachers. Furthermore, if the respondents represent the more interested portion of the targeted survey population, one might speculate that the knowledge level of the non-responding teachers was even lower than that measured in the respondents.

Recommendations

Tracking EIA Prevalence

The literature review conducted for this study also exposed a great need for better tracking of EIA, especially among school aged youth. Statistics on asthma in general are readily available from the American Lung Association, the National Heart, Lung, and Blood Institute, the Centers for Disease Control and Prevention, and the Michigan Department of Community Health. However, there was little information on specific EIA prevalence rates among school children. Unfortunately, this study was not able to address this need due to the small sample size and the type of participants involved. However, the fact that every participant indicated that he or she has had an asthmatic student at some point in their teaching career reinforces the fact that the prevalence rates for EIA need to be measured due to the fact that reported rates for this disease have varied widely (Wilkerson, 1998; Bransford, et al. 1991; Kukafka et al., 1998; Nichols & Longsworth, 1995; Vacek, 1999; Rupp, et al. 1992).

The lack of data on this topic is very evident. A better method of tracking and surveillance of EIA is necessary. The Michigan Department of Community Health (MDCH) has begun work on the improvement of statewide surveillance and monitoring of asthma control. MCDH has also started work on a centralized database of asthma information, which will also serve as a resource to schools and teachers. Further, the MDCH is in the infancy stages of work to explore the feasibility, benefits, risks, and cost of a screening system capable of identifying uncontrolled and unrecognized asthma in school aged children. It is recommended by this study investigator that this system should include the tracking of EIA and its role in causing or triggering asthma, as well as emergency room visits due to EIA triggered asthma attacks.

Resources

Michigan has several local asthma coalitions which bring public and private stakeholders together on a volunteer basis to work on a variety of asthma control and education efforts, including school-based interventions. This is a good resource for schools and educators to tap for expert advice and/or potential speakers for in-service programs to educate teaching staff. It is imperative that individuals who are providing asthma education services provide core competencies and possess adequate qualifications. These coalitions are a great place to find that expertise, and oftentimes these organizations have grant monies available for projects like teacher education. These coalitions would serve as a good resource for schools that have limited time and resources to develop and/or conduct training.

Well-designed, comprehensive, and easily accessible learning opportunities and informal resources are needed to assist physical education teachers. The National Heart,

Lung, and Blood Institute has developed a handbook for teachers and coaches who want to help students with asthma participate in sports and physical activities. It covers the causes of asthma, symptoms of an asthma attack, how to avoid and control asthma triggers, how to help students who take medications, and how to modify activities to match children's current asthma status. The handbook comes with a video and a reproducible student asthma action card. This handbook provides national guidelines set forth by the National Institute on Health, and could easily be distributed to physical education teachers at schools with minimal to no cost to the school. This option would be a good resource for those schools that have limited time and resources to formally train their staff.

Education

Wide scale attempts to educate physical education teachers about EIA specifically have not been made. The literature has not demonstrated what is the best method to educate teachers on the topic of asthma. Henry, et al. (1994) demonstrated that a two-hour seminar produced significant differences in asthma knowledge among school staff. However, Atchison and Cuskelly (1994) conducted a study with a similar design to Henry, et al. (1994) and failed to produce significant results based on pre and post-test scores.

In terms of the development of staff in-service training, it is recommended that this be done on more than one occasion during the school year, as it has been demonstrated that a one-time in-service is not always effective (Atchison & Cully, 1994). In addition, it is recommended that the in-service should adopt and provide written

materials that are consistent with accepted guidelines and standards, such as those provided by the National Heart, Lung, and Blood Institute.

Information provided in an in-service for staff should include the following topics: (a) overview of what exercise-induced asthma is and simple physiology of the disease; (b) prevention; (c) signs and symptoms; (d) triggers; (e) medications and the administration of them; (f) the law in Michigan as it pertains to access to and administration of meter-dosed inhalers; (g) emergency action plans; (h) activity modifications; and (i) further resources on the topic. There are many components necessary to provide physical education teachers with the knowledge they need. Therefore, it is recommended that this information be shared in two or three 1-hour sessions.

There are also several organizations in Michigan which provide access to physical education teachers and other professionals who could benefit from this type of education or in-service. The Michigan High School Athletic Association would be one such organization. Another organization that could be approached with this type of educational opportunity would be the Youth Sports Institute at Michigan State University. Lastly, the American Lung Association of Michigan, which already has school-based asthma programs, could be a potential partner or granting agency to develop this type of program and evaluate its effectiveness.

Conclusion

It is the plan of the researcher that this study will serve as a foundation to conduct future testing in this area, as well as to develop educational materials and programs for physical education teachers and other professionals that work with youth who have

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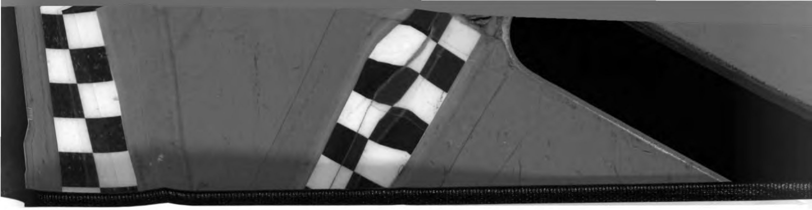
asthma and EIA. This study has demonstrated on a small scale that education in this area is needed and would be utilized if provided. It is the intent of the researcher to secure grant funding from one of the agencies discussed to develop education opportunities for physical education teachers in Michigan. Physical educators have access to a large population of school-aged children who participate in physical activity. Improving their knowledge on this topic would serve to improve their decision-making capabilities concerning the health and welfare of their students.

APPENDICES

APPENDIX A

Cover Letter



Laura Kennett

April, 2001

Dear Physical Educator,

I am a graduate student at Michigan State University and I am currently gathering information that is vital to my thesis and that I hope will result in benefits to children with exercise-induced asthma. As a physical educator, you play a critical role in encouraging healthy attitudes and exercise habits in young children. Your response to this ten minute survey will help me and my colleagues develop improved methods of informing teachers and coaches about prevention and treatment of exercise-induced asthma.

This short questionnaire is completely confidential. You do not need to provide your name or identify yourself in any way, nor is there any identifying mark or code on your survey. However, as a small compensation for your time, you may chose to be entered in a drawing for a $50.00 gift certificate to MC Sports by completing and returning the enclosed information sheet. If you decide to do this, I will maintain your anonymity by separating your contact information from your survey before I look at your responses. You can also use the information sheet to request a summary of the study. I have also provided my contact information in case you want to ask me any questions at any time during or after the study.

I realize that teachers have hectic schedules and that you have a very long "to-do" list. However, the information you provide may some day serve to help a child. It will also help me complete my thesis, and graduate. Please return your completed survey no later than May 31, 2001. Thank you very much for considering helping me out. Your assistance to me would be appreciated more than you know.

Sincerely,

Laura Kennett
Graduate Student
Michigan State University
Department of Kinesiology

APPENDIX B

Informed Consent

Informed Consent

I am a graduate student at Michigan State University. As part of my thesis, I am administering this survey on Exercise Induced Asthma (EIA). Participation is voluntary. You indicate your voluntary agreement to participate by completing and returning the survey. You may choose not to participate at all, may refuse to answer certain questions, or may discontinue your participation at any time without penalty. Responses will be kept confidential to the maximum extent allowable by law. Please DO NOT put your name on the survey. Results will be reported in aggregate form in my completed thesis and possibly in professional journals or at professional meetings. There are no known risks with participation in this study. Participation will require approximately 10 minutes of your time. If you have any questions, I can be reached at (616) 447-0682 or at laurakennett@netscape.net. If you have any questions concerning your role and rights as a participant of human research, you may contact Dr. David E. Wright, Chair of the University Committee on Research Involving Human Subjects at (517) 355-2180.

Filling out the bottom portion of this form is only necessary if you would like to be entered into a drawing, or would like to get survey result information. In order to compensate you for returning your completed survey, you may fill out the form below to be included in the drawing for a $50.00 gift certificate to MC Sports. When I receive this informed consent with your survey, I will immediately separate the two so as to maintain your anonymity. Again, you may choose not to fill out this form when you return it with your survey.

Name: ________________________________ Date:________________________

Address: ____

City, Zip Code: ____

Phone: ____

Email Address: ____

_____Yes, I would like to be included in the drawing

_____Yes, I would like information on the results of this survey

I am a graduat [illegible]
administering th [illegible]
You indicat [illegible]
survey. You [illegible]
or may [illegible]
kept confid [illegible]
name on th [illegible]
and possib [illegible]
risks with [illegible]
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Universit [illegible]

Filling [illegible]
entered [illegible]
compensati [illegible]
be includ [illegible]
informed [illegible]
your anony [illegible]
your surv [illegible]

Name [illegible]

Address [illegible]

City, Zip [illegible]

Phone [illegible]

Email Add [illegible]

____ Yes [illegible]

____ Yes [illegible]

APPENDIX C

Exercise-Induced Asthma Survey

Exercise-Induced Asthma Survey

Directions: Please circle the ONE item you feel is the correct response.

General knowledge

K1) What is exercise-induced asthma?
1) mucus production in the airways caused by physical activity
2) a psychological disorder that causes panic and inability to breath during physical activity
3) acute, reversible airway obstruction triggered by physical activity
4) I don't know

K2) Swimming is the only exercise that is suitable for individuals with asthma or exercise-induced asthma
1) Strongly Agree
2) Agree
3) Not sure
4) Disagree
5) Strongly Disagree

K3) Full participation in sport should NOT be encouraged to individuals with asthma or exercise-induced asthma
1) Strongly Agree
2) Agree
3) Not sure
4) Disagree
5) Strongly Disagree

Prevention

P1) Playing games/physical activities in the cold wind increases the likelihood of an asthmatic having an asthma attack.
1) True
2) False
3) Don't know

P2) Teachers of elementary aged children should be responsible for ensuring that proper medications are taken by their students with asthma prior to engaging in physical activity.
1) Strongly Disagree
2) Disagree
3) Not sure
4) Agree
5) Strongly Agree

P3) Which of the following is MOST likely to inflame an asthma attack in an asthmatic child?
1) sudden changes in temperature
2) teacher punishment
3) parental anxiety about child's health
4) too much medication
5) I don't know

P4) Which of the following activities should NOT be undertaken by children with controlled, mild asthma?
1) swimming
2) running
3) hockey
4) all of the above can be done safely
5) I don't know

P5) Which is the MOST likely to bring about an asthma attack in children with controlled asthma?
1) fear
2) anxiety
3) exercise
4) I don't know

Signs and Symptoms

S1) Wheezing after exercise suggests that a person has asthma
1) Strongly Disagree
2) Disagree
3) Not sure
4) Agree
5) Strongly Agree

S2) Asthmatic students are generally less competent at sports
1) Strongly Agree
2) Agree
3) Not sure
4) Disagree
5) Strongly Disagree

S3) What factor indicate that a child is experiencing a bad attack of asthma?
1) inability to talk
2) presence of wheeze in a distressed child
3) development of vomiting
4) preoccupation with breathing
5) all of the above
6) I don't know

S4) What is the most obvious feature associated with asthma?
1) bouts of coughing
2) wheezing
3) breathlessness / gasping for air
4) all of the above
5) I don't know

Medication

M1) Antibiotics are the most important part of treatment for most children with asthma.
1) True
2) False
3) Don't know

M2) Taking medication for exercise-induced asthma as prescribed before physical activity/games should reduce the likelihood of an asthma attack.
1) True
2) False
3) Don't know

M3) Prior to physical activity, beta-adrenergic medications are the most effective type of medications used by individuals with exercise-induced asthma
1) True
2) False
3) Don't know

M4) Do you supervise asthmatic children when they use their inhalers?
1) Yes
2) No

M5) Which of the following medications is most effective at preventing an exercise-induced asthma attack?
1) Claritin
2) Penicillin
3) Ventolin
4) I'm not sure

Emergency Action

E1) Does your school have a policy on how to handle an asthma attack?
1) Yes
2) No
3) I don't know

E2) When should an ambulance be called for an asthmatic child?
1) when the child coughs regularly
2) when the child complains of wheezing
3) when the child is wheezing slightly and irritable
4) when the child has had two puffs of their quick acting asthma medication within 6 hours
5) none of the above
6) I don't know

E3) When a child has a severe attack of asthma and the asthma has not improved after several doses of medication, which is the MOST crucial procedure that needs to be implemented
1) keep the child in the sick bay or with the school nurse
2) contact a parent or guardian
3) administer prescribed inhaler every 3 hours
4) call an ambulance
5) I don't know

Training

T1) Do you feel that you know enough about exercise-induced asthma?
1) Yes, I am completely satisfied with my knowledge
2) No, I am not completely satisfied with my knowledge

T2) Would you attend training on this topic if it were offered?
1) Yes
2) No

T3) Have you ever had any training on asthma or exercise-induced asthma?
1) Yes
2) No

T4) If yes to the previous question, where did you obtain the education?
1) in-service or seminar
2) college or university
3) community organization
4) local health care agency / hospital
5) Other: ____________________

Background Information

B1) Do you allow asthmatic children to keep their inhaler with them?
1) Yes
2) No

B2) Do you currently have, or have you ever had exercise-induced asthma?
1) Yes
2) No

B3) Do you have an asthmatic child?
1) Yes
2) No

B4) Do you currently, or have you ever had, an asthmatic child in your class?
1) Yes
2) No

B5) Do you currently, or have you ever taught health classes other than physical education?
1) Yes
2) No

B6) Are you currently CPR certified?
1) Yes
2) No

B7) What is your gender?
1) Male
2) Female

B8) Are you aware of Public Act 9 in the state of Michigan?
1) Yes
2) No

B9) A school administrator, teacher, or other school employee designated by the school administrator, who in good faith administers medication to a pupil in the presence of another adult or in an emergency that threatens the life/health of the pupil is not liable in a criminal action
1) True
2) False

B10) How many years have you been teaching physical education?_____

B11) What grades do you teach?______

B12) How old are you?___________

B13) What is the highest level of education you have completed?
1) Associates degree from a 2 year college
2) Some undergraduate work
3) A Bachelor degree from a 4 year college
4) Some graduate work (Ph.D or Masters)
5) a Masters degree
6) Beyond Master's degree
7) Other: ___________________

Please return your completed survey on/before May 31, 2001 A stamped envelope has been provided. Mail to: Laura Kennett

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