AGRICULTURAL SCIENCE STUDENTS' PERCEPTIONS AND KNOWLEDGE OF HEARING LOSS

A Thesis

by

SUNNY LEIGH SLAYDON

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

December 2008

Major Subject: Agricultural Education

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Approved by:

Chair of Committee,	James Lindner
Committee Members,	Gary Briers
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ABSTRACT

Agricultural Science Students' Perceptions and Knowledge of Hearing Loss

(December 2008)

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Chair of Advisory Committee: Dr. James R. Lindner

This study is designed to examine participants' view of hearing loss as a critical health issue, the attitudes of people toward a person with a hearing impairment, the knowledge level of OSHA regulations pertaining to hearing loss, the general knowledge level of hearing loss and hearing impairment, and its causes, and participants attitudes towards wearing hearing protection. The study design is descriptive and correlational with data collected using a written questionnaire with a controlled population. Results were computed using the means and standard deviation for each factor.

The findings indicate that additional education and awareness is essential if changes are to occur in the areas of general knowledge of hearing impairment, the acceptance of hearing protective devices in the work place or school, and better interaction and communication with those who exhibit a hearing impairment. One area of specific improvement must be in how agricultural instructors are trained in the field of safety so that students involved in agricultural sciences are better prepared to protect his/her hearing while performing activities found in the agricultural business.

DEDICATION

Since you are precious and honored in my sight, and because I love you, I will give men in exchange for you and people in exchange for your life.

Isaiah 43:4

To Mom, Dad and Lindsay, I couldn't have made it without your love, support, and help on this journey the past two years! I love you more than you know!

ACKNOWLEDGEMENTS

The work before you is far from my own. There was any number of people who helped with the process that has lead me to this point. I know there will be many people whom I will forget to mention, but know that you are all very special to me and I thank you for your love and support through it all!

To my family, what can I say? Your love and support for the past two years has not gone unnoticed. I love you all and I thank God everyday that I have you!

To my friends, thank you for all your love and support these past two years. I truly couldn't have done this without you!

To my colleagues, thank you for putting up with me while I have endured on this journey. I know it wasn't easy working with me the past two years, but it was worth it!

To Dr. Lindner, thank you for showing me I could do this. You believed that I could write a thesis and here it is!

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CHAPTER I

INTRODUCTION

Much of the general public has the misconception that hearing impairments are usually present when a person is born. Though persons are born with genetic traits that impose a loss of hearing from birth, many other occurrences in one's life can contribute to the loss of hearing. A traumatic or catastrophic event may be the reason for a sudden or gradual reduction in the ability to hear, but everyday activities with no regard to one's hearing can also lead to a permanent impairment. A serious illness with a high fever, chronic ear infections, and noise induced hearing loss are examples of occurrences that can begin or perpetuate the loss of this sense.

"Agriculture is a noisy business. Levels of noise potentially damaging to hearing have been known to be associated with agricultural activities for nearly 60 years. High levels of noise are also found in the shops of programs preparing young people for careers in agriculture. The prevalence of high frequency loss of hearing ostensibly caused by over-exposure to noise has been found to be unacceptably high in students enrolled in general shop classes and in agricultural mechanics classes" (Woodford, Lawrence, Fazalare, Martin 1996, p. 34). "Agricultural education programs offer many unique hands-on opportunities to develop both valuable academic and vocational skills

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This thesis follows the style of *Journal of Agricultural Education*.

for its students. A variety of laboratories provide a setting for students to actively and experientially engage in scientific inquiry and agricultural applications. Positive safety attitudes, beliefs, and practices of agricultural science teachers are crucial for insuring students' educational opportunities are not hampered" (Hubert, Ullrich, Lindner, Murphy, 2003, p. 1).

"The role of teacher educators is important in developing the safety proficiency of current and future teachers. However, studies have indicated several voids exist in teacher preparation in laboratory safety (Forsythe, 1983; Jarrett, 1967; Rosencrans, 1996). In national studies of teacher educators, Forsythe concluded that teacher education provided minimal experiences and instruction designed to develop teacher competency in the field of safety. Instructors use a variety of materials while teaching safety, but appear to limit their instructional repertoire to demonstration (Dyer, Andreasen, 1999, p. 48).

It is hard to believe that a very noisy and possibly harmful environment can be a peaceful rural farm. (Lankford 2008, p. 1).

Statement of the Problem

Those who work on a farm, in metal shops, or other agriculturally based careers are unaware of the potential damage to their hearing due to the noise levels and durations to which they are exposed to specific noise levels in the agricultural environment. Those same individuals are also unaware of the regulations set forth by the Occupational Safety and Health Administration (OSHA, www.osha.gov) to protect their hearing from deteriorating over a lifetime of extended exposure to high decibel levels. Another issue is

that people are unsure of how to communicate effectively with people who have hearing impairments. Whether it is the hearing impaired person who is trying to conceal the impairment or the hearing individual who can not effectively communicate with an impaired person, the effectiveness of good communication is compromised. A final issue pertains to the attitudes of people towards wearing proper ear protection.

The Purpose of the Study

The purpose of the descriptive and correlational study is to acquire the knowledge of agricultural science students on what they know about hearing impairments; what causes hearing impairments in the agricultural world; safety regulations regarding hearing protection in agricultural environments, and their attitudes towards people with hearing impairments.

Objectives

1. To determine whether agricultural science students perceive hearing loss as a critical health issue facing people of the United States.
2. To understand the attitudes of agricultural science students towards those with hearing impairments.
3. To determine the knowledge level of agricultural science students on safety regulations set by government agencies with regard to hearing protection.
4. To determine the knowledge level of agricultural science students in regards to hearing impairments and their causes.

5. To understand the attitudes of agricultural science students on wearing hearing protective devices.

Hypothesis

H_{01}: Agricultural science students believe that hearing loss is a critical health issue facing the United States.

H_{02}: There is no significant difference in students' belief that hearing loss is a critical health issue facing the United States when differentiated by gender.

H_{03}: There is no significant difference in students' belief that hearing loss is a critical health issue facing the United States when differentiated by student classification.

H_{04}: There is no significant difference in students' belief that hearing loss is a critical health issue facing the United States when differentiated by classes.

H_{05}: There is no significant difference in students' attitudes toward people with hearing impairments when differentiated by gender.

H_{06}: There is no significant difference in students' attitudes toward people with hearing impairments when differentiated by student classification.

H_{07}: There is no significant difference in students' attitudes toward people with hearing impairments when differentiated by class.

H_{08}: Agricultural science students are unaware of federal agency regulations pertaining to hearing loss and/or hearing protection.

H_{09}: There is no significant difference in students' awareness of federal agency regulations pertaining to hearing loss and/or hearing protection when differentiated by gender.

H_{10}: There is no significant difference in students' awareness of federal agency regulations pertaining to hearing loss and/or hearing protection when differentiated by student classification.

H_{11}: There is no significant difference in students' awareness of federal agency regulations pertaining to hearing loss and/or hearing protection when differentiated by class.

H_{12}: Agricultural science students are unaware of hearing impairments and their causes.

H_{13}: There is no significant difference in students' knowledge of hearing impairments and their causes when differentiated by gender.

H_{14}: There is no significant difference in students' knowledge of hearing impairments and their causes when differentiated by student classification.

H_{15}: There is no significant difference in students' knowledge of hearing impairments and their causes when differentiated by class.

Definition of Terms

Audiogram – "Often called a 'hearing test', but there is no pass or fail; it is a written record of your hearing levels; your hearing threshold levels (the quietest sounds you can hear are measured in decibels (dB) at different frequencies from low (500 Hz) to high (8000 Hz)." (National Institute for Occupational Safety and Health, 2008)

Conductive Hearing Loss – “When injury or a medical condition affects the outer ear or middle ear (i.e. from the pinna, ear canal, and ear drum to the cavity behind the hear drum.” (National Institute for Occupational Safety and Health, 2008)

Normal Hearing – “Is measured from -10 – 25 dB.” (National Institute for Occupational Safety and Health, 2008)

Decibel (dB) – “A unit used to express the intensity of sound.” (National Institute for Occupational Safety and Health, 2008)

Frequency – “The number of cycles or completed alternations per unit time of a wave or oscillation.” (Random House Webster’s Dictionary, 1993)

Hearing Loss –“Is often characterized by the area of the auditory system responsible for the loss.” (National Institute for Occupational Safety and Health, 2008)

Hertz (Hz) – “The unit measurement for audio frequencies.” (National Institute for Occupational Safety and Health, 2008)

Mild Loss – “Is a hearing loss that ranges from 26-40 dB.” (National Institute for Occupational Safety and Health, 2008)

Moderate Loss – “is a hearing loss that ranges from 41-55 dB.” (National Institute for Occupational Safety and Health, 2008)

Moderate/Severe Loss – “Is a hearing loss that ranges from 56-70 dB.” (National Institute for Occupational Safety and Health, 2008)

Noise Induced Hearing Loss (NIHL) – “A sensori-neural hearing loss that is attributed to noise and for which no other etiology can be determined.” (National Institute for Occupational Safety and Health, 2008)

Permissible Exposure Limit – “OSHA-permissible limits; presently 90 dB; a time-weighted average exposure that must not be exceeded during any 8-hour work shift of a 40-hour work week.” (National Institute for Occupational Safety and Health, 2008)

Profound Loss – “Is a hearing loss that ranges from 91-100 dB.” (National Institute for Occupational Safety and Health, 2008)

Sensori-Neural Hearing Loss – “A hearing loss resulting from damage to the inner ear (from any source).” (National Institute for Occupational Safety and Health, 2008)

Severe Loss – “Is a hearing loss that ranges from 71-90 dB.” (National Institute for Occupational Safety and Health, 2008)

Sound – “Vibrations transmitted through an elastic medium, especially air that can be perceived by the ear.” (Random House Webster’s Dictionary, 1993)

CHAPTER II

REVIEW OF LITERATURE

One of the more important means of communication or obtaining information around us is through sound. We talk with other persons, get information on the weather by listening to the wind, thunder, or rain, know if a piece of machinery is running properly, or if an animal or child is in need. We listen to beautiful music and determine if the sound is useful and pleasing or if it is irritating, unpleasant, and possibly harmful. The latter, or the unwanted sounds, are called noise (Bean, 2008, p. 1).

"According to a study by Bunch (1937), noise at levels potentially damaging to the auditory system has been associated with agricultural activities for over 50 years. Tractors and the noise they generate were the primary focus of early studies (Bunch, 1937, Lierle and Reger, 1958). Since these reports, many articles dealing with auditory sensitivity of agricultural workers and/or sound levels associated with agricultural activities have appeared (Ouzts, 1969; Gregg, 1972, Jensen, 1966, Jones and Oser, 1968; Broste et.al 1989). In a study that expanded the analysis of noise in agriculture, Matthews (1986) included a wide variety of farm equipment as well as analysis of noise associated with animals linked with agriculture. The common conclusion of this research is that agriculture is a noisy professional pursuit" (Woodlord, Lawrence, Bartrug, 1993, p. 77).

"Noise induced hearing loss is a permanent hearing impairment resulting from prolonged exposure to high levels of noise. One in 10 Americans has a hearing loss that affects his or her ability to understand normal speech. Excessive noise exposure is the most common cause of hearing loss" (American Hearing Research Foundation 2008, p.

1). Twenty-five percent of the work force in the United States is regularly exposed to potentially damaging noise (American Hearing Research Foundation 2008, p. 1). Another area of concern is the effect of impact or impulse noise. Research has shown that sudden impact noise (welding metal dropped on a concrete floor) or impulse noise (a grinding wheel intermittently coming in contact with steel) can cause actual damage to parts of the inner ear (Bohne, 1976; Luz and Hodge, 1971). Depending on the decibel level, impact or impulse noise levels can cause temporary loss of hearing activity or can result in damage that is permanent (Reynolds, 1990, p. 23). "Noise is not a new hazard. It has been a constant threat since the industrial revolution. Too much noise exposure may cause a temporary change in hearing or a temporary ringing in the ears. These short-term problems usually go away within a few minutes or hours after leaving the noise. However, repeated exposures to loud noise can lead to permanent, incurable hearing loss" (National Institute for Occupational Safety and Health 2008, p. 1).

Our ears interpret sound by interpreting pressure waves in the air. These waves are caused by movements of people, animals, machines, or anything else. When these pressure waves fall within a certain range of frequencies, we have sound. (Bean, 2008, p. 1). "Whether a sound is 'soft' or 'loud' is a subjective attribute of noise. It depends primarily upon sound pressure level and to a lesser extent, the frequency characteristics and duration of the sound" (National Institute fore Occupational Safety and Health 2008, p. 3). A large piece of equipment, such as a Combine, produces large and small waves, but a whisper produces on small pressure waves. (Bean 2008, pg. 1) "The size or amplitude of these waves is measured in decibels (dB). The decibel unit is used to indicate the loudness of sound as received or heard by the ear. The decibel scale is such

that the sound level doubles for each increase of ten number on the scale, i.e. 90dB(A) is twice as loud as 80dB(A)" (Bean, 2008, p. 1).

"Noise induced hearing loss (NIHL) is a significant social and public health problem. Much effort has been placed to reduce NIHL in occupational noise exposure in adults" (Chung, Des Roches, Meunier, Eavey, 2005, p. 2). "Occupational hearing loss in adults is a serious health problem in America." Current estimates indicate that approximately 28 to 33 million Americans experience severely impaired hearing from all causes, which significantly alter the quality of life for these individuals (Patel, et al 2001, p. 156). Hearing–impaired patients suggest that hearing loss alter physiological states (increased blood pressure, decreased vision), produces psychological and emotional problems (increased stress, elevated feelings of isolation), and can adversely affect speech patterns and communication efforts (Patel, et al 2001, p. 156). "Habitual exposure to noise above 85dB will cause a gradual hearing loss in a significant number of individuals, and louder noises will accelerate this damage. For unprotected ears, the allowed exposure time decreases by one half for each 5 dB increase in the average noise level. For instance, exposure is limited to 8 hours per day at 90 dB, 4 hours per day at 95 dB, and 2 hours per day at 100 dB. The highest permissible noise exposure for the unprotected ear is 115 for 15 minutes per day. Any noise above 140 dB is not permitted" (American Hearing Research Foundation 2008, p. 4). The National Institute for Occupational Safety and Health (NIOSH) recommends removing hazardous noise from the workplace. When that is not possible, it urges workers to wear hearing protection (National Institute for Occupational Safety and Health 2008, p. 1).

One issue concerning hearing impairment is a general lack of knowledge of NIHL and a historically apathetic attitude towards hearing safety. "During the 1990s agriculture was reported as one of the three most dangerous occupational industries in the United States" (Hubert, Ullrich, Lindner, Murphy, 2003, p. 2). Agricultural Education programs offer unique academic and vocational skill opportunities for students. Agricultural laboratories are a mix of classrooms, greenhouses, mechanic shops, school farms, and other facilities. While positive experiences in preparation for college or career in an agricultural field, they are less than ideal examples of a work environment. Lack of safety regulation knowledge by teachers and administrators challenge the meeting of educational goals. New teachers have been shown to be inadequately trained in safety practices. Experienced teachers show even less safety awareness in their approach to this phase of Agricultural Education. "Studies have reaffirmed that new teachers were inadequately trained in safety and experienced teachers were even less safety conscious than their professionally young colleagues (Hubert, Ullrich, Lindner, Murphy, 2003, p. 2). If teachers fail to promote and follow safety procedures, students may very well follow suit" (Hubert, Ullrich, Lindner, Murphy, 2003, p. 2).

"After a decade of studying the farming population and analyzing the results of audiometric and survey data, it is apparent and not surprising, that NIHL is a very large part of the personal lives of most farmers" (Lankford 2002) In 1996 Woodford, Lawrence, Fazalare, and Martin designed a study "to determine the extent of hearing loss experienced by high school agriculture teachers in West Virginia and the hearing conservation practices used by those teachers and their students. It was found that 78.3% of the teachers suffered from some high frequency hearing loss. Data analysis from this

study, specifically individual audiograms, was consistent with over-exposure to noise as a primary factor. The relatively large standard deviation indicated a considerable variability in the severity of the hearing loss. Questionnaire items indicated that a majority of the teachers (66%) did not recall ever being presented with information on hearing conservation in college. Of those who did receive information or education, most (63%) received one hour or less" (Woodford, Lawrence, Fazalare, Martin, 1996, p. 35).

"Instruction in agricultural mechanics is basic to all specialized programs in vocational agriculture. In 1973, Zurbrick found that over 86% of the employees in all agricultural job titles required one or more skills in agricultural mechanics. Noise levels in these educational laboratories often exceed the safety limits for noise set by OSHA. A circular saw produces 105 dBs of noise, a wood planer goes between 98-110 dBs and a chain saw can reach 110 dBs" (Miller, 1989, p. 62). Of all the responsibilities that a laboratory teacher performs, safety of students is the most important. According to Bruening, Hoover, and Radhakrishna (1991), physical safety of students and teachers is more important than what a student learns in an agricultural laboratory. It is expected that students will be properly supervised and taught proper safety skills in handling tools, equipment, and materials. Students, teachers, parents and the public must recognize the potential for accidents and injuries. The safety of all the work in Agricultural Education is a moral, professional, and legal obligation. (Dyer, Andreasen, 1999, p. 46).

"Agricultural science teachers have all been exposed to a number of noise sources and with many still engaged in farming, continued noise exposure is likely. Over one third (35%) never wear hearing protectors in their school laboratories, and only about 5% state they always do. Sixty two percent of the instructors reported that their school

furnished some type of hearing protection, while 46% indicated that students routinely use hearing protection. Fifty one percent said they have trouble getting students to use safety and health equipment. Safety glasses and hearing protection were most frequently cited as presenting the biggest problems. In those examples where there was no problem getting students to use safety equipment the major reason was the example set by the instructor and the enforcement of rules. The stated reasons for not using protective equipment were generally categorized as related to ignorance and attitude. Only 9% of the teachers reported that the sound levels had been measured in their shops, and none were aware of the results" (Woodford, Lawrence, Fazalare, Martin, 1996, p. 35).

The use of an annual hearing test has been suggested for all persons working in a farming environment. Hearing protection must be made available and farmers must be motivated to use these hearing protective devices (HPD)" (Lankford 2008, p. 1). "The increased spread of hearing loss from high frequencies through low frequencies with age and noise exposure is common for this population. In 1983 the U.S. Occupational Safety and Health Administration (OSHA) compared the hearing sensitivity values of persons 20-60 years of age, all farming populations showed dramatically more hearing loss than the comparison group. This trend repeated itself when the data was reviewed in 1990 by the International Organization for Standardization (ISO)" (Lankford 2008, p. 1). In 2002, James Lankford cites a study on the noise level of crop dusters. Twelve pilots were used in this test. It showed that the pilots were exposed to high levels of noise and they showed a greater hearing loss than pilots not exposed to the same noise levels. The study suggests that crop duster pilots should be included in hearing conservation programs and should wear HPDs" (Lankford 2008, p. 1).

"Since 1970 the Nebraska Tractor Test Center has measured sound levels, at the operator's ear, of a representative number of tractors. The average sound level of all new tractors tested in 1970 was over 98 dB at a maximum power and nearly 95 dB at a 50 percent maximum pull. Some older tractors produced as much as 111dB when tested. Although a few models were within the 85 dB range, most tractors being tested today, without cabs, still are at or over 91dB. These sound levels undoubtedly increase with age. Other machines such as self-propelled combines, corn pickers, hammer mills, and dryers produced sound levels exceeding 100 dB (Bean, 2008). Loud sounds can cause a significant loss of hearing. The amount of hearing loss experienced is related not only to the loudness of the sound but also to the frequency (pitch) and to the length of time exposure. Higher frequency sounds are much more damaging than low ones. Thus, the ability of the ear to hear high frequencies is usually the indication of damage. Some danger signals to be aware of are (1) ringing in the ear or one experiences head noises a few hours after getting off the tractor following a day's work, or (2) one's speech seems muffled when talking after being around loud noises for extended periods" (Bean, 2008, p. 3).

Since test data shows that the agricultural business is at a higher risk of NIHL, one must look at the means available to prevent or reduce the occurrences of NIHL in this profession (Bean, 2008, p. 4). "In accordance with current literature, it is recommended that educational programs for hearing loss prevention start in elementary school and continue through the 12^{th} grade. Hearing test should be provided by audiologist at farm shows and other farm events as a way of identifying individuals with potential hearing loss or those at risk for noise induced hearing impairment." (Lankford 2008, p. 2)

Farmers have the choice of obtaining and using hearing protection. The cost and inconvience of hearing protection is minimal when compared to the cost of hearing aids or deafness. Any reduction in noise is beneficial. People adjust to wearing hearing protection and often forget they are being worn. A reduction of stress and fatigue are other advantages of wearing HPDs. Acoustical earmuffs and properly fitted ear plugs are the two best barriers to reduce high levels of noise. (Bean, 2008, p. 4).

"Agricultural education laboratories and shops require teachers to exhibit proper safety behaviors as these have influence on student behavior/performance. Newcomb, et al. (1993) reinforced the need for teachers to demonstrate the specifics of safe, psychomotor operations and for student to be reminded throughout the course of safe practices. Teachers must set a good example, serve as role models, and practice what they preach. Today's litigious legal environment, combined with teaching and student injury rates, illustrates the need to ensure teachers and administrators are practicing proper safety practices, following applicable safety laws, exhibiting positive attitudes toward safety, and providing safe teaching and learning environments" (Hubert, Ullrich, Lindner, Murphy, 2003, p. 5).

The strong fear of being stigmatized lead many with Occupational Hearing Loss (OHL) and those exhibiting symptoms of NIHL to conceal the manifestations and consequences of this hearing loss in their everyday life. As a result, significant others, co-workers, employers, and the general population are not aware of the hearing loss that is affecting their friend, peer, subordinate, supervisor, or loved one. In the workplace the problem of OHL is viewed as inconsequential, and many times the effects are ignored. Within the family hearing difficulties are often not interpreted as such, but they

nevertheless affect the workers' significant others. People do not know how to facilitate communication with a person affected by OHL. (Waridel, 1994, p. 1)

Barriers or factors that block one from engaging in a certain action have been identified as a key variable in many health behavior change theories. Barriers to performing a health behavior must be low, benefits must be high, and individuals must perceive that the health issue is significant and relevant before a health behavior will be adopted. Although barriers to action have been studied across a number of health-related issues, such as immunizations, HIV/AIDS prevention, condom use, alcohol/drug abuse, and medical regime adherence, no consistent conceptualization or definition of the variable has emerged. One Study using coal miners as test subjects found five types of environmental barriers to using HPDs in their work environment. These five barriers were identified as being outside of the miner, meaning the miner had no control over the factors that caused them to not wear the protective devices. Patel et al (2001) found:

> The miners mentioned that economic issues played a crucial role in their decision to not protect their hearing. They were concerned about the possibility of job loss or demotion because they felt that if they complained about not being able to hear, then they might be demoted to a less desirable position or fired for safety reasons. By complaining the miners also worried about being labeled as a troublemaker and laid off, passed over for promotion, or passed over for overtime. (p. 162)
>
> The miners reported that medical issues prevented them from using hearing protection. When miners wore earplugs, instead of earmuffs, dust was

> often trapped in the outer ear, causing severe pain and outer ear infections. By simply not using the plugs, miners claimed that they alleviated the possibility of future occurrences of ear infection and pain. (p.162)
>
> A lack of enforced federal regulations often was cited as a significant reason why miner failed to protect themselves. Many miners stated that they did not use protection because there were no laws that mandated the consistent use of HPDs. This deficiency created an environment where foremen and supervisors enforced safety regulation regarding eyewear, heavy gloves, and proper footwear, but nothing in relation to hearing protection. (p. 162)
>
> The miners felt that the HPDs were uncomfortable, bulky, heavy, and restrictive. They called for improvements in the design of hearing protection muffs that facilitated their long term use. Miners said that using the earmuffs over the course of a 10 hour day was physically difficult. (p. 162)
>
> The final barrier was the work group itself. Over the years the miners had developed a system of efficiently working with crews and machinery to fulfill the job objectives. Any change to this system was seen as detrimental to their quality of work life. Because wearing hearing protection would necessitate a change in work habits (using hand signals rather than voice commands), the miners were reluctant to wear protective devices. (p. 162)

In addition to the outside barriers, the same study presented three individual barriers for the coal miners to not used hearing protection.

The perceived loss of hearing ability was commonly cited as a factor in not using a HPD. Most believed that while wearing the HPD, they would not be able to hear verbal commands from co-workers or hear the sounds of machinery gone awry. They were most concerned about being able to hear "roof talk" which is the sound of the tunnel as it settles. Those sounds are used to interpret the tunnel's safety and whether miners need to take evasive action for his and the other's safety. (p. 163)

The miners perceived the emotional experience of wearing a HPD as a concern. They feared that if they wore protection, they would experience negative emotions such as pain, fear, loneliness, and isolation. This barrier was present only in those miners who had never used hearing protection. Those who consistently wore hearing protection said they could still hear what their colleagues said and did not feel isolated. (p. 163)

The final individual barrier was the perceived social norms regarding hearing protection. When new miners joined a crew, they worked to fit into the culture established by the experienced miners. If those who had been doing the job for years did not see the need for hearing protection, they why should they spotlight themselves by doing something out of the norm. Miners stated that it was too late to change their habits pertaining to hearing protection. (p.163)

Life, even on the farm, is not all work related; people allow time for recreation and leisure. Music is often heard through individual speakers attached to an iPod or similar device. Since damage to hearing caused by high volume is

determined by its duration, continuous listening to an MP3 player, even at a seemingly reasonable level, can damage the delicate hair cells in the inner ear that transmit sound impulses to the brain (Valeo, 2005, p. 1). About 12 percent of children and teens in the country – more than 5 million – have noise-induced hearing loss. Hearing loss in general has doubled in the United States in the last 30 years (Wang, 2005, p.1). Hearing test have shown that excessive iPod use specifically affects high-pitched hearing. When we start having trouble with the higher pitches, we start misunderstanding conversations. As the loss worsens, people start having difficulty having conversations at all (Thepvongsa, 2005, p. 1) Hearing loss is permanent and additive, which means the longer one listens and the greater the volume, the more likely one will develop problems with their hearing over time (Wang, 2005, p.1).

CHAPTER III

METHODOLOGY

The type of research, sample population, instrumentation, validity and reliability, data collection, and statistical procedures that were used are described in this chapter.

Type of Research

The research design used for this study was descriptive and correlational in nature. The study was designed to examine the attitudes of people towards those with hearing impairments, their knowledge of the OSHA regulations as it pertains to hearing protection, their attitudes towards wearing ear protection, and their knowledge of hearing impairments.

This study has three dependent variables and several independent variables. The dependent variables are "hearing loss is a critical health issue facing people in the United States" issue question, attitudes toward those with a hearing impairment, and the knowledge of the OSHA regulations. The independent variables include: gender, their academic level, and class enrollment.

Sample Population

A controlled sample was used for this study. The sample consisted of 48 individuals who were enrolled in AGSC 327 (*N*=10), AGSC 301a (*N*=23), and AGSC 301b (*N*=13) in the spring 2008 academic semester at Texas A&M University, College Station, Texas. All respondents became participants and used in the study.

Instrumentation

The research instrument was designed based on the literature review and OSHA regulations. The instrument used in this study was a questionnaire that was divided into four parts. The first part was designed to measure attitudes towards people with hearing impairments. The participants were asked to indicate their agreement with ten statements by marking their responses on a five point Likert scale. The points on the scale are: 1= Strongly Disagree (SD); 2= Disagree (D); 3= Neither Agree or Disagree (N); 4= Agree (A); 5= Strongly Agree (SA). The level of measurement for this variable is interval.

The second part of the instrument was designed to measure the knowledge of the participant on the OSHA regulations as they pertain to hearing impairments and hearing loss. The participants were asked again to indicate their agreement with ten statements by marking their responses on a five point Likert scale. The points on the scale are: 1= Strongly Disagree (SD); 2= Disagree (D); 3= Neither Agree or Disagree (N); 4= Agree (A); 5= Strongly Agree (SA). The level of measurement for this variable is interval.

The third part of the questionnaire was designed to test the knowledge of the participant with regards to hearing impairments in general. The participants were asked to indicate the correct answer to the posed multiple choice question by marking their responses as “A”, “B”, “C”, or “D”.

The fourth part of the instrument was designed to gather data on personal characteristics and experiences of the participants. Gender was measured as either male or female. The level of measurement for this variable is nominal. The measurement of student classification was measured as Freshman, Sophomore, Junior, Senior, Post

Graduation, or Graduate Student. The level of measurement for this variable is nominal. The three additional questions in the fourth part dealt with personal habits and were answered as: “Always”, “Sometimes”, “Never”, and “I don’t…” The level of measurement for this variable is interval.

Validity and Reliability

This study pilot tested using a fixed sample. The internal validity and measurement error were controlled for by having a panel of experts review the instrument for content and face validity.

Data Collection

Data for this study was collected by having the questionnaire distributed to the sample population during class of AGSC 327, AGSC 301a, and AGSC 301b. During the last week of April, 2008, the questionnaire, containing an introductory letter (Appendix A), was distributed to students in the afore mentioned classes (N=48). The questionnaire was returned to the classroom professor on the same day as distribution. An assumption was made that all distributed questionnaires were returned and were included in the study.

Data Analysis

Data was analyzed using the Statistical Package for Social Sciences. (SPSS15, 2008)

Objective 1

To determine whether agricultural science students perceive hearing loss as a critical health issue facing people of the United States.

Scores for this issue question were described by frequencies, percentages, mean, and standard deviation.

Objective 2

The second objective is to understand the attitudes of agricultural science students towards those with hearing impairments.

Scores for this objective were described by frequencies, percentages, mean, and standard deviation.

Objective 3

The third objective is to determine the knowledge level of agricultural science students on safety regulations set by government agencies with regard to hearing protection.

Scores for this objective were described by frequencies, percentages, means and standard deviation.

Objective 4

The fourth objective is to determine the knowledge level of agricultural science students in regards to hearing impairments and their causes.

Scores for this objective were described by frequencies, percentages, means and standard deviation.

Objective 5

The fifth objective is to understand the attitudes of agricultural science students on wearing hearing protective devices.

Scores for this objective were described by frequencies and percentages.

The following null hypotheses were tested:

H_{01}: Agricultural science students believe that hearing loss is a critical health issue facing the United States.

The null hypothesis H_{01} was calculated by using the frequency of valid responses to the issue question.

H_{02}: There is no significant difference in students' belief that hearing loss is a critical health issue facing the United States when differentiated by gender.

The null hypothesis H_{02} was tested by calculating and presenting a t-test of independent sample tests for gender and computing the mean and standard deviation.

H_{03}: There is no significant difference in students' belief that hearing loss is a critical health issue facing the United States when differentiated by student classification.

The null hypothesis H_{03} was tested by using the mean and the standard deviation.

H_{04}: Agricultural science students are unaware of federal agency regulations pertaining to hearing loss and/or hearing protection.

The null hypothesis H_{04} was tested by calculating and presenting a t-test of independent sample tests for gender and computing the mean and standard deviation.

H_{05}: There is no significant difference in students' awareness of federal agency regulations pertaining to hearing loss and/or hearing protection when differentiated by gender.

The null hypothesis H_{05} was tested by calculating and presenting a t-test of independent sample tests for gender and computing the mean and standard deviation.

H_{06}: There is no significant difference in students' awareness of federal agency regulations pertaining to hearing loss and/or hearing protection when differentiated by student classification.

The null hypothesis H_{06} was tested by using the mean and standard deviation.

H_{07}: Agricultural science students are unaware of hearing impairments and their causes.

The null hypothesis H_{07} was tested by calculating and presenting a t-test of independent sample tests for gender and computing the mean and standard deviation.

$H_{08:}$ There is no significant difference in students' knowledge of hearing impairments and their causes when differentiated by gender.

The null hypothesis H_{08} was tested by calculating and presenting a t-test of independent sample tests for gender and computing the mean and standard deviation.

H_{09}: There is no significant difference in students' knowledge of hearing impairments and their causes when differentiated by student classification.

The null hypothesis of H_{09} was tested by using the mean and standard deviation.

CHAPTER IV

FINDINGS AND DISCUSSION

This chapter includes a presentation and discussion of the findings of the study.

Population Response

Agricultural Science students at Texas A&M University, College Station, Texas, (*N*=46) were the target population for this study. Table 1 shows that by the data collected during the last week of April, 2008, 98% of the total experiment sample had responded to the questionnaire. All responses were complete resulting in a usable response rate of 98%.

Table 1. Response of Population to Questionnaire

Groups	*n*	%
Respondents	44	98
Non-respondents	2	2
Total	46	100

As shown in Table 2, 17 (35.40%) respondents were male and 29 (60.40%) were female.

Table 2. Gender Distribution of Participants

Groups	f	%
Males	17.00	35.40
Female	29.00	60.40

Objective 1

Response to Issue Question

Issue question scores are described in this section. This variable included one statement that asked "Hearing Loss is a critical health issue facing people in the United States." By calculating the frequencies and percentages of the participant's responses to each statement, the statements were ranked by how the participants answered each statement. As shown in Table 3, 29 (60.40%) of the participants believe that hearing loss is a major health issue facing people in the United States. It also shows that 3 (6.30%) do not believe it is of major concern.

Table 3. Response to Issue Question

Groups	*f*	%
I agree	29.00	60.40
I disagree	3.00	6.30
I am not sure	12.00	25.00

Note. "N" does not equal 46 because two participants did not respond. M=1.61;SD=0.90

Table 4 shows that when differentiated by gender, there was no significant difference when asked if hearing loss is a critical health issue facing people in the United States, t (42) = .84, p >.05.

Table 4. Hearing Loss Is a Critical Health Issue Facing People in the United States by Gender

	n	*Mean*	*Std. Dev.*	*t*	*p*
Male	17	1.47	0.87	0.84	0.41
Female	27	1.70	0.91		

Note. Mean scores are a summated score for the construct.

Table 5 shows a significant difference when differentiated by student classification when talking about hearing impairments as a critical issue facing people in the United States, $F(3) = 3.91$, $p < .05$.

Table 5. Hearing Loss Is Critical Health Issue Facing People in the United States by Student Classification

	n	*Mean*	*Std. Dev.*	*F*
Sophomore	2	1.00	0.00	3.91
Junior	22	1.68	0.95	
Senior	14	1.21	0.58	
Graduate Student	6	2.50	0.84	
Total	44	1.61	0.90	

Note: “N” does not equal 46 because two participants did not respond.

Table 6 shows that when differentiated by Student Class, there is no significant difference when asked if hearing loss is a critical health issue facing people in the United States, $F(2) = .29$, $p > .05$.

Table 6. Hearing Loss Is a Critical Health Issue Facing People in the United States by Student Class.

	n	*Mean*	*Std. Dev.*	*F*
AGSC 327	10	1.50	0.85	0.29
AGSC 301A	21	1.57	0.93	
AGSC 301B	13	1.77	0.93	
Total	44	1.61	0.90	

Note: “N” does not equal 46 because two participants did not respond.

Objective 2

Description of Participants Attitudes toward People with a Hearing Loss

Attitudes toward people with a Hearing Loss are described in the section. This variable included ten statements that the participant had to rank them from either Strongly Disagree to Strongly Agree. By calculating the frequencies and percentages of the participant's responses to each statement, the statements were ranked by how the participants answered each statement. They ranked them as: Strongly Disagree, Disagree, Neither Disagree or Agree, Agree or Strongly Agree. In Table 7, it shows that most people have a positive attitude toward people with Hearing Impairments.

As shown in Table 8, when differentiated by gender, there is no significant difference of attitudes toward the hearing impaired, t (44) = 1.12, $p > .05$.

As shown in Table 9, when differentiated by student classification, there is no significant difference of attitudes toward the hearing impaired, F (3) = 2.14, $p > .05$.

Table 10 shows that when differentiated by student class, there is no significant difference of attitudes toward people with hearing impairments, F (2) = 1.31, $p > .05$.

Table 7. Attitudes Towards Person Who Are Hearing Impaired.

			Strongly Disagree (1)		Disagree (2)		Neither (3)		Agree (4)		Strongly Agree (5)	
Rank	Statement	*n*	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
1	I have difficulty communicating with people who have a hearing loss.	46	2.00	4.20	10.00	20.80	15.00	31.30	17.00	35.40	2.00	4.20
2	Wearing hearing protection while working with farm equipment is important.	46	0.00	0.00	1.00	2.10	3.00	6.30	21.00	43.80	21.00	43.80
3	I am or would be cooperative with people who have a hearing loss caused by working with farm equipment.	46	0.00	0.00	0.00	0.00	3.00	6.30	21.00	43.80	22.00	45.80
4	I am or would be cooperative with people who are born with a hearing loss.	46	0.00	0.00	1.00	2.10	2.00	4.20	15.00	31.30	28.00	58.30
5	I can be friends with a person who is hearing impaired.	46	0.00	0.00	0.00	0.00	0.00	0.00	16.00	33.30	30.00	62.50
6	It is important to wear hearing protection when working near loud machinery.	46	0.00	0.00	0.00	0.00	0.00	0.00	11.00	22.90	35.00	72.90

Table 7. Continued

Rank	Statement		Strongly Disagree (1)		Disagree (2)		Neither (3)		Agree (4)		Strongly Agree (5)	
		n	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
7	I am better than people who have a hearing loss.	46	1.00	2.10	0.00	0.00	3.00	6.30	6.00	12.50	36.00	75.00
8	I would communicate with a hearing impaired person if they needed help.	46	0.00	0.00	0.00	0.00	0.00	0.00	22.00	45.80	24.00	50.00
9	I would learn sign language if one of my friends was hearing impaired.	46	0.00	0.00	1.00	2.10	6.00	12.50	25.00	52.10	14.00	29.20
10	I would learn sign language if I became hearing impaired.	46	0.00	0.00	0.00	0.00	2.00	4.20	12.00	25.00	32.00	66.70

Note. The overall mean for this construct; M = 4.38; SD = .3

Table 8. Sum of Attitudes Toward People Who Are Hearing Impaired by Gender

	n	*Mean*	*Std. Dev.*	*t*	*p*
Male	17	4.32	0.35	1.12	0.27
Female	29	4.42	0.25		

Table 9. Sum of Attitudes Toward People Who Are Hearing Impaired by Student Classification

	n	*Mean*	*Std. Dev.*	*F*
Sophomore	2	4.40	0.14	2.14
Junior	24	4.34	0.28	
Senior	14	4.33	0.33	
Graduate Student	6	4.65	0.14	
Total	46	4.38	0.29	

Table 10. Sum of Attitudes Toward People Who Are Hearing Impaired by Student Class.

	n	*Mean*	*Std. Dev.*	*F*
AGSC 327	10	4.51	0.19	1.31
AGSC 301A	23	4.34	0.30	
AGSC 301B	13	4.33	0.33	
Total	46	4.38	0.29	

Objective 3

Description of Participants Knowledge of OSHA Regulations

Knowledge of OSHA regulations of the participants are described in the section. This variable included eight statements that the participant had to rank. By calculating the frequencies and percentages of participant's responses to each statement, the statements were ranked by how the participants answered each statement. They ranked them as: Strongly Disagree, Disagree, Neither Disagree or Agree, Agree, or Strongly Agree. In Table 11, it shows that those that participated in the survey are not aware of the OSHA regulations with regards to Hearing Loss.

As shown in Table 12, when differentiated by gender, there is no significant difference when asked about the OSHA regulations, $\underline{t}$ (44) = .98, $\underline{p}$ > .05.

As shown in Table 13, when differentiated by student classification, there is no significant difference when asked about the OSHA regulations, $\underline{F}$ (3) = .71, $\underline{p}$ > .05.

As shown in Table 14, when differentiated by student class, there is no significant difference when asked about the OSHA regulations, F (2) = .68, p > .05.

Table11. Knowledge of OSHA Regulations

Rank	Statement	n	Strongly Disagree (1) f	%	Disagree (2) f	%	Neither (3) f	%	Agree (4) f	%	Strongly Disagree (5) f	%
1	Before working with loud machinery for the first time, people should have a baseline audiogram.	46	0	0	2	4.2	25	52.1	13	27.1	6	12.5
2	Teachers and students should have an annual audiogram to monitor hearing levels.	46	0	0	3	6.3	12	25	23	47.9	8	16.7
3	If the established hearing threshold has changed, the school/company should notify the student/worker.	46	0	0	1	2.1	6	12.5	30	62.5	9	18.8
4	If the hearing threshold changes, student/worker should refrain from working with loud machinery.	46	1	2.1	8	16.7	18	37.5	13	27.1	6	12.5
5	If the hearing threshold changes, student/worker should wear hearing protection while working with loud machinery.	46	0	0	0	0	2	4.2	23	47.9	21	43.8

Table11. Continued

Rank	Statement	n	Strongly Disagree (1) f	%	Disagree (2) f	%	Neither (3) f	%	Agree (4) f	%	Strongly Disagree (5) f	%
6	The school/company should provide the student/worker with hearing protection when working with loud machinery.	48	0	0	0	0	0	0	18	37.5	18	58.3
7	The school/company should inform/train the student/worker of the dangers of working with loud machinery and what it will do to his/her hearing	48	0	0	0	0	0	0	17	35.4	29	60.4
8	If the established hearing threshold has changed, the school/company should notify the student/worker	48	0	0	0	0	5	10.4	22	45.8	19	39.6

Table 12. Sum of Knowledge of OSHA Regulations by Gender

	n	*Mean*	*Std. Dev.*	*t*	*p*
Male	17	3.99	0.47	0.98	0.33
Female	29	4.13	0.47		

Table 13. Sum of Knowledge of OSHA Regulations by Student Classification

	n	*Mean*	*Std. Dev.*	*F*
Sophomore	2	3.63	0.18	0.71
Junior	24	4.07	0.43	
Senior	14	4.14	0.51	
Graduate Student	6	4.08	0.58	
Total	46	4.07	0.47	

Table 14. Sum of Knowledge of OSHA Regulations by Student Class.

	n	*Mean*	*Std. Dev.*	*F*
AGSC 327	10	4.23	0.42	0.68
AGSC 301A	23	4.02	0.51	
AGSC 301B	13	4.05	0.43	
Total	46	4.07	0.47	

Objective 4

Description of Participants by Test of Knowledge Scores

Test of Knowledge on Hearing Impairments are described in this section. This variable includes 10 questions that are related to one's general knowledge of hearing impairments. By calculating the frequencies and percentages of the participant's response to each answer, the statements were ranked by how the participants answered each question. The responses to Knowledge Test are shown in Table 15.

Table 15. Responses to Knowledge Test

Groups	f	%
1	1.00	2.10
2	3.00	6.30
3	1.00	2.10
4	9.00	18.80
5	14.00	29.20
6	10.00	20.80
7	5.00	10.40
8	1.00	2.10
9	2.00	4.20

Note. "N" does not equal 48 because two participants did not respond. M= 5.18; SD= 1.67

As shown in Table 16, 20 (41.7%) of the participants know how many people in the United States, have a hearing loss.

Table 16. Response to Q1. "According to the National Institute on Deafness and other communication disorders, how many people in the United States suffer from some hearing loss?"

Groups	f	%
A. 1,785,000 people	9.00	18.80
B. 11,785,000 people	12.00	25.00
C. 28,000,000 people	20.00	41.70
D. 117,000,000 people	5.00	10.40

In Table 17, when asked “Which of the following is NOT a cause of hearing loss”, it shows that 23 (47.9%) of the participants know that someone yelling in your ear is not a cause of hearing loss, whereas 9 (18.8%) think that listening to an “iPod” will not cause you to lose your hearing.

Table 17. Response to Q2. "Which of the following is NOT a cause of hearing loss?"

Groups	f	%
A. High fever	14.00	29.20
B. Listening to an iPod	9.00	18.80
C. Someone yelling in your ear one time	23.00	47.90
D. Prolonged riding on a tractor without ear protection	0.00	0.00

In Table 18, the results show that 23 (47.9%) of the participants know that “Mild, Moderate, Sever, and Profound” are types of hearing loss.

Table 18. Response to Q3. "Hearing losses can be classified as:"

Groups	f	%
A. low, moderate, average, high	3.00	6.30
B. little, some, much, high	3.00	6.30
C. mild, moderate, severe, profound	23.00	47.90
D. temporary, mild, acute, chronic	17.00	35.40

AS shown in Table 19, only 11 (22.9%) of those surveyed, know that “Bioneural” is not a basic type of hearing loss.

Table 19. Response to Q4. "Which of the following is NOT a basic type of hearing loss?"

Groups	f	%
A. sensorineural	5.00	10.40
B. conductive	9.00	18.80
C. mixed	21.00	43.80
D. bioneural	11.00	22.90

Table 20 shows that 26 (56.2%) of the participants know that ear wax build-up cannot cause a permanent hearing loss.

Table 20. Response to Q5. "Ear wax build-up can cause a permanent hearing loss?"

Groups	f	%
A. True	20.00	41.70
B. False	26.00	54.20

As shown in Table 21, 38 (79.2%) of the participants surveyed know that an audiogram is a sound level measurement.

Table 21. Response to Q6. "What is an audiogram?"

Groups	f	%
A. farm equipment calibration	0.00	0.00
B. hearing test	0.00	0.00
C. sound level measurement	38.00	79.20
D. singing telegram	8.00	16.70

As shown in Table 22, when asked “Who performs the audiogram”, 29 (60.4%) of the respondents know that an audiologist completes the audiogram.

Table 22. Response to Q7. "Who performs the audiogram?"

Groups	f	%
A. audiologist	29.00	60.40
B. ENT	4.00	8.30
C. nurse	9.00	18.80
D. occupational health specialist	4.00	8.30

As shown in Table 23, 6 (12.5%) of the participants know that frequencies covered during audiometry are 125 hertz to 8,000 hertz.

Table 23. Response to Q8. "Frequencies covered during audiometry should include:"

Groups	f	%
A. -500 hertz to + 500 hertz	20.00	41.70
B. 0 hertz to 1,000 hertz	10.00	20.80
C. 0 hertz to 8,000 hertz	10.00	20.80
D. 125 hertz to 8,000 hertz	6.00	12.50

Table 24 shows that 33 (68.8%) of the participants know that a decibel is a unit of relative sound loudness.

Table 24. Response to Q9. "What is a decibel?"

Groups	f	%
A. a unit relative sound loudness	33.00	68.80
B. a frequency unit	13.00	27.10
C. a mathematical unit	0.00	0.00
D. a piece of farm equipment	0.00	0.00

Table 25 shows that 28 (58.3%) of the participants know that a typical rock concert produces and maintains a decibel level of 120 dB.

Table 25. Response to Q10. "A typical rock concert produces and maintains a decibel level of:"

Groups	f	%
A. 25 dB	0.00	0.00
B. 50 dB	5.00	10.40
C.90 dB	13.00	27.10
D. 120 dB	28.00	58.30

As shown in Table 26, when differentiated by gender, there is no significant difference when the participants Knowledge of Hearing Impairments is tested, $t(44) = .08$, $p > .05$.

Table 26. Score of Knowledge Test by Gender.

	n	*Mean*	*Std. Dev.*	*t*	*p*
Male	17	5.18	1.67	0.08	0.94
Female	29	5.14	1.71		

As shown in Table 27, when differentiated by Student Classification, there is no significant difference when the participants Knowledge of Hearing Impairments is tested, $F(3) = .41$, $p > .05$.

Table 27. Score of Knowledge Test by Student Classification.

	n	*Mean*	*Std. Dev.*	*F*
Sophomore	2	4.00	1.41	0.41
Junior	24	5.08	2.13	
Senior	14	5.36	0.93	
Graduate Student	6	5.33	1.03	
Total	46	5.15	1.67	

As shown in Table 28, when differentiated by Student Class, there is no significant difference when the participants Knowledge of Hearing Impairments is tested, $F(2) = .10$, $p > .05$.

Table 28. Scores of Knowledge Test by Student Class

	n	*Mean*	*Std. Dev.*	*F*
AGSC 327	10	5.00	1.33	0.10
AGSC 301A	23	5.13	1.79	
AGSC 301B	13	5.31	1.80	
Total	46	5.15	1.67	

Objective 5

Description of Participants by Characteristics

Characteristics of the participant are described in this section. This variable included three statements that the participant had to rank. By calculating the frequencies and percentages of the participant's responses to each statement, the statements were ranked by how the participant answered each statement. They ranked them as: Always, Sometimes, Never, or I do not…

In Table 29 shows that 24 (50.0%) of the participants never wear ear protection when they mow the yard.

Table 29. "Do You Wear Ear Protection When Mowing the Yard?"

Groups	f	%
A. Always	4.00	8.30
B. Sometimes	6.00	12.50
C. Never	24.00	50.00
D. I do not mow the yard	12.00	25.00

Note. "N" does not equal 48 because two participants did not respond.

As shown in Table 30, when differentiated by gender, there is a significant difference when wearing ear protection while mowing the yard, t (32) =, $p < .05$.

Table 30. 'Do You Wear Ear Protection When Mowing the Yard?" by Gender

	n	*Mean*	*Std. Dev.*	*t*	*p*
Male	16	2.25	0.86	2.94	0.01
Female	18	2.89	0.32		

As shown in Table 31, when differentiated by Student Classification, there was no significant difference when wearing ear protection while mowing the yard, $F(3) = 2.19$, $p > .05$.

Table 31. "Do You Wear Ear Protection When Mowing the Yard?" by Student Classification

	n	*Mean*	*Std. Dev.*	*F*
Sophomore	1	3.00	0.00	2.19
Junior	17	2.65	0.70	
Senior	13	2.69	0.48	
Graduate Student	3	1.67	1.16	
Total	34	2.59	0.70	

As shown in Table 32, when differentiated by Student Class, there was no significant difference when wearing ear protection while mowing the yard, $F(2) = .42$, $p > .05$.

Table 32. "Do You Wear Ear Protection When Mowing the Yard?" by Student Class

	n	*Mean*	*Std. Dev.*	*F*
AGSC 327	9	2.56	0.73	0.42
AGSC 301A	14	2.71	0.61	
AGSC 301B	11	2.45	0.82	
Total	34	2.59	0.71	

As shown in Table 33, when asked how often you worked with loud equipment, 32 (66.7%) of the participants sometimes work with loud equipment.

Table 33. "How Often do You Work with Loud Equipment?"

Groups	f	%
A. Always	7.00	14.60
B. Sometimes	32.00	66.70
C. Never	2.00	4.20
D. I do not work with loud equipment	5.00	10.40

Note. "N" does not equal 48 because two participants did not respond.

As shown in Table 34, when differentiated by gender, there is a significant difference with how often the participants work with loud equipment, $t(39) = 2.12$, $p < .05$.

Table 34. "How Often do You Work with Loud Equipment?" by Gender

	n	*Mean*	*Std. Dev.*	*t*	*p*
Male	17	1.71	0.47	2.11	0.04
Female	24	2.00	0.42		

As shown in Table 35, when differentiated by Student Classification, there is no significant difference with how often the participants work with loud equipment, $F(3) = 1.03$, $p > .05$.

Table 35. “How Often do You Work with Loud Equipment?” by Student Classification

	n	*Mean*	*Std. Dev.*	*F*
Sophomore	2	2.00	0.00	1.03
Junior	22	1.91	0.43	
Senior	13	1.92	0.49	
Graduate Student	4	1.50	0.58	
Total	41	1.88	0.46	

As shown in Table 36, when differentiated by Student Class, there is no significant difference with how often the participants work with loud machinery, $F(2) = 1.94$. $p > .05$.

Table 36. “How Often do You Work with Loud Equipment?” by Student Class

	n	*Mean*	*Std. Dev.*	*F*
AGSC 327	10	2.00	0.67	1.94
AGSC 301A	19	1.95	0.23	
AGSC 301B	12	1.67	0.49	
Total	41	1.88	0.46	

As shown in Table 37, 30 (62.5%) of the participants listen to their “iPod” some of the time.

Table 37. "How Often do You Listen to an iPod?"

Groups	*f*	%
A. Always	6.00	12.50
B. Sometimes	30.00	62.50
C. Never	5.00	10.40
D. I do not listen to an iPod	5.00	10.40

Note. "N" does not equal 48 because two participants did not respond.

As shown in Table 38, when differentiated by gender, there is no significant difference with how often the participants listen to their “iPod”, $t(39) = .24$, $p > .05$.

Table 38. “How Often do You Listen to an iPod?” by Gender

	n	*Mean*	*Std. Dev.*	*t*	*p*
Male	16	2.00	0.73	0.24	0.82
Female	25	1.96	0.35		

As shown in Table 39, when differentiated by Student Classification, there is no significant difference with how often the participants listen to their “iPod”, $F(3) = 1.50$, $p > .05$.

Table 39. "How Often do You Listen to an iPod?" by Student Classification

	n	*Mean*	*Std. Dev.*	*F*
Sophomore	1	2.00	0.00	1.49
Junior	22	1.86	0.47	
Senior	13	2.00	0.58	
Graduate Student	5	2.40	0.55	
Total	41	1.98	0.52	

As shown in Table 40, when differentiated by Student Class, there is no significant difference with how often the participants listen to their "iPod", $F(2) = .70$, $p > .05$.

Table 40. "How Often do You Listen to an iPod?" by Student Class

	n	*Mean*	*Std. Dev.*	*F*
AGSC 327	9	2.00	0.71	0.69
AGSC 301A	21	2.05	0.50	
AGSC 301B	11	1.82	0.41	
Total	41	1.98	0.52	

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The purpose of the study, objectives of the study, null hypothesis tested, type of research, population, instrumentation, data collection, data analysis, summary or findings, conclusions and recommendations are presented in this chapter.

Purpose of the Study

The purpose of the study is to acquire the knowledge of agricultural science students on what they know about hearing impairments; what causes hearing impairments in the agricultural world; safety regulations regarding hearing protection in agricultural environments and their attitudes towards people with hearing impairments.

The specific objectives of the study were:

1. To determine whether agricultural science students perceive hearing loss as a critical health issue facing people of the United States.
2. To understand the attitudes of agricultural science students towards those with hearing impairments.
3. To determine the knowledge level of agricultural science students on safety regulations set by government agencies with regard to hearing protection.
4. To determine the knowledge of agricultural science students in regards to hearing impairments and their causes.

5. To understand the attitudes of agricultural science students on wearing hearing protective devices.

The following null hypotheses were also tested:

H_{01}: Agricultural science students believe that hearing loss is a critical health issue facing the United States.

H_{02}: There is no significant difference in students' belief that hearing loss is a critical health issue facing the United States when differentiated by gender.

H_{03}: There is no significant difference in students' belief that hearing loss is a critical health issue facing the United States when differentiated by student classification.

H_{04}: There is no significant difference in students' belief that hearing loss is a critical health issue facing the United States when differentiated by classes.

H_{05}: There is no significant difference in students' attitudes toward people with hearing impairments when differentiated by gender.

H_{06}: There is no significant difference in students' attitudes toward people with hearing impairments when differentiated by student classification.

H_{07}: There is no significant difference in students' attitudes toward people with hearing impairments when differentiated by class.

H_{08}: Agricultural science students are unaware of federal agency regulations pertaining to hearing loss and/or hearing protection.

H_{09}: There is no significant difference in students' awareness of federal agency regulations pertaining to hearing loss and/or hearing protection when differentiated by gender.

H_{10}: There is no significant difference in students' awareness of federal agency regulations pertaining to hearing loss and/or hearing protection when differentiated by student classification.

H_{11}: There is no significant difference in students' awareness of federal agency regulations pertaining to hearing loss and/or hearing protection when differentiated by class.

H_{12}: Agricultural science students are unaware of hearing impairments and their causes.

H_{13}: There is no significant difference in students' knowledge of hearing impairments and their causes when differentiated by gender.

H_{14}: There is no significant difference in students' knowledge of hearing impairments and their causes when differentiated by student classification.

H_{15}: There is no significant difference in students' knowledge of hearing impairments and their causes when differentiated by class.

Type of Research

The research design used for this study was descriptive and correlational in nature. The study was designed to examine the attitudes of people towards those persons who exhibited a hearing impairment, persons' general knowledge of the OSHA regulations as it pertains to hearing protection, attitudes towards wearing ear protection, and a general knowledge of hearing impairments.

This study has no one dependent variable and one group of independent variables. Although federal regulations and the opinion of experts in the field of hearing impairment

and hearing loss were used to establish scoring criteria in this study, there is no one dependent variable established for this study. Participants were asked to respond to their feelings and attitudes which make objectivity difficult. The independent variables used in this study include: gender, academic level, and class enrollment.

Population

The target population for this study was students of varying classifications who intend to pursue a career in an agricultural field.

Instrumentation

The instrument used in this study was a questionnaire that was divided into four parts. The first part was designed to measure attitudes towards people with hearing impairments. The participants were asked to indicate their agreement with ten statements by marking their responses on a five point Likert scale. The points on the scale are: 1= Strongly Disagree (SD); 2= Disagree (D); 3= Neither Agree or Disagree (N); 4= Agree (A); 5= Strongly Agree (SA). The level of measurement for this variable is interval.

The second part of the instrument was designed to measure the knowledge of the participant on the OSHA regulations as they pertain to hearing impairments and hearing loss. The participants were asked again to indicate their agreement with ten statements by marking their responses on a five point Likert scale. The points on the scale are: 1= Strongly Disagree (SD); 2= Disagree (D); 3= Neither Agree or Disagree (N); 4= Agree (A); 5= Strongly Agree (SA). The level of measurement for this variable is interval.

The third part of the questionnaire was designed to test the knowledge of the participant with regards to hearing impairments in general. The participants were asked to indicate the correct answer to the posed multiple choice question by marking their responses as “A”, “B”, “C”, or “D”.

The fourth part of the instrument was designed to gather data on personal characteristics and experiences of the participants. Gender was measured as either male or female. The level of measurement for this variable is nominal. The measurement of student classification was measured as Freshman, Sophomore, Junior, Senior, Post Graduation, or Graduate Student. The level of measurement for this variable is nominal. The three additional questions in the fourth part dealt with personal habits and were answered as: “Always”, “Sometimes”, “Never”, and “I don’t…”

Data Collection

Data for this study was collected by having the questionnaire distributed to the sample population during class of AGSC 327, AGSC 301a, and AGSC 301b. During the last week of April, 2008, the questionnaire, containing an introductory letter (Appendix A), was distributed to students in the afore mentioned classes (N=46). The questionnaire was returned to the classroom professor on the same day as distribution. An assumption was made that all distributed questionnaires were returned and were included in the study.

Summary of Findings

This section presents a summary of finding by objective.

Objective 1

The first objective of the study was to determine if agricultural students perceived that hearing loss is a critical health issue facing people of the United States. By calculating the frequencies and percentages of participant responses, we were able to determine that over 60% of respondents agree that hearing loss is a critical health issue. 25 % of respondents were not sure so that only slightly over 6 % of those asked thought that hearing loss was not a critical issue facing those in the United States.

Objective 2

The second objective was to understand the attitudes of agricultural science students toward those with a hearing impairment. 95.8% of the respondents stated they would assist a hearing impaired person though 39.6% agreed they would have difficulty in that communication. Participants also agreed (> 87%) that working with loud machinery and specifically farm equipment required the wearing of ear protection. The study also revealed that more than 89% of the participants would be cooperative with a hearing impaired person whether the person had the difficulty from birth or was due to working with farm equipment. Participants stated that they were more likely to learn sign language if they became hearing impaired (91%) than if a friend needed sign language to communicate (81%).

Objective 3

The third objective was to determine the general knowledge of agricultural students of OSHA rules and regulations pertaining to hearing loss and ear protection. Respondents revealed that only 39.6% of them thought a baseline audiogram was necessary before working with loud machinery although over 60% agreed that students/workers should have an annual audiogram to monitor hearing levels. Most participants (>81%) agreed that students/workers should be notified if the hearing threshold changed in their work environment, and even more (91.7%) stated that hearing protection should be used if the hearing threshold changed. Fewer participants (<40%) agreed that persons should refrain from working with loud machinery if the hearing threshold changed. 95.8% of those questioned agreed that school/company should inform/train the student/worker of the dangers of working with loud machinery and its impact upon his/her hearing. Respondents revealed that >95% thought that the company/school should provide hearing/ear protections for its workers/students, but only 85% thought the company/school should train its workers/students on hearing protection.

Objective 4

The fourth objective was to determine the knowledge level of agricultural science students in regards to hearing impairment and their causes. This was administered via a knowledge test with the results determined by experts in the field of hearing loss and protection. No one participant received a perfect score on the ten question test. Question six had the highest percentage of correct answers (83%) while question eight had the

lowest at only 13% correct responses. Only two questions of the 10 had a correct response rate greater than 70%.

Objective 5

The final objective was to determine the attitudes of agricultural science students on wearing hearing protective devices. It was determined that only 21% sometimes or never wear hearing protection while mowing the yard, while 50% never wear hearing protection while mowing. The study showed that >81% work with loud equipment either sometimes or always. It was also determined that 75% of the respondents listen to an iPod at least some of the time.

Conclusions

Based on the review of literature and the interpretation of finds related to the study objectives, the following conclusions were drawn.

Conclusion 1

As just one of our five senses, the ability to hear is seen as essential for most people. This study has shown that only 6% of those questioned think that hearing or loss of hearing is a critical issue facing people in the United States. By accepting this study Texas A&M and the Department of Agricultural and Life Sciences is showing its interest and concern for the safety and protection of its students in the area of hearing loss and hearing protection. Not only does this concern pertain to current students, but also to the future leaders and members of the agricultural science industry.

Implication

Although the study shows that most participants see hearing loss as a critical health issue facing this country, there seems to be little or no motivation to make the necessary changes in habits, or work cultures to secure the hearing safety of those at risk of hearing loss in the workplace. The review of literature presents a work cultural that shows that if changes are to happen, they must be instituted when new workers are entering the work force, while attempting to influence the acceptance of those more experienced workers.

Recommendation

Additional study with a larger population will probably show the same results on this issue, but more emphasis and possibly a new study looking at how to better protect the hearing of the working public and specifically those in the agricultural fields is needed.

Conclusion 2

In response to how people interact with a person with a hearing impairment, the study reflects a somewhat selfish reaction. The respondents state they would have difficulty communicating with a hearing impaired person, and they are more likely to learn sign language when it would benefit themselves as either needing it for their own communication efforts or with that of a friend. Participants state that cooperating with a hearing impaired person would not be difficult, though a small percentage stated that they were better than a person who exhibited a hearing impairment. Persons polled in this

study appear to have sympathy for those with a hearing impairment, but are not ready or prepared to work closely with the hearing impaired.

Implication

Participants represent a cross section of our society and its culture. We work on the assumption that a person can hear and therefore verbal communication is accepted as the primary means of communication and all are expected to comply. We are willing to learn sign language as an alternative means of communication, but only when we need it within our own area of need. When forced to learn sign language we will do so and be ready to use that means of communication.

Recommendation

All levels of education must provide more information in the area of hearing impairments. Our society must become more aware of the needs of those who are hearing impaired. This can be achieved by teaching sign language as a second language or providing more opportunities in the area of education to focus on awareness of those with a hearing impairment.

Conclusion 3

OSHA regulations were recognized by the participants as a necessary part of doing work within the agricultural science industry. The use of audiograms to determine hearing threshold levels was seen as a positive step in the education of workers and students. Companies and schools must make hearing loss a major issue for its workers or students so they are better prepared to protect themselves while working in the business. Workers and students must be made aware of jobs with a high decibel level environment, and must also be kept informed when that noise threshold changes so that proper protection can be instituted.

Implication

Workers and students will be more active in demanding proper hearing protection as the level of education improves. With that demand for protection companies and schools will respond with increased safety guidelines and the expectation of worker compliance with those regulations. As the acceptance of those guidelines escalates, the culture within the company or school will change to one that expects its workers or students to follow the necessary guidelines to improve the work environment in the area of hearing protection.

Recommendation

There must be more emphasis on hearing protection and the possibility of hearing loss by instructors who are charged with educating workers or students in the area of hearing protection. It is human nature to follow the example of those who are listed as

being the expert in the field. If hearing protection is not a high priority for the instructor, then there is little possibility for it to become a high priority for the student or worker. Additional education is therefore needed for those who instruct or if the proper courses of education are available, more accountability of those instructors is required.

Conclusion 4

The participants who responded to this section of the study were lacking in their general knowledge of hearing impairments and hearing loss as well as the causes of both. It might be concluded that persons who have a hearing impaired person in their family or someone who works with a hearing impaired person might have a better knowledge, but that variable was not entered into the study. With 8 of 10 questions not having at least a 70% correct response rate, it must be concluded that the study group is not well versed in hearing loss, hearing impairments, and their causes.

Implication

With a general lack of knowledge of hearing loss and hearing impairments, it would lead one to believe that those topics are not a high priority within the sample population and therefore society in this country. When one is forced to deal with this issue, people are willing to react and respond, but there appears to be little or no motivation to be proactive in educating oneself on the topic of hearing impairment or hearing loss.

Recommendation

Awareness of hearing impairments and education of the causes and adaptive measures taken by those with a hearing impairment is essential if we are to see a rise in the knowledge of this issue. Whether by means of formal training within the educational system or people becoming proactive and learning of the somewhat secluded world of the hearing impaired, education is the key measure of improvement.

Conclusion 5

The acceptance of hearing protective devices within the work force will require time, focus, and education. Workers or students recognize the possibility of damage to their hearing while working with loud machinery or listening to an iPod, but believe that it is a problem for someone else, not themselves. The wearing of ear protection will take changes in the work culture and this can only be done through education and the support of the entire company or school to mandate safety regulations and guidelines in the use of hearing protection.

Implication

The study shows that participants are not fully aware of the damage that can be done to one's hearing through such activities as mowing the yard, working with loud machinery, or listening to an iPod.

Recommendation 1

Again, education is the key to seeing a change in how people perceive hearing loss due to daily activities. Whether it is the work environment or the means by which music is listened, society must recognize the dangers of work environment noise levels as well as the use of personal and individual music transmission (iPod). Once those dangers are identified, they must be addressed through education for change to occur.

Recommendation 2

Education and training are needed in Agricultural Science shops. Teachers and students need to not only learn the proper ways in which to wear ear protection, but they also need to practice it as well. Have teachers bring in materials, such as a sound meter, to show the students how loud just a silent classroom is in comparison to a piece of metal being cut in the shop. Use materials that relevant to students to show them how much damage they are doing to their hearing, when they do not wear ear protection.

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APPENDIX A

PANEL OF EXPERTS

Dr. James Lindner, Professor, Department of Agricultural Education, Texas A&M University

Dr. Gary Briers, Professor, Department of Agricultural Education, Texas A&M University

Dr. Larry Dooley, Professor, Department of Educational Human Resources Development, Texas A&M University

APPENDIX B

COVER LETTER TO PARTICIPANTS

The following questionnaire is designed to gather data on students' perception and knowledge about hearing loss.

This information is being gathered and analyzed as part of my requirement for completing my Masters degree. It will take you approximately 5-10 minutes to fill out the questionnaire.

If you have any questions about this questionnaire, please contact with me at sslaydon@bryanisd.org or 862-3000. Thank you for taking time to fill out this questionnaire.

Sincerely,

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APPENDIX C

QUESTIONNAIRE

Please indicate your attitude toward the statement described below.

Hearing loss is a critical health issue facing people in United States.

_____ I agree.

_____ I disagree.

_____ I am not sure.

Use the following scale to indicate your response by circling the number that most represents your level of agreement

1=Strongly Disagree (**SD**)
2=Disagree (**D**)
3=Neither Agree or Disagree (**N**)
4=Agree (**A**)
5=Strongly Agree (**SA**)

Items	**SD**	**D**	**N**	**A**	**SA**
I have difficulty communicating with people who have a hearing loss.	1	2	3	4	5
Wearing hearing protection while working with farm equipment is important.	1	2	3	4	5
I am or would be cooperative with people who have a hearing loss caused by working with farm equipment.	1	2	3	4	5
I am or would be cooperative with people who are born with a hearing loss.	1	2	3	4	5
I can be friends with a person who is hearing impaired.	1	2	3	4	5
It is important to wear hearing protection when working near loud machinery.	1	2	3	4	5
I am better than people who have a hearing loss	1	2	3	4	5
I would communicate with a hearing impaired person if they needed help.	1	2	3	4	5
I would learn sign language if one of my friends was hearing impaired.	1	2	3	4	5
I would learn sign language if I became hearing impaired.	1	2	3	4	5
Continues on Next Page →→→					

Use the following scales to indicate your response. Circle the best response.

Use the following scale to indicate your response by circling the number that most represents your level of agreement

1=Strongly Disagree (**SD**)
2=Disagree (**D**)
3=Neither Agree or Disagree (**N**)
4=Agree (**A**)
5=Strongly Agree (**SA**)

Items	**SD**	**D**	**N**	**A**	**SA**
Before working with loud machinery for the first time, people should have a baseline audiogram.	1	2	3	4	5
Teachers and students should have an annual audiogram to monitor hearing levels.	1	2	3	4	5
If the established hearing threshold has changed, the school/company should notify the student/worker.	1	2	3	4	5
If the hearing threshold changes, the student/worker should refrain from working with the loud machinery.	1	2	3	4	5
If the hearing threshold changes, student/worker should wear hearing protection while working with the loud machinery.	1	2	3	4	5
The school/company should provide the student/worker with hearing protection when working with loud machinery.	1	2	3	4	5
The school/company should inform/train the student/worker of the dangers of working with loud machinery and what it will do to his/her hearing.	1	2	3	4	5
Annual training should be provided to the student/worker on hearing protection.	1	2	3	4	5
Continues on Next Page →→→					

Read the following questions and select the answer you believe is most correct by circling the appropriate letter

According to the National Institute on Deafness and Other Communication Disorders, how many people in the United States suffer from some hearing loss?

a. 1,785,000 people
b. 11,785,000 people
c. 28,000,000 people
d. 117,000,000 people

Which of the following is NOT a cause of hearing loss?

a. High Fever
b. Listening to an iPod
c. Someone yelling in your ear one time
d. Prolonged Riding on a tractor without ear protection

Hearing losses can be classified as

a. Low, Moderate, Average, High
b. Little, Some, Much, High
c. Mild, Moderate, Severe, Profound
d. Temporary, Mild, Acute, Chronic

Which of the following is NOT a basic type of hearing loss?

a. sensorineural
b. conductive
c. mixed
d. bioneural

Ear wax build-up can cause a permanent hearing loss?

a. True
b. False

Continues on Next Page →→→

What is an audiogram?

a. Farm Equipment Calibration
b. Hearing Test
c. Sound Level Measurement
d. Singing Telegram

Who performs the Audiogram?

a. Audiologist
b. ENT
c. Nurse
d. Occupational Health Specialist

Frequencies covered during audiometry should include

a. -500 Hertz to +500 Hertz
b. 0 Hertz to 1,000 Hertz
c. 0 Hertz to 8,000 Hertz
d. 125 Hertz to 8,000 Hertz

What is a decibel?

a. A unit of relative sound loudness
b. A Frequency Unit
c. A Mathematical Unit
d. A piece of farm equipment

A typical rock concert produces and maintains a decibel level of

a. 25dB
b. 50dB
c. 90dB
d. 120dB

Continues on Next Page →→→

Please indicate your responses to the following questions by checking or circling the most appropriate selection

What is your gender?

_____Male
_____Female

What is your student classification?

_____Freshman
_____Sophomore
_____Junior
_____Senior
_____Post Graduation
_____Graduate Student

How often do you wear ear protection when mowing the yard?

a. Always
b. Sometimes
c. Never
d. I don't mow the yard

How often do you work with loud equipment?

a. Always
b. Sometimes
c. Never
d. I don't work with loud equipment

How often do you listen to the iPod?

a. Always
b. Sometimes
c. Never
d. I don't listen to an iPod

END

THANK YOU FOR YOUR TIME AND HELP!

VITA

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