

A university-based hearing conservation program for high school students

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ABSTRACT

Several researchers have suggested the prevalence of noise-induced hearing loss (NIHL) is increasing among secondary school students. Causes include exposure to loud music and toys, firearms, power tools, fireworks, snowmobiles, Jet Skis, motorcycles and, especially, personal stereo systems (e.g., iPods, MP3 players, CD players) played at loud volumes. Although teachers and audiologists in some school districts have addressed this problem, many secondary schools do not have personnel with adequate time and expertise to educate students about protecting their hearing. The purpose of this study was to develop, implement, and evaluate a hearing conservation program offered during recruitment of local, high school students to a USA university. Specifically, faculty in the university's College of Health Professions offered 20-minute presentations about their discipline during open houses to recruit high school students. This included two audiologists from the Department of Communication Sciences and Disorders (CSD) who presented 32, interactive, hearing conservation sessions to about 800 students divided into groups of 10 to 30 students. The presentation was entitled, "You Only Have Two Ears: Protecting Hearing of Teenagers." Each group learned about basic anatomy of the ear, listened to a recorded simulation of NIHL; tried different hearing protection devices; and measured sound intensities of their personal stereo systems. Verbal and written comments by students indicated improvements in their knowledge and attitudes toward protecting their hearing. We are continuing and refining this hearing conservation program to educate local secondary school students about protecting their hearing while simultaneously recruiting some of them into their programs.

INTRODUCTION

Several researchers (Cooley Hedecker 2008; Deconde Johnson & Meinke 2008; Folmer 2008; Holmes et al. 1997; Meinke & Dice 2007; Niskar et al. 1998, 2001) have reported that the prevalence of NIHL is increasing among teenagers attending secondary schools (i.e., middle and high schools) in the USA. Although these NIHLs may be classified as "minimal" hearing losses, they can hinder language, behavioral, academic, and social development of some teenagers (Bess et al. 1998; Ross et al. 2008; Yoshinaga-Itano et al. 2008). Potential causes of NIHL in teenagers include exposure to loud music and toys, firearms, power tools, fireworks, snowmobiles, Jet Skis, motorcycles and, especially, personal stereo systems (e.g., iPods, MP3 players, CD players) played at loud volumes (Cooley Hedecker 2008; Fligor & Cox 2004; Meyer-Bisch 1996; Mostafapour et al. 1998; Wong et al. 1990). Chung et al. (2005), nevertheless, reported that most teenagers consider NIHL as a much smaller risk than other health risks they are warned about: sexually transmitted diseases, alcohol and substance abuse, depression, smoking, weight issues, and even acne.

As information about the prevalence and impact of NIHL in teenagers has increased over the past decade, calls for hearing conservation programs have grown. Prevention of NIHL through public education was one of the national health objectives included in *Healthy People 2010* (US Department of Health and Human Services (2000). Folmer (2008) reports that several organizations now provide materials and curricula for educating students about hearing conservation. In 1999, for example, the Oregon Hearing Research Center (OHRC), the Oregon Museum of Science and Industry (OMSI), the Veterans Affairs National Center for Rehabilitative Auditory Research (NCRAR), and the American Tinnitus Association (ATA) began partnering to promote hearing health. This culminated in *Dangerous Decibels* an educational program designed to improve students' long-term knowledge and attitudes toward protecting their hearing (Martin 2008). Griest (2008) reported that *Dangerous Decibels* hearing loss provided a relatively efficient and effective hearing conservation curriculum. Howarth (2008), however, provided a real life "case study" detailing how developing, implementing, and evaluating *Dangerous Decibels* required personnel at several schools considerable time and effort in preparation, collaboration, scheduling, coordination, and outcomes measurements.

To our knowledge, no one has previously reported on a university-based hearing conservation program for secondary school students. The purpose of this study was to develop, implement, and evaluate a hearing conservation program offered during recruitment of local, high school students to a USA university. That is, rather than having the program delivered to students at their schools, the program was delivered while high school students were visiting the university.

METHOD

Participants: Approximately 800 juniors and seniors drawn from 11 Wichita, Kansas high schools participated in this study. All of the participants had expressed an interest to their high school teachers and guidance counselors about attending college and majoring in medicine or an allied health profession. In cooperation with these schools, administrative coordinators from the College of Health Professions at Wichita State University (WSU) invited these students to attend "open houses" at WSU. They were conducted on four consecutive Friday mornings during the fall semester of 2007. When up to 250 students arrived at the College of Health Professions each Friday morning, the open house coordinators divided them into groups of 10 to 30 students. Each group was chaperoned by a staff member from their school - often a science or health teacher.

Presenters: WSU does not have a medical school. Its College of Health Professions, however, houses departments in Dental Hygiene, Health Services Management and Communication Development, Medical Technology, Physician Assistants, Physical Therapy, Nursing, and Communication Sciences and Disorders (CSD). At least one faculty member from six of these departments developed a program that they presented several times at the open houses. The two presenters from CSD were audiologists who were certified by the American Speech-Language-

Hearing Association and licensed to practice in Kansas. One instructor, Downs, was an assistant professor of audiology with extensive teaching and clinical experience in hearing conservation with adults, children, and adolescents. This included developing and presenting previous university-based hearing conservation programs for secondary school students. The other instructor, Kanekama, was a student in the CSD PhD program and was Downs' teaching and research assistant.

Facilities and Equipment: All of the open house programs were conducted in classrooms of the College of Health Professions. All sessions of the CSD hearing conservation program were conducted in a single classroom seating up to 40 students. The presenters prearranged equipment on a table in front of the classroom, including a large model of the ear; a CD player presenting a commercially-recorded hearing loss simulation of different degrees of high-frequency hearing loss; a radio playing music at 85 dB SPL; a Type III sound level meter; passive and active hearing protection devices (i.e., earmuffs, earplugs, and semi-aural devices); and personal stereo systems furnished by students (i.e., iPods, MP3 player, cell phones).

Procedures: The open house on each Friday morning was divided into eight, 20-minute sessions with a five-minute break between sessions. Students rotated in their groups to each of their sessions. The two main purposes of the open house were (1) for local high school students to learn about different health professions, and (2) for the College of Health Profession to eventually recruit some of these students into one of their undergraduate and graduate programs. Accordingly, the college coordinators of the open house requested presenters to spend a couple of minutes during their program talking about their profession, in general; and then to devote the bulk of program to an interesting topic in their discipline.

The CSD presenters designed a 20-minute presentation with the title, "You Only Have Two Ears: Protecting Hearing of Teenagers." The emphasis was not only to recruit students into CSD, but also for students to learn interactively about the need and ways to protect their hearing. Moreover, they chose this topic (in lieu of other topics in speech-language pathology or audiology) because (1) it was not complicated, but could be addressed in a brief period of time; (2) it lent itself to an educational and entertaining approach; (3) NIHL was a leading, preventative, cause of communication disorders in teenagers; and (4) all teenagers are exposed to noise in their everyday activities, and therefore could identify with the topic.

The presenters first practiced their program together without students. On the first Friday with students, Downs presented the first four sessions and Kanekama presented the second four sessions. Kanekama also attended Downs' third and fourth sessions on the first Friday to insure consistency between their presentations. Between them, Downs and Kanekama then individually presented eight more sessions during each of the next three Fridays. Accordingly, they presented 32 sessions to about 800 participants over the month.

Table 1 outlines the three general areas of their presentation, the specific topics they covered, and equipment they employed with each topic. The presenters began each session with a brief description of speech-language pathology and audiology, moved to how noise can damage hearing, and concluded with how students can protect their hearing. To make the discussion more interactive and meaningful, the presenters used several large pieces of equipment that participants could see, or hear, or both. Moreover, the presenters had participants volunteer to manipulate the equipment. As illustration, some participants read off sound level meter readings of music from the radio. Others individually played their personal stereo systems at their typical listening volumes, and then they read their output levels (from as low as 75 dBA to as high as 130 dBA) on the sound level meter. All students got to listen to sounds in the room with passive earmuffs. Some students, moreover, wore active earmuffs and reported how sound suddenly decreased in intensity when the presenter hit a hammer on a desk. Finally, from beginning to end of each session, the presenters encouraged students to ask questions, or prompted their comments by asking questions like, "What is ear wax

for?” “Who works around noise?” “How do you clean your ear?” “What can you do to protect your hearing?”

Table 1: General areas and specific topics discussed in the program and equipment used (in parentheses) to illustrate different topics

Description of Profession
Self introduction of presenters.
What audiologists and speech-language pathologists do.
Variety of settings where they work.
The college education needed to work in these professions.
How much we they get paid.
Effects of Noise on Hearing
Basic anatomy and physiology of the ear (Model of ear).
How hair cells are damaged.
Listening to hearing loss simulation (CD recording).
What are unacceptable noise levels (Sound level meter, radio).
Measuring levels of personal stereo devices (Sound level meter, students own devices).
Protecting Hearing of Teenagers
Reduce noise levels.
Wear hearing protection devices (Muffs, plugs, semi-aural devices).
Not sticking things in ears.

RESULTS

Several students offered positive verbal feedback to the presenters immediately after each session. Moreover, after all four open houses were completed, the coordinators gave each student a form to write down comments about presentations they attended. The open house coordinators compiled and typed out the comments and gave them to the presenters in each department. The CSD presenters then sorted participants' comments into three general themes (see Table 2). Specifically, the themes suggested the participants considered the hearing conservation presentation entertaining, informative, and relevant. The open house coordinators also asked students to write down which presentations they attended in the College of Health Professions impressed them the most. Most of the students rated CSD as the first or second most impressive. Some of the students, moreover, also stated they were more interested in pursuing CSD as a profession after they had attended the presentation.

Table 2: General themes about the presentations and specific, verbatim, written, comments illustrating these themes

The presentation was entertaining.

“The guy was pretty funny.”

“CSD lady was cool.”

“Made it fund (*sic*) and put it in a way we could understand.”

“Funny!!!”

“She was very insightful and she also made my day!”

“She was really energetic.”

“Had a few laughs.”

The presentation was Informative.

“I learned fun facts I didn't know because it explains how loud sounds even one time can give you ear damage.”

“The simulation of NIHL was interesting.”

“Interesting things about sound levels I didn't know.”

“It really interest (*sic*) me and he gave us lots of information.”

“Hearing loss, because it was the most informational.”

“Had nice explanations and examples.”

“I like the concept of specialized in one particular part of the body.”

“I got to learn how we lose our hearing at an early age.”

“I learned some vital information that I never knew.”

“I learned a lot of things I didn't know.”

“I got to learn about how the ear works.”

“A lot of facts that haven't know before.”

“I learned lots of things that I did not know about noise and ear relationships.”

The presentation was relevant to participants' lives.

“It was interesting to see how loud my iPod really was.”

“She went through everything and showed us what we do to ourselves everyday.”

“I listen to a lot of loud music.”

“I probably listen to my MP3 too loud.”

“It was hands on.”

“It dealt with things that pertain more to my life.”

“It was very interactive.”

“Relatable, good examples.”

“She did hands on stuff.”

DISCUSSION

The purpose of this study was to develop, implement, and evaluate a university-based hearing conservation program offered during recruitment of local, high school students to WSU. The program was relatively easy to develop and efficient to implement: During 32, 20-minute sessions on four mornings during the Fall of 2007, the two CSD presenters completed 32, 20-minute presentations to approximately 800 juniors and seniors. At least among the students who offered written and verbal comments, the presentation was entertaining to attend, informative about effects of noise on hearing, and relevant to their everyday lives. Moreover, after completing the open house, some of the students were more disposed to consider disciplines within the WSU College of Health Professions, including audiology or speech-language pathology, as possible university majors.

Our hearing conservation program did have some limitations that we or others may wish to address in future university-based hearing conservation programs. First, measuring the intensity levels of students' personal stereo devices was probably the most enlightening portion of the presentation. The high schools, however, prohibited their students to bring them to school. Accordingly, students were reluctant to volunteer when we asked which ones had brought their personal stereo players with them. Their teachers were in an equally awkward position when they let the students expose their stereo systems for sound measurements. This predicament may be forestalled by informing school administrators in advance that we wished students be permitted to bring their stereo systems to school on the day of the open house. Second, we are unaware how many of the students attending our hearing conservation program will, in the long run, carry over our recommendations for protecting their hearing. Follow-up surveys of students attending future university-based hearing conservations would be useful.

Finally, the students who attended our university-based hearing conservation program were only those university-bound students who expressed an interest in matriculating into health sciences professions. Our presentations missed university-bound students who hoped to major in disciplines outside of our College of Health Professions. More important, we missed high school students who were not intending to attend a university. More of these students, speculatively, may enter jobs or have lifestyles in which they are even more exposed to high-intensity noise than college bound students in the health sciences. We have begun to address this problem as we continue to refine our university-based hearing conservation program. During the past year, for example, we have offered slightly modified hearing conservation presentations at WSU for college-bound high school students interested in the natural sciences and engineering, and, more important for all students from a local junior high school who came to WSU on a field trip.

In closing, 237 universities in the USA currently have masters degree programs in speech-Language pathology and the 73 have doctor of audiology programs (American Speech-Language-Hearing Association 2008). These programs have many professors, clinical educators, and graduate students with adequate training, facilities, and materials to deliver hearing conservation programs. Moreover, these programs often have mandates to recruit high school students to their universities as well as to provide services to the community. Implementing a university-based program like the one detailed in this study may allow these programs to "kill two or three birds with one stone." They educate a high-risk population of teenagers from their community about NIHL while recruiting some of these students to their programs.

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