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Attitudes of Speech-Language Pathology/Audiology Students Towards Noise in Youth Culture

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Abstract

ATTITUDES OF SPEECH/LANGUAGE PATHOLOGY STUDENTS TOWARD NOISE IN YOUTH CULTURE

by

Lillian Law

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In order to increase the use of hearing conservation strategies among youth, it is important to identify which populations are most amenable to potential behavior change. The purpose of the present study was to compare attitudes towards noise between undergraduate speech-language pathology/audiology majors and other majors. Participants (N = 119) responded to a survey used to compare attitudes toward noise in the two groups, as well as their perceived ability to influence their sound environment. In addition, a correlational analysis was performed to determine if a relation exists between attitudes towards noise and attitudes towards influencing one's sound environment. Findings revealed that the speech-language pathology/audiology majors group had significantly healthier attitudes toward noise in youth culture than the other group. In addition, a significant correlation was found between attitudes towards noise and attitudes towards influencing one's sound environment, providing systematic replication based on the theory of planned behavior. Results support the hypothesis that more exposure and education can lead to more positive attitudes. These findings suggest that speech-language pathology/audiology majors are among the population of youth who may be more responsive to hearing conservation education and more likely to make behavioral changes.

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Introduction

Noise induced hearing loss (NIHL) is the second most common type of acquired hearing loss following presbycusis and there is some evidence that NIHL may be on the rise in adolescents and young adults (Portnuff, Fligor & Arehart, 2011). An estimated 15% of Americans between the ages of 20 and 69 have NIHL (National Institute on Deafness and other Communication Disorders, 2010). However, there are not much data available on the approximate prevalence of NIHL among adolescents and young adults. Most studies looking at prevalence address hearing loss in general rather than NIHL specifically. One study in 2001 found that approximately 12.5% of children and adolescents aged 6-19 had NIHL in one or both ears (Niskar et al., 2001). More recent studies have shown evidence of a decrease in hearing ability among youth, although the amount of change is a subject of debate (Schlauch & Carney, 2011; Shargorodsky, Curhan, Curhan & Eavey, 2010).

It is likely that many adolescents and young adults are not even aware that they have hearing loss resulting from exposure to loud noise. With NIHL, individuals may only have a notch in one or two frequencies, giving them the perception that they still have normal hearing sensitivity (Le Prell, Hensley, Campbell, Hall & Guire, 2011). In a study by Widen, Holmes, Johnson, Bohlin & Erlandsson (2009), about 25% of undergraduate students were found to have notched audiograms, yet they were unaware of any hearing loss. Consequences of exposure to loud music may include tinnitus as well. Research has shown that approximately 50 to 85% of college students have experienced tinnitus in the past, with some having tinnitus always or frequently, some occasionally, and some who rarely have it (Le Prell et al., 2011; Degeest 2014).

There are a variety of leisure activities in which adolescents and young adults engage in, which may make them more susceptible to loud noise exposure; however, a common one is

listening to music. Many studies have focused on the music listening behaviors among this population, and the potential consequences of this leisure activity (Portnuff et al., 2011; Vogel et al., 2011). With the increased availability of personal listening devices (PLDs), such as iPods, mp3 players, and even cellular phones via music listening applications, young adults may expose themselves to loud music for prolonged periods. Despite the knowledge from media publicizing that PLDs may cause hearing loss, there are few studies directly linking use of PLDs and hearing loss (Portnuff et al., 2011).

There are various factors that play a role in the possibility of NIHL from using PLDs; one major factor is the volume of the music. Findings from Goshorn, White & Kemker (2009) indicated that 55% of college students listened to music at levels greater than 85 dB, which is considered very loud, and 26% listened at 70-85 dB, which is considered loud. When analyzing the distribution of listening levels according to music genre, results indicated that those listening to rap and rock music listened at the loudest levels, at 100-107 dB. Though, interestingly, audiometric testing on the participants in the Goshorn et al study did not reveal hearing loss in any of the students. However, the students reported owning PLDs for 3 years or less, so the students may not have been exposed long enough for hearing loss to manifest itself (Goshorn et al., 2009). Although some of the measured listening levels in another study were not necessarily considered to be dangerous, with prolonged listening at that level, the chance of NIHL was significantly increased (Danhauer et al., 2009).

As noted above, the length of time spent listening to PLDs also plays a role in risk for NIHL. The Occupational Safety and Health Administration and the National Institute for Occupational Safety and Health (NIOSH) have established guidelines for safe durations of noise exposure at specific levels before being at risk for NIHL (NIOSH, 1998). The louder the level of

noise, the shorter the recommended duration of exposure. According to the more conservative standards of NIOSH, it is safe to be exposed to 85 dBA of noise for up to 8 hours. There is an inverse relationship between duration and intensity. For example, the person exposed to 88 dBA of noise for 4 hours is at equal risk to the person being exposed to 91 dBA of noise for 2 hours. Adolescents and young adults commonly listen to music more than 2 to 3 hours each day (Danhauer et al., 2009). As noted earlier, the longer a person listens to music at high levels, the greater the risk for NIHL. Danhauer et al (2009) calculated that it is safe for individuals to listen to iPods at 70% volume for 4.6 hours a day when using the Apple earbuds that are included with the purchase of the device. Fligor et al (2011) suggested the 80/90 rule; one can listen at 80% volume for a maximum of 90 minutes without being at risk for NIHL.

Also, as expected, when people were using PLDs in noisy environments, they increased the volumes further. Typical earbuds or headphones do not block out ambient noise, causing listeners to feel the need to raise the volume. Therefore, using PLDs in noisy environments increases the risk of NIHL (Danhauer et al., 2009). Earbuds are more commonly used with PLDs than supra-aural headphones, and it was found that people using PLDs with ear buds tended to listen at higher levels than those who use supra-aural headphones due to earbuds being more vulnerable to ambient noise (Hoover & Krishnamurti, 2010). Therefore, supra-aural headphones have been deemed to be safer for listening to PLDs. Not only does the volume coming through the earbuds put the individual at risk, but the closer distance of the earbuds to the eardrums, compared to headphones, increases the potential maximum output. One solution that has been proposed to reduce the risk in noisy situations is to avoid listening to music in these situations or to purchase sound isolating earphones (Hoover & Krishnamurti, 2010; Danhauer et al., 2009).

Although many studies have focused on the music listening behaviors among this population with PLD's, use of PLDs is not the only activity in which adolescents and young adults engage in that expose them to dangerous levels. Other leisure activities that tend toward loud music exposure include attending or working at nightclubs or bars, listening to music in automobiles, working out in exercise facilities, and attending concerts. Noise levels in nightclubs can range from 94.9 to 112.4 dBA, while the maximum sound level in an automobile can reach levels of 154.7 dBA (Rawool & Colligon-Wayne, 2008). Unfortunately, young people enjoy turning up the music to high levels when driving so that their cars will vibrate from the sound pressure. Some gym facilities and health clubs also tend to turn up the music to levels ranging from 78 to 106 dBA (Rawool & Colligon-Wayne, 2008). Loud music may be played either in the public area with the exercise machines or in the private classes teaching aerobics or other types of exercises. Noise levels at rock concerts can range from 100 to 115 dBA (Rawool & Colligon-Wayne, 2008). As noted earlier, not only is the sound level of importance, but also the duration of exposure. In the case of rock concerts, for example, results from a survey of rock concert attendees revealed that the majority went to multiple rock concerts per year, with 54.3% attending at least four concerts each year. The more rock concerts an individual attends, the greater the risk for NIHL.

Not only did rock concert enthusiasts report frequent concert attendance, they also reported gravitating towards the loudest areas of the concert, which are close to the speakers or in the mosh pits (Bogoch, House & Kudla, 2005). According to Bogoch et al (2005), many rock concert attendees commonly believe that the louder the music, the more enjoyable the experience. Although many adolescents and undergraduate students reported awareness, they still reported continuing to seek pleasure from it (Portnuff et al., 2011; Rawool & Colligon-

Wayne, 2008). One study investigating the listening habits of adolescents found that those who listened to music at risky levels did so without considering the future consequences (Vogel, Brug, Van der Ploeg & Raat, 2011). Also, they reported that they found satisfaction from listening at those high levels. Compared to these adolescents, those who listened to music at lower levels were more motivated to engage in healthy listening behaviors and had more self efficacy. Some of the adolescents in this study either were not fully aware of the risks of exposure to loud noise or were not concerned by them.

Another important concern is youth awareness about hearing protection devices (HPDs). Studies have revealed that youth did not lack awareness about HPDs, but rather they chose not to use them (Bogoch et al., 2005; Goggin et al., 2008; Widen et al., 2009). Rock concert attendees were found to be aware of hearing protection; however, less than 20% of them had ever used them. Only 3% of attendees reported that they always wore hearing protection during rock concerts. Bogoch et al (2005) found that over 40% of attendees reported that if free hearing protection was provided by the venue, they would be willing to wear them. On the other hand, Goggin et al conducted a study in 2008, which found that only 7% of their participants would use hearing protection if they were complimentary. This can be an indication of either minimal concern for hearing health or lack of knowledge about the potential harms of loud noise exposure of rock concert attendees. Participants who had either experienced negative auditory effects or believed that music was being played at dangerous levels were more likely to wear hearing protection or accept free hearing protection devices (Widen et al., 2009).

Youth who are potentially at even greater risk of music-induced hearing loss are music students, who are exposed during individual practice, rehearsals, and performances. This applies to both classical musicians and pop/rock musicians. It is also common for classical musicians to

have tinnitus resulting from music exposure. The location of the musician in the orchestra plays a role in the degree of susceptibility to hearing loss. The musicians' location in the orchestra exposes them to sound levels of varying intensity. The orchestra pit was found to be the area in which the sound levels were highest and therefore representing greater risk for NIHL (Toppila, Hoskinen, & Pyykkö, 2011). Past studies have shown that approximately 37 to 58% of classical musicians have music induced hearing loss. Zhao, Manchaiah, French and Price (2010) found that 46% of rock/pop musicians had hearing loss between 3000-8000 Hz. Therefore, this is a population for which knowledge about the risks of noise exposure is particularly crucial.

Research has investigated the attitudes of undergraduate music students toward noise. Since hearing health plays such an important role in their academic success and future, it would be expected that music students would value their hearing more and be more diligent in protecting their hearing. However, Barlow (2010) found that undergraduate music students engaged in leisure activities and/or occupations involving loud music exposure outside of school without wearing hearing protection. There was a high rate of using PLDs, attending concerts, and working in loud music environments, being employed as DJs, sound engineers, or other positions. Moreover, the students reported having experienced temporary or permanent tinnitus and/or hearing loss, and were even concerned about these symptoms. Yet, the majority did not consistently wear hearing protection devices.

Health belief models can aid in determining how likely an individual is to take preventative action. According to one model, the probability that an individual will take action depends on three factors: 1. Individual perception of how susceptible they are to the disease and the seriousness of the disease 2. Modifying variables such as perceived threat of the disease or demographic characteristic (i.e. age) 3. Perceived benefits of taking preventative action.

According to this model, an internal (i.e. negative auditory consequence) or external (participation in a health promotion program) stimulus must occur to motivate an individual to take preventative action (Rawool & Colligon-Wayne, 2008). In the case of NIHL, the individuals must be aware of how susceptible they are to NIHL and the perceived threat or seriousness of hearing loss. Motivating variables can refer to auditory (internal) symptoms, such as hearing loss, tinnitus, or difficulty understanding speech, or health promotion programs (external). Finally, some perceived benefits may include preserving the hearing for a longer period of time or being able to listen to music without difficulty or distortion (Rawool & Colligon-Wayne, 2008).

A similar health belief model is the theory of planned behavior, which claims that the willingness of an individual to carry out a behavior depends on three general factors. The first is his or her attitude toward that behavior, such as in terms of whether or not the behavior is positive or negative (Chesky, Pair, Lanford & Yoshimura, 2009). Thus, if a person feels that noise levels at nightclubs are dangerous, he or she will have a negative attitude towards attending nightclubs without wearing hearing protection. On the other hand, if a person feels that it is necessary to wear earplugs at nightclubs to prevent NIHL, he or she will have a positive attitude towards ear protection. The second and third factors relate to subjective norms and perceived behavioral control**.** Subjective norms include aspects which are judged to be highly influenced by significant others including perceived threat of hearing loss, perceived impact of the consequences of hearing loss, and social norms. Perceived behavioral control refers to perceived benefits of hearing protection, hindrances to hearing protection use, and perceptions of self-efficacy in controlling the environment and engaging in hearing protection (Gilles & Paul 2014).

In order to determine whether there was a relationship between Factors 1 and 3 in the theory of planned behavior, Chesky et al (2009) used the Youth Attitudes to Noise Scale (YANS) (Olsen & Erlandsson 2004, as cited in Widen, Olsen & Erlandsson, 2004) to establish the relationship between undergraduate students' attitudes towards noise and their attitudes towards their ability to influence their environment. Results for the two populations investigating music majors and non-music majors revealed that attitudes toward noise significantly correlated with attitudes towards their perceived ability to influence their environment. Therefore, students with negative attitudes toward noise would be more likely to influence their sound environment with hearing protection (Chesky et al., 2009).

In addition to establishing relationships, Chesky et al (2009) also compared the attitudes of undergraduate music students toward noise in youth culture with attitudes from all other majors. Overall, they found that music students were more knowledgeable about the harms of loud noise exposure, had healthier attitudes about noise, and were more positive in their perception about their ability to influence their own sound environment. The music students scored higher on all 12 survey questions compared to undergraduate students from other majors. This may be due to musicians valuing the ability to hear their music and not wanting to be occupationally threatened.

The study above suggests that when adolescents and young adults are more aware about the harms of noise exposure, they will either have more negative attitudes toward it and/or be more willing to take action to protect their hearing. However, most schools do not incorporate hearing education into the curriculum. Education about other health issues, such as smoking and substance abuse, are provided. However, hearing health is also an important health issue. Therefore, schools and universities should be more proactive about including hearing health

training in their curricula (Marlenga et al., 2012). Research has found that some high school and college students may be misinformed about NIHL, with beliefs such as NIHL being an indicator of damage to the tympanic membrane or that hearing loss would not occur until an older age (Zhao et al., 2011; Rawool & Colligon-Wayne, 2008). Therefore, these misconceptions suggest the importance of hearing health education for this population.

With the goal of impacting on changing health behaviors, it is helpful to know which populations are amenable to behavior change. The results from the Chesky et al study (2009) suggest that music students may be such a population. It is possible that speech language pathology/audiology students (SLPA) would be another population. There are currently no studies that have investigated the knowledge or the attitudes of SLPA students toward noise in youth culture. The purpose of this study is to compare the attitudes of undergraduate SLP students toward noise in youth culture to undergraduate students from other majors (nonSLPA), and to corroborate the correlations demonstrated in the Chesky et al study. One objective was to determine whether SLPA students would have healthier attitudes toward noise than students from other majors and another was to determine whether SLPA students also would have more positive attitudes about influencing their own sound environment. Since SLPA students are required to take audiology courses, they may be more aware of the potential risks of loud noise exposure. Thus, the hypothesis is that SLPA students would be more knowledgeable about the dangers of noise and have healthier attitudes toward noise following coursework in audiology. A second goal was to determine if there is a relationship between attitudes towards noise and perceived ability to influence the sound environment, as demonstrated previously with music students.

Methods

Participants

This study was approved by the Institutional Review Board of Brooklyn College. Participants consisted of students from Brooklyn College, Brooklyn, New York. Selection criteria required that students were undergraduates who were juniors or seniors, ranging from 18-28 years of age. Students were divided into one of two groups: students in the first group were majoring in speech-language pathology/audiology (SLPA) students. In order to be included in the study, they had to have completed or almost completed at least one course in audiology. Students in the second group consisted of undergraduate students from majors other than SLPA (nonSLPA).

Procedure

Professors teaching two types of courses were contacted via email, asking permission to visit the class and administer the survey. The first group were all professors teaching audiology courses to SLPA majors. The only class not included was one taught by the mentor. The second group (nonSLPA) was chosen from of a random set of professors teaching CORE courses. CORE courses are a set of required classes from which undergraduates choose, designed to expose them to a broad range of ideas and skills. Professors were contacted the third week in April 2013. All professors who were contacted consented to allow the principle investigator to address the students and administer the survey. Data were collected during the period of the end of April to the middle of May 2013. Surveys were distributed to those students who agreed to participate following an oral description of the project. The principal investigator collected the surveys from the students as soon as they were finished filling them out. However, for one of the SLPA courses, the principal investigator visited the class during the day of their final, so the

students opted to fill out the surveys after their final. The surveys were placed in an interdepartmental envelope and subsequently submitted to the investigator.

Materials

The design of this study essentially replicated that of Chesky et al (2009). The same survey was used, which was a revised version of the YANS, originally developed by Olsen and Erlandsson (2004) (as cited in Widen, Olsen & Erlandsson 2004). A copy of the survey used in the study appears in the appendix. The survey is comprised of 12 questions, which can be classified into two categories: 7 items were geared towards attitudes towards noise in youth culture, and 5 items addressed attitudes concerning the ability to influence one's own sound environment. Participants responded to the items using a 5 point Likert scale, with "5" indicating *strongly agree* and "1" indicating *strongly disagree*. Higher scores corresponded to healthier attitudes and greater knowledge. There were also four categorical questions at the end of the survey to be used for subject selection criteria and description, and data analysis. These items addressed age, major, status (freshman, sophomore, junior, senior, or post-bachelor's) and number of audiology courses taken. Data were analyzed using SPSS statistical software.

Results

Of the 120 participants who were approached to participate, a total of 119 participants were recruited. Of these, 22 subjects were excluded who fell outside of the selection criteria: 9 due to age and 13 due to status (freshman, sophomore, or post-bachelor), and 10 other participants were excluded who did not submit completed surveys; they left out questions either pertaining to the categorical items or the items from the YANS. Thus, a total of 45 nonSLPA major and 42 SLPA undergraduate students were included in the data analysis. For the nonSLPA participants, 27% were business majors, 7% were double majors (in unrelated fields), 16% in humanities, 33% in science, and 16% in social sciences. For the SLPA participants, 5% were double majors with the second major being in the social sciences.

Table 1. Mean, Standard Deviation, and Standard Error Mean of Ages of SLPA and NonSLPA majors

Major Type	*N*	Mean	Std. Deviation	Std. Error Mean
SLPA	45	21.91	1.550	.231
NonSLPA	42	22.10	2.407	.371

The nonSLPA group was comprised of 25 juniors and 20 seniors, and there were 20 juniors and 22 seniors in the SLPA group. As expected, none of the nonSLPA participants had taken any audiology courses. In the SLPA group, 21 participants had taken one audiology course and 21 had taken two. Table 1 shows the mean age statistics for each group, with the mean age of all participants being 22.01. There was no significant difference in age between the two groups (t= 0.427; df= 85; p= 0.67).

Table 2. Means, Standard deviations, and Significant Levels for Categories and Total Score for SLPA and NonSLPA majors

	SLPA		NonSLPA		Difference
	Mean	*SD*	Mean	*SD*	Sig. (2-tailed)
Attitudes toward noise in youth culture	3.43	.605	3.10	.670	.018*
Attitudes toward influencing their sound environment	3.03	.635	2.73	.797	.053
Total	3.26	.557	2.94	.647	.016*

Note. * Significant at the $p < 0.5$ level

Table 2 displays the mean scores and standard deviations on the YANS. The mean score for attitudes towards noise, and the mean score for attitudes towards ability to influence one's own environment for each group are also displayed as well as the scores combined over both groups. Using independent t-tests, results revealed that the SLPA group scored significantly higher at the 0.5 level on all three comparisons between groups indicating healthier attitudes toward noise. To account for the increased risk of a Type 1-error due to performing multiple t-tests, the Bonferonni correction, displayed in table 3, was calculated (Haynes & Johnson 2009). Differences were significant at the 0.5 level on two of the three comparisons (attitudes toward noise in youth culture category and total score) when the Bonferonni method was applied.

Table 3. Bonferonni Correction Statistics for Categories and Total Score

Question	Type III Sum of Squares	*df*	Mean Square	*F*	Sig
Attitudes Toward Noise in Youth Culture	2.368	1	2.368	5.787	.018*
Attitudes Toward Influence Their Sound Environment	2.014	1	2.014	3.847	.053
Total	2.217	1	2.217	6.054	.016*

Note. * Significant at the $p < 0.5$ level

To explore further the theory of planned behavior, Pearson correlation coefficients were determined to investigate whether or not there was a correlation between attitudes towards noise in youth culture (attitudes category) and attitudes toward influencing the sound environment (influence category) (Table 4). Separate analyses were made for the two groups as well as for all 87 participants. For all participants, the attitudes and influence categories were significantly

correlated (r= .625, P <.000). The same correlation was significant when examining the results for the SLPA group alone (r= .618, P <0.000), and for the NSLPA group alone (r= .599, P <0.000). Differences remained significant at the 0.001 level for all three correlations when the Bonferonni correction was applied.

Table 4. Pearson Correlation Coefficients Among Attitude Measures for SLPA, NonSLPA and Both Groups Combined

Major			Attitudes toward noise	Attitudes toward influence
SLPA	Attitudes toward noise in youth culture	Pearson correlation	1	.618
		sig. (two-tailed)		.000*
		N	42	42
	Attitudes toward influencing their sound environment	Pearson correlation	.618	1
		sig. (two-tailed)	.000*	
		N	42	42
NonSLPA	Attitudes toward noise in youth culture	Pearson correlation	1	.599
		sig. (two-tailed)		.000*
		N	45	45
	Attitudes toward influencing their sound environment	Pearson correlation	.599	1
		sig. (two-tailed)	.000*	
		N	45	45
Both groups combined	Attitudes toward noise in youth culture	Pearson correlation	1	.625
		sig. (two-tailed)		.000*
		N	87	87
	Attitudes toward influencing their sound environment	Pearson correlation	.625	1
		sig. (two-tailed)	.000*	
		N	87	87

Note. * Significant at the $p < 0.001$ level

Discussion

The results revealed that SLPA students performed significantly higher than the nonSLPA students on the YANS, a survey designed to measure attitudes toward noise in youth culture and influencing their own sound environment. When comparing the two groups on overall mean score, the mean scores for attitudes toward noise and the ability to influence one's own sound environment, the SLPA students scored significantly higher. This indicates that the SLPA students have healthier attitudes toward noise and are more likely to possess proactive attitudes regarding the ability to influence one's own sound environment. When taking into account the Bonferonni correction, however, the differences in attitude regarding influencing the environment approached, but did not achieve statistical significance.

Table 5. Comparison Between Present Study and Chesky et al (2009) Study for Categories and Total Score

	SLPA		NonSLPA		Difference
	Mean	*SD*	Mean	*SD*	Sig. (2-tailed)
Attitudes category	3.43	.605	3.10	.670	.018*
Influence category	3.03	.635	2.73	.797	.053
Total	3.26	.557	2.94	.647	.016*

	Music		Nonmusic		Difference
	Mean	*SD*	Mean	*SD*	Sig. (2-tailed)
Attitudes category	3.541	.721	2.972	.787	.000*
Influence category	2.991	.608	2.581	.706	.000*
Total	3.242	.6131	2.754	.679	.000*

Findings in this study were similar to those in the Chesky et al study (2009), in which music majors demonstrated significantly healthier attitudes toward noise. Table 5 shows the comparison of mean scores for attitudes towards noise, attitudes toward ability influence their sound environment and the total score. In the present study, SLPA students only scored significantly higher on the attitudes category and the total, while in the Chesky et al study, the music majors scored significantly higher on both the attitudes and influence categories and the

total. When looking at the mean values, the non-music majors scored more poorly than the nonSLPA students, which could account for the highly significant values in the Chesky et al study. It should also be noted that, in the Chesky et al study, the Bonferonni correction was not taken into account.

Chesky et al (2009) theorized that the reason music majors had healthier attitudes toward noise was due to their musical instruction. The music majors had musical training, influence from faculty, peers and parents, and appreciation of the importance of listening to music; therefore, they feel threatened by the dangers of loud noise exposure. Additionally, they may have experienced suffering the consequences of loud noise exposure (tinnitus or temporary threshold shift) (Chesky et al., 2009). This suggests that individuals with more knowledge about consequences of loud noise exposure (i.e. music majors and SLPA majors) have healthier attitudes and would be more likely to have increased perceived ability to influence their own sound environment. Therefore, it can be speculated that with more instruction about the potential harms of loud noise exposure, students will have healthier attitudes toward noise in youth culture, and in turn, will perceive the ability to influence their own sound environment. The results from the present study support the hypotheses that more exposure and education can lead to more positive attitudes.

The literature is mixed on the effect of increased knowledge about hearing health on leading to preventative actions against hearing damage. One school-based hearing loss prevention program called "Dangerous Decibels" (Griest, Folmer & Martin, 2007) found that instruction about hearing health will lead to increased knowledge that can be retained over at least a one month period. In this study, 479 fourth graders and 550 seventh graders were given a 35-minute presentation about hearing and hearing loss prevention. Results showed that both

groups exhibited increased knowledge about hearing at 1 month and 3 months post-presentation. Moreover, healthy attitudes were retained up to 3 months post-presentation for the fourth graders. On the other hand, health attitudes were only retained up to 1 month post-presentation for the seventh graders, and at 3 months post-presentation, attitudes had reverted back to those they had at baseline. On the other hand, the students were only given a single presentation, so perhaps with a multi-session program, healthier attitudes could be retained for a significant period of time. According to Griest et al (2007), results for the seventh graders can indicate either one of the following: (a) instruction should begin at a younger age; (b) increased knowledge does not lead to healthy sound prevention behaviors (i.e. listening to music under headphones at healthy levels) (Griest et al., 2007). Also, as noted above, it may be beneficial, but only after a longer training period.

Knobloch & Broste (1998) found that a hearing conservation program for high school students working in agriculture lasting four years was effective in increasing the number of people who wear (HPDs). When reporting the motivation for wearing HPDs, the reasons were the free earmuff and earplugs for 94% of students, the annual audiological examinations for 90% of students and the informational brochures mailed to their homes for 77% of students. A comparison of HPD usage before and after treatment showed that usage increased from 23 to 81% in the treatment group and usage only increased from 24 to 43% in the control group (which did not receive any intervention) (Knobloch &Broste, 1998).

On the other hand, Weichbold & Zorowka (2007) found that following a hearing health campaign for adolescents, the adolescents did not change their loud noise exposure behaviors. The campaign was called PROjectEAR, and was a 3 day program comprising four 45-minute sessions. The students were given a survey prior to the campaign and one year later, assessing

their attitudes and experiences of loud noise exposure. Both frequency of attending discotheques and music listening at unhealthy levels remained the same before and after PROjectEAR. Weichbold and Zorowka (2007) hypothesized this may be due to the fact that generally adolescents between the ages of 12 and 17 are more likely to attend discotheques. This is the trend, and even with increased knowledge, it is not likely to affect adolescents' choice to engage in activities involving loud noise exposure. Based on the health belief model, the reason increased knowledge does not necessarily lead to actions to protect hearing may be that perceived vulnerability is low in this population. Students may feel that since they are not vulnerable, it is unnecessary to protect their hearing due to lack of a perceived threat (Rawool & Colligon-Wayne, 2008).

Other studies have also shown that intervention led to small changes in use of HPDs (Marlenga et al., 2012; Kotowski, Smith, Johnstone & Pritt, 2011). One hearing conservation program provided 3 years of comprehensive hearing health education for high school students in agricultural communities. Findings showed that participants in the intervention group had significantly higher rates of wearing hearing protection than those in the control group. However, the rates were still low in both groups, with 25.6% in the intervention program and 19.6% in the control. Despite providing long term hearing health education, there was minimal effectiveness even though it began at an early stage in the lives of these participants (Marlenga et al., 2012). Similarly, in another study, where the majority of undergraduate music students reported direct (education about hearing loss and/or noise levels) or indirect (signs about warnings of consequences of loud noise exposure) hearing health education, there was a low rate of hearing protection usage (Barlow, 2010).

Due to the lack of psychometrically-validated questionnaires regarding this topic, Saunders, Dann, Griest, & Frederick (2014) developed a questionnaire assessing knowledge, attitudes and behaviors regarding hearing, conserving hearing, and engaging in leisure activities with loud noise. Respondents consisted of adults between the ages of 18 and 80. Groups 1 and 2 filled out the questionnaires prior to intervention and 7 to 36 days post intervention. Only group 2 received intervention during the interval between the two administrations of the questionnaire. Knowledge scores ranged from 15.6 to 93.8% pre-intervention for the two groups, indicating that increased knowledge about loud noise exposure would be beneficial to many of the participants. Knowledge scores increased for group 2 post-intervention. Intention to use hearing protection devices did not increase significant post-intervention, but attitudes toward hearing conservation became more positive. (Saunders et al., 2014).

Kotowski et al (2011) suggested that perhaps even with the knowledge of the value of using hearing protection, individuals will not be willing to use them because they are not perceived as "cool" or acceptable among peers. After reading brochures informing students that circumaural headphones are safer than inserts, a significant amount of students switched. Circumaural headphones were perceived as cool and acceptable, while HPDs were not, so students were willing to make this change. Knowledge about hearing health also significantly increased after receiving the brochures; however, results showed that there was not a significant change in willingness to wear HPDs. This implies that no matter the method or impact of the intervention, willingness to take action may still be low if it is not acceptable, even if they are aware of the dangers of loud noise exposure (Kotowski et al., 2011).

Another reason that adolescents are less likely to take action is that they apparently enjoy taking risks, and are therefore not prone to exhibit protective behaviors. Even if adolescents are

aware of the risks of certain activities, such as loud noise exposure, smoking and talking to strangers, they will still engage in these activities. This population believes that risky behaviors are acceptable due to social norms and values; therefore, these behaviors are encouraged. Also, adolescents felt that listening to music at loud levels is more pleasurable and enhances the musical experience (Bohlin, Sorbring, Widén & Erlandsson, 2011). Furthermore, adolescents feel that loud music exposure is less risky than traditional risky behaviors, such as taking drugs and speeding. However, teenagers typically engage in loud music exposure while joining in on other risky behaviors. For example, when attending clubs, they will drink illegally, talk to strangers and drink excessively. Therefore, attending clubs can be viewed as both positive and negative experiences by this population. They are beneficial for socializing with peers, but people also exhibit negative behaviors at these venues (Bohlin et al., 2011).

A second goal of this study was to corroborate Chesky et al's (2009) finding regarding the theory of planned behavior and whether attitudes towards noise would correlate with proactive attitudes. A Pearson correlation analysis revealed significantly positive correlation for each group individually and as a whole. These data suggest that individuals who have healthier attitudes toward noise are likely to believe they can influence their own sound environment, and vice versa. To apply these findings to the theory of planned behavior, it would signify that those with healthier attitudes toward noise are either aware that they are susceptible to hearing damage resulting from loud noise exposure, conscious of the perceived threats of loud noise exposure, or realize the benefits of protecting their hearing. According to the theory of planned behavior, the SLPA majors are aware of the harms of loud noise exposure, so they would have positive attitudes toward hearing protection.

One factor that differs between the present study and the Chesky et al (2009) study is that the SLPA group was dominated by females. Although participants were not asked to state their gender in the questionnaire, with a cursory glance at each of the SLPA classes, it was apparent that the majority of each class was females, with only one or two males in each. However, this is due to the nature of the SLPA field.

Another aspect that differs between the present study and the Chesky et al (2009) study is the mean age of the participants in the Chesky et al study was about 20 years of age, while in this study, it was approximately 22 years of age. This is due to the fact that SLPA students who are taking audiology courses are juniors and seniors, so only juniors and seniors from the CORE classes were included in the study.

It should be noted that upon review of all 87 questionnaires, there were three questionnaires that were suspicious for random answering. Two of them had the same answer circled for all questions. The third had the same answer for all questions except for two. It was decided to include all questionnaires for analysis; it could not be ruled out that other questionnaires with more varied answers may have been randomly answered as well. Another limitation of this study was that the primary investigator was present while the students filled out the questionnaires, which creates the risk for a Hawthorne effect. The students may have felt obligated to participate due to the primary investigator standing in the front of the classroom. Additionally, the SLPA students may have been more inclined to respond in the anticipated direction (with healthier attitudes toward noise and ability to influence their sound environment).

In future studies, if a larger size were obtained, it should be explored whether an age effect would be found. Perhaps older students would have healthier attitudes than younger students. Additionally, it would be interesting to determine whether a gender effect would be

found. Saunders et al (2014) compared her findings with those of Widen et al (2011) and Bohlin & Erlandsson (2007), and noted that older female adults reported lower perceived susceptibility to damaged hearing as compared to all males as well as younger female participants. This could possibly indicate that maturity plays a role in individuals' attitudes toward noise in youth culture and their likelihood of engaging in risky hearing behaviors. Rawool and Colligon-Wayne et al (2008) also evaluated whether there was a gender effect in their study; however, there were significantly more males than females in their study, so any gender effects found should be viewed with caution. Results indicated that women were less likely than men to wear hearing protection (4.17% compared to 38.10%), but men were more likely than women to use noisy equipment without ear protection (74.36% compared to 34.39%) (Rawool & Colligon-Wayne, 2008).

Conclusion

The following conclusions may be reached from the present study:

1. SLPA students demonstrated healthier attitudes regarding the risk of loud sound as compared to students from other majors. There was also a trend towards greater perceived behavioral control of their environment. These results are similar to the findings of Chesky et al. (2009) who compared music students to students from other majors.
2. There is a significant correlation between students' attitudes towards noise and their attitudes towards their perceived ability to control their sound environment. These findings provide systematic replication of the theory of planned behavior model.
3. SLPA majors are among the population of youth, who based on previous exposure may be more responsive to hearing conservation education and more likely to make behavioral changes. Future hearing education programs should consider focusing their efforts first towards groups with greater sensitivity to the importance of good hearing, such as music and SLPA majors.

As more adolescents and young adults engage in leisure activities involving loud music exposure, it is necessary to reach this population and stress the importance of hearing health.

Appendix A

Youth Attitudes to Noise Scale (YANS)

Please indicate to what extent do you agree with the following statements on a scale of 1 to 5.
5= completely agree, 4= agree, 3= neutral, 2= disagree, 1= completely disagree

	Completely Disagree				Completely Agree
The sound levels should be lowered at clubs, rock concerts, dances or sporting events.	1	2	3	4	5
There should be more rules and regulations for the sound levels in society.	1	2	3	4	5
The sound levels at clubs should not be played so loudly if it can be harmful to people's hearing.	1	2	3	4	5
It is important for me to make my sound environment more comfortable.	1	2	3	4	5
In general, there is too much noise in society.	1	2	3	4	5
I would consider leaving a club, dance, rock concert, rave, or sporting event if the sound level is too loud.	1	2	3	4	5
I think it is my own responsibility to lower the sound levels at clubs.	1	2	3	4	5
I think it is unnecessary to use earplugs when I am at a club, rock concert, dance, or sporting event.	1	2	3	4	5
I would be prepared to give up activities where the sound level is too loud.	1	2	3	4	5
The sound level at clubs, dances, rock concerts, raves, or sporting event is not a problem.	1	2	3	4	5
I am prepared to do something to make the school environment quieter.	1	2	3	4	5
I think that the sound levels at clubs, dances, rock concerts, and sporting events, in general, are too loud.	1	2	3	4	5

(Olsen S.E. & Erlandsson S.I. 2004)

The following questions are for informational purposes only, and will aid in the analysis portion of the study.

Age _____

Major _____

Status ____Freshman ____Sophomore ____Junior ___Senior ____Post Bac

Number of courses taken in Diagnostic or Rehabilitative Audiology: _____0 ___1 ___2 ___more than 2

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