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Noise Exposure and Hearing Protection in Marching Band Students

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Abstract

The purpose of this research project was to investigate collegiate marching band members' use of hearing protection during rehearsals and performances. A second purpose was to identify the concerns of marching band members about the use of hearing protection. Finally, the third purpose was to determine if the type of protection used, standard or custom, impacted wearing time. Hearing threshold sensitivity, tympanometry, and use of hearing protection were measured prior to the fitting of the custom earmolds and again at the end of the marching season.

Pre-season results indicated that the majority of band members reported they did not wear standard ear protection for practice and performances. The reasons for lack of consistent use of hearing protection with standard plugs were comfort, forgetting to wear hearing protection, perception of volume, and quality of sound.

Most participants who did not consistently wear the earmolds stated that fit, comfort, and perception of volume were the main reasons for inconsistent wear. Overall, provision of custom earmolds was associated with increased number of RMB members who wore ear protection as well as increased wearing time overall.

Noise Exposure and Hearing Protection in Marching Band Students

Introduction

Approximately 5.2 million individuals between the ages of six to 19 years have permanent hearing loss from excessive exposure to elevated noise levels in recreational settings ("Preventing Noise-Induced Hearing Loss," 2020). These recreational activities often involve music such as concerts or large crowds in clubs or bars. There are multiple levels of sound that are considered dangerous and not safe for any length of time as well as levels that should have limited exposure. Certain sounds are called impulse noises, which can cause instant hearing damage if preventative measures are not taken. These impulse noises include firearms, which produce intensity levels of 140 dB, fireworks, which produce intensity levels of 150 dB, and rock concerts, which produce intensity levels of 112 dB (American Speech-Language-Hearing Association, n.d.).

Hearing conservation for occupational noise risks is mandated through regulations created by the Occupational Safety and Health Administration (OSHA). OSHA requires employers to provide free hearing protection to employees that are exposed to an average noise level of 85 dB or greater for an eight-hour timeframe (United States Department of Labor, n.d.). Failure to consistently wear hearing protection in occupational settings that produce loud noise levels can lead to noise-induced hearing loss. This risk is heightened with improperly fit hearing protection (American Academy of Audiology, 2003).

Collegiate musicians in marching bands, however, do not have regulations regarding wearing hearing protection during rehearsals or performances. There are no regulations in place regarding hearing conservation for musicians in general. This ultimately leaves the choice of wearing hearing protection to the individual musician. The majority of musicians choose not to

wear hearing protection due to inconvenience or the impact the hearing protection may have on the overall performance (Federman, & Picou, 2009).

Hearing Conservation in Musicians

Collegiate musicians, specifically those in the ensembles associated with band, are exposed to elevated noise levels on an almost daily basis. Marching bands may rehearse outdoors with music in extremely loud dynamics, as well as indoor music rehearsals where although the music is the same written dynamic, the overall volume is much louder in an enclosed space. This increased exposure puts musicians at risk for noise-induced hearing loss. A study conducted at the University of Minnesota investigated the risk for NIHL in university marching band musicians. A second purpose of the study was to provide an overview of a hearing conservation program for the band. The participants consisted of 350 musicians across a span of three years from the University of Minnesota marching band and 348 individuals similar in age and demographic to the musicians that served as a control group. Each participant had audiological assessments to measure hearing thresholds in a pretest, posttest, and annually during their band camp. This data was directly compared to the control group's round on testing data. At this time, the participants also received a pair of non-custom musician's earplugs as well as training on how to correctly wear them.

An educational component was also included during the sessions to educate participants on the risks of NIHL and how to prevent it. For the returning participants in subsequent years, feedback was gathered on how often the participants wore the provided hearing protection and why they may not have worn them during rehearsal. Sound levels of indoor marching band rehearsal were measured. The average sound levels across various positions throughout the ensemble were above 98 dB at every position, with peaks of at least 112 dB in every position. Over 50% of participants reported that they did not ever use hearing protection during rehearsals. The

data collected from threshold testing indicated that 12.4% of the marching band participants' audiograms showed a "notch" in threshold configuration. A notch on an audiogram is a marked decrease in hearing sensitivity relative to nearby frequencies. Notches are found in the range of normal hearing or the hearing loss range. Although there was no evidence of hearing loss within the participants, they were still exposed to high-level sound. Because of this, it was recommended that musicians carefully monitor their hearing health and increase their self-awareness of hearing and hearing loss. After being presented with hearing protection, their audiograms one year later indicated that most notches had disappeared, demonstrating that the ear protection was effective in conserving the hearing of the college musicians (Jin et al., 2013).

A study conducted with high school marching bands in North Carolina analyzed changes in earplug use assessed through self-report surveys. The participants consisted of 69 members, varying in instrumentation, that were taken from two high school marching bands**.** Three surveys were distributed throughout the study's duration. In the first survey, participants were prompted to rate their earplug use during marching band rehearsal. The options on the scale were "always, often, sometimes, occasionally, and never." Another survey question asked whether the participant had ever been educated on hearing loss and if they were ever concerned about their hearing. Participants were then educated on hearing loss and given standard earplugs with insertion training. The second survey prompted participants to provide their intentions for future earplug use and if the presentations were helpful in their understanding of hearing loss. The third and final survey assessed the self-reported use of earplugs by the participants at the end of the marching band season. In this survey, participants were asked questions about factors that affected their earplug use and if they were planning on continuing their current level of earplug use.

The results indicated that there was a statistically significant positive change in reported earplug use throughout the individuals. Prior to the educational component of the study, earplug use was reported as minimal and increased significantly by the end of the study. The main findings influencing earplug use within the participants were comfort and sound quality. Sixty percent of the participants indicated that they planned on continuing their current earplug use. In statistical analysis, the musicians who reported continuous use of earplugs during rehearsals after the third survey were in the percussion section. The introduction of hearing loss training and education had a significant impact on the participants and the study data. While the percentage of participants that indicated consistent use of earplugs remained the same, the percentage of participants who indicated that they used earplugs occasionally increased significantly (Auchter, & Le Prell, 2014).

Noise-Induced Hearing Loss (NIHL) in Musicians

Noise-induced hearing loss is caused by long-term and repeated exposure to loud sound levels (Jansen et al., 2008). Threshold shifts often occur first temporarily and become permanent with repeated exposures to loud sounds. Temporary threshold shifts have been recorded after a University of North Texas jazz band ensemble rehearsal with noise levels exceeding safe sound limits. A large portion of the ensemble members also reported experiencing tinnitus (Auchter, & Le Prell, 2014).

Excessive noise exposure is considered the second highest cause of sensorineural hearing loss and is one of the most common occupational hazards (Lake, & Stuart, 2019). More specifically, music-induced hearing loss results from extensive exposure to loud music. The result is a sensorineural hearing loss with notches on pure-tone audiograms at higher frequencies.

A study conducted at the University of Maryland evaluated temporary shifts in auditory function due to marching band practice. Participants consisted of an experimental group of 20

members of The Mighty Sound of Maryland Marching Band and a control group of 20 college students that were not involved in any musical ensembles. Each marching band participant was tested prior to and immediately following two separate band rehearsals to see if there was any change in pure-tone thresholds or otoacoustic emissions data. If there was a significant shift in hearing, the member would return the following morning to have their hearing retested. Each control group participant went through the same process, except they were not exposed to any loud noise during the band's rehearsal time. The sound level of the band was also recorded at the center of the band, where sound levels reached anywhere from 85-105 dB and peaked at 114 dB. The data were compared for differences.

Results showed that subtle changes were recorded for band members at 4000 Hz and 8000 Hz, and notable changes were discovered at 6000 Hz. Testing showed that there was a significant increase in thresholds from pre- and post-testing. Large changes in distortion product otoacoustic emissions data did not occur. Analysis of transient evoked otoacoustic emissions data revealed that there were lower emission levels following band rehearsal in comparison to before band rehearsal. The marching band members showed significant changes in their auditory function following their band rehearsals, specifically in the higher frequencies of their hearing thresholds. While there was a significant shift in thresholds and otoacoustic emissions, the marching band members presented with significant recovery within a 24-hour period (Libbin, 2008).

Symptoms and Handicaps of Hearing Loss in Musicians

A study conducted by Vardonikolaki and colleagues (2020) aimed to develop the Musician's Hearing Handicap Index (MMHI), which is an approach towards quantifying the effects of the symptoms of hearing and hearing loss on musician's performances. The participants were 204 musicians and sound engineers. A 43-item questionnaire was distributed to the 204

participants, which was then analyzed and brought down to 29 items. This questionnaire contained questions on social difficulties related to hearing loss, physical difficulties within performances that were related to hearing loss, difficulties in music perception due to hearing loss and emotional difficulties related to hearing loss. The questions were answered using a 5-point Likert scale. Each participant underwent a battery of otorhinolaryngology assessments after being asked to avoid loud noise or music exposure for 48 hours prior to their testing.

Following factor analyses, four main factors for the MMHI were discovered to be significant. They were "impact on social and working lives," "emotional distress," "communication difficulties," and "difficulties in performance and sound perception." Data and analysis taken from the 29 items indicated that the MMHI is a valid way to assess a musician's difficulties in their work due to hearing impairment. A musician's difficulties with performance due to auditory symptoms of hearing loss can be partially explained through a pure-tone audiogram. However, the MMHI allows for differentiation of individuals with different auditory symptoms and reaches deeper into possible difficulties a musician may experience due to hearing loss. (Vardonikolaki et al, 2020).

A study by Jansen, Helleman, and Dreschler (2008) investigated the hearing status of professional symphony orchestra musicians with regard to musicians as a special group for noise related hearing problems, patterns of hearing loss based on instrumentation, and whether or not otoacoustic emissions benefit the diagnosis of NIHL. The participants consisted of 241 professional musicians between the ages of 23-64 years from five symphony orchestras and varied in instrumentation played. Participants participated in a battery of audiological assessments to analyze audiometric thresholds, loudness perception, diplacusis, tinnitus, otoacoustic emissions, and speech perception. The participants also completed a questionnaire that consisted of questions

about ear and hearing problems within their medical history, behaviors towards loud noise, personal hearing complaints, use of hearing protection, and their own hearing capacity.

After statistical analysis, most of the participants in this study were reported as having normal hearing. There were 132 participants who reported they experienced tinnitus in some capacity. Out of the participant's responses, 79% of the participants reported hyperacusis and being sensitive to loud sounds from slight sensitivity to severe sensitivity. Results indicated that a large portion of the musicians reported the use of hearing protection, with a few using it in only one ear that is closest to louder sound. Most of these participants wore disposable hearing protection. Most notches within the thresholds on audiograms, if present, were at 6000 Hz. The effects of NIHL, including tinnitus and hyperacusis, can cause severe problems for individuals in both professional and private environments. The average thresholds, specifically at 6000 Hz, were said to clearly suggest an association with NIHL (Jansen et al., 2008).

Music-induced hearing loss often presents as a unilateral or asymmetric hearing loss due to the positioning of either the musician's instrument or the musician themselves within the ensemble and may be accompanied by tinnitus (Audiological Services for Musicians and Music Industry Personnel, 2020). Musicians are at an elevated risk for NIHL as they are exposed to dangerously loud sound levels on a weekly basis. The exposure to louder noise levels varies throughout the ensemble depending on the position of the musician. Sound levels may vary throughout a marching band ensemble. For example, standing in the center of the ensemble directly in front of the percussion section would have high amplitude levels compared to standing on the outer edge of the ensemble. The brass and percussive instruments produce the loudest sound levels, while woodwinds tend to produce sounds with higher frequencies. Those closer in position to the

"louder" instruments such as percussion, brass, or any amplification systems have an increased risk for NIHL (Dinakaran, & Rejoythadathil, 2018).

Factors Affecting Use of Hearing Protection

The issue with standard-fit hearing protection is that they may not fit comfortably in a musician's ear, causing the individual to not wear them during rehearsals or performances. In addition to issues with the fit of the hearing protection, research has identified issues with the hearing protection distorting sounds that results in non-use of hearing protection (Jin et al., 2013).

A study by Bockstael, Keppler, and Bottledooren (2015) analyzed the subjective perspectives of participants on five different types of earplugs that varied in price and design. Participants consisted of 59 individuals between the ages of 18 and 30 years, the average male age being 23 years old and the average female age being 22 years old. These individuals were recruited with the requirement that they were not professionally involved in music. Each participant completed trials using one of the five options of earplugs, four pairs of musician's earplugs and one pair of standard earplugs, on separate days. The participants wore the earplugs in a listening room for 30 minutes while music played continuously. Immediately following the 30 minutes, otoacoustic emissions measurements were taken to possibly record a temporary threshold shift followed by a questionnaire on the participant's experience. This procedure was repeated for the other earplugs.

Participants reported their appreciation for a variety of factors including looks, sound quality, fit, and general appreciation of the earplugs. In terms of looks, certain earplugs were more discreet in others and those who had experience with standard earplugs previously found the musician's earplugs to be more discreet, with the smallest earplugs being found as the most esthetical. In terms of sound quality, the musician's earplugs were rated significantly higher than

the standard earplugs. In terms of fit, the musician's earplugs were rated higher than the standard earplugs, and fit varied between male and female subjects. In terms of general appreciation, the participants favored a pair of musician's earplugs over the pair of standard earplugs. Overall, the main topics of appreciation by the participants were looks and comfort, with sound quality not being as noticed. The study indicated that hearing conservation programs would be beneficial and that the aspects of attenuation, fit, and preferences affect an individual's choice to wear hearing protection and can shift motivation (Bockstael et al., 2015).

The shapes of custom earmolds and "over-the-counter" (OTC) earplugs can vary extensively. With custom earmolds, they are molded directly to the shape of the ear, both external and within the ear canal, whereas OTC earplugs come in a default shape that may or may not be temporarily malleable. Proper insertion is vital when using OTC earplugs and may be a reason a musician may have difficulties with wearing hearing protection (Audiological Services for Musicians and Music Industry Personnel, 2020). In terms of sound quality, for truly custom earmolds there are options in types of filters that vary in levels of noise dampening. OTC earplugs are typically sold with one type of filter. However, some brands allow consumers to choose hearing protection with different filter levels. Typical levels for filters include 9 dB, 15 dB, and 25 dB, indicating how much sound is attenuated.

Issues that lead to the non-use of hearing protection by musicians, all of which relate to the marketing and wide-spread use of standard-fit hearing protection, include discomfort, lack of ability to localize sound, and lack of ability to communicate (Chesky et al., 2009).

The main attributes musicians look for in hearing protection are comfort, sound quality, and cost (Audiological Services for Musicians and Music Industry Personnel, 2020). Professional musicians, specifically rock or pop artists, are often more concerned with the quality of their

performances and their overall image rather than the health of their hearing. This results in failure to wear hearing protection. However, it is not the specific genre that causes hearing loss, but rather the volume of the music being performed (Blum, 2016).

While non-classical musicians are at a higher risk for hearing loss due to their increased music volume compared to classical and orchestral musicians, the classical and orchestral musicians are exposed to increased sound levels for a much longer amount of time (Federman, & Picou, 2009).

Summary

Musicians are at a significant risk for NIHL. Lack of guidelines? Collegiate musicians are exposed to sound levels measuring above 85 dB for a significant and consistent amount of time. These noise levels are known to be associated with hearing loss over long periods of exposure. For musicians, one of the most common ways to help prevent NIHL is using hearing protection during rehearsals or performances. Research has shown that decreases in hearing sensitivity known as "notches" can disappear over time with the use of ear protection. Education about hearing loss and hearing protection have also been beneficial to musicians who do not wear hearing protection.

Purpose

The purpose of this study was to determine whether the provision of custom earmolds affected the practice of consistently wearing hearing protection. To determine this, the following questions were addressed in this study:

1. How consistently do members of the Razorback Marching Band (RMB) wear hearing protection?
2. What are the reasons some RMB members do not wear hearing protection consistently?
3. Will provision of custom earmolds with musician acoustic filters impact wearing time?

Methods

Participants

Participants were 36 members of the University of Arkansas Razorback Marching Band (RMB). The participants ranged in age from 18 to 23 years and were active band members throughout the marching season. Each participant gave informed consent prior to the assessments [See Appendix A]. The participants then underwent a battery of assessment, including shallow otoscopy to examine the ear canal and tympanic membrane for any anomalies, abnormalities, or impaction, tympanometry as a physiological assessment of middle ear compliance, and pure-tone threshold sensitivities to detect any possible hearing loss.

Procedures

Participants were asked to complete a brief online survey about their use of hearing protection prior to and at the conclusion of the study. This survey included questions about whether a participant wears hearing protection, reasons why the participant may choose not to wear hearing protection, how often the individual wears hearing protection, and the type of hearing protection worn [See Appendix B & C]. Assessments including shallow otoscopy, tympanometry, and pure-tone hearing thresholds were also completed prior to custom fitting and at the conclusion of the study. These assessments took place within the Epley Center for Health Professions Speech and Hearing Clinic located on the University of Arkansas campus. Testing was conducted in a sound-treated two-room sound suite using insert earphones. Each student who participated in the study were provided custom-made earmolds which were created by a combination of a silicone blend, acoustic filter, and tubing. The earmolds provided an average attenuation of 20 dB per ear. The participants were asked to wear the hearing protection for the duration of the season. Once the

marching season concluded, the participants returned for a second battery of assessments identical to the first round before the season.

Results

Of the 71 individuals who responded to the initial pre-season survey indicating interest, a total of 36 initial responders actually completed the pre- and post-season visits. Participants responded to the post-season survey that was distributed electronically in the Spring of 2020.

Number of Participants Wearing Ear Protection Pre- and Post-Season

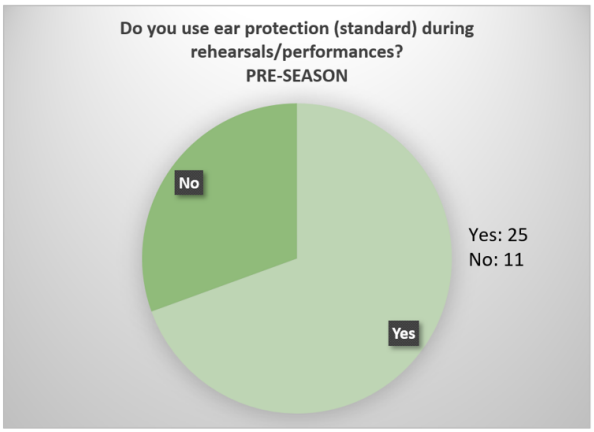

Figure 1

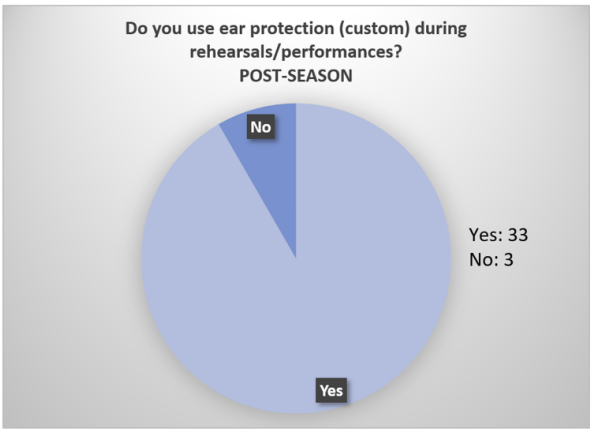

Figure 2

Figures 1 & 2: Initially, 11 members were not using their standard earplugs at all, whereas only three members were not using their custom earmolds at the end of the study.

In response to the pre-season survey, 25 participants responded that they used hearing protection, and 11 participants responded that they did not use hearing protection (See Figure 1). In response to the post-season survey, 33 participants responded “Yes” and 3 responded “No” (See Figure 2).

Subjects' Reported Wearing Time During Rehearsals and Performances

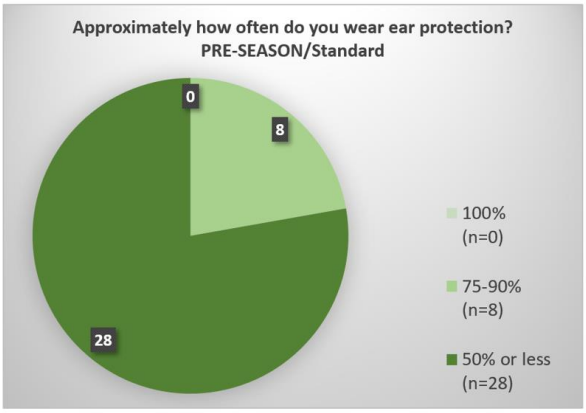

Figure 4

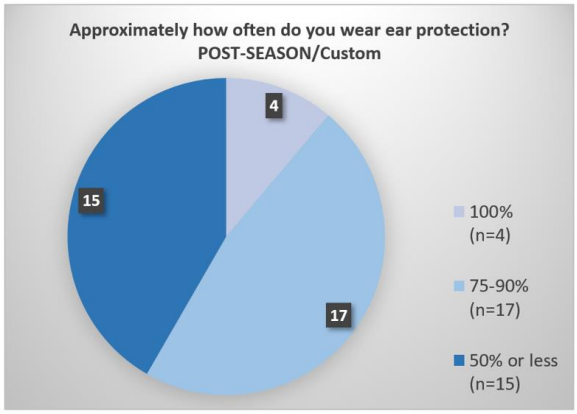

Figure 5

Figures 4 & 5: Wearing time increased overall with the use of custom earmolds. Standard earplugs were not used 100% of the time by anyone in the study whereas four members reported 100% use of custom earmolds. The number of members who wore ear protection 75-90% of the time more than doubled with the use of custom earmolds.

The participants were asked about their average wearing time of hearing protection with the question, "Approximately how often do you wear ear protection?" In the pre-season survey, 28 participants indicated an estimated wearing time of 50% or less of rehearsals/performances, eight participants indicated an estimated wearing time of 75-90% of rehearsals/performances, and zero participants indicated an estimated wearing time of 100% of rehearsals/performances (See Figure 4). In the post-season survey, 15 participants indicated an estimated wearing time of 50% or less of rehearsals/performances, 17 participants indicated an estimated wearing time of 75-90% of rehearsals/performances, and four participants indicated an estimated wearing time of 100% during rehearsals/performances (See Figure 5).

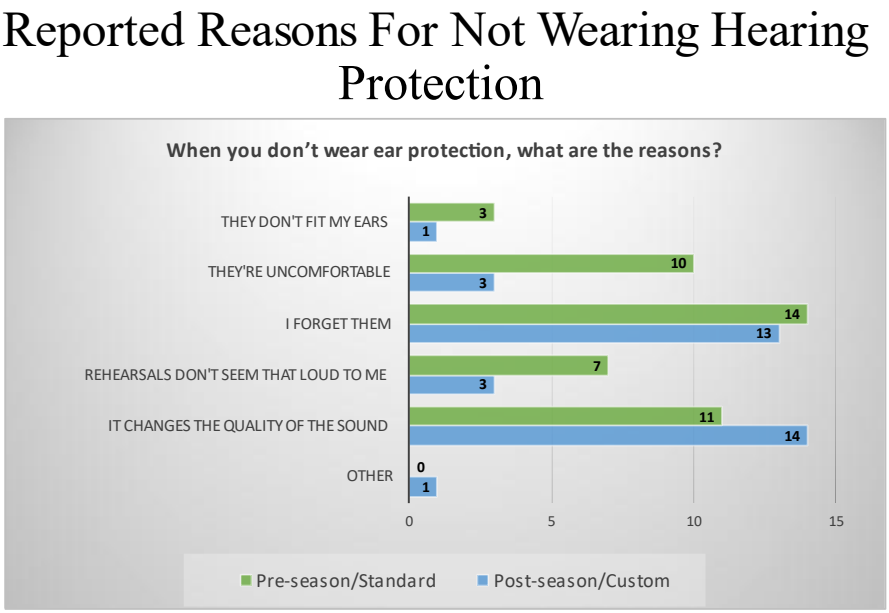

Figure 3

Figure 3: Comfort, sound quality, and remembering hearing protection were the most reported reasons for lack of use.

As seen in Figure 3, the reported reasons for lack of consistent use of hearing protection with standard plugs were comfort, forgetting to wear hearing protection, perception of volume, and quality of sound. Most participants who did not consistently wear the earmolds stated that fit, comfort, and perception of volume were the main reasons for inconsistent wear. Issues with lack of consistent wear continued to be forgetting to wear the hearing protection and changes in sound quality.

Each participant received a tympanogram in both the left and right ears. From the data collected, all 36 participants presented with Type A tympanograms, indicating normal middle ear function. Each participant was additionally assessed for hearing thresholds at 250 Hz, 500 Hz, 1000 Hz, 2000 Hz, 4000 Hz, and 8000 Hz in both the left and right ears.

Results of Pre-Season Pure-Tone Threshold Assessments

Participants With Normal Hearing	Participants With Hearing Loss
32	4

Table 1

In the pure-tone hearing threshold assessments, four participants presented with at least one tested threshold over 20 dB, with the highest threshold being recorded at 35 dB. Four participants presented with thresholds in the hearing loss range in the pre-season pure-tone threshold assessments within the thresholds tested, with the remaining 32 participants presenting with thresholds in the normal hearing range across all tested thresholds (See Table 1).

Results of Post-Season Pure-Tone Threshold Assessments

Participants With Normal Hearing	Participants With Hearing Loss
34	0

Table 2

In the post-season pure-tone threshold assessments, 34 participants presented with thresholds in the normal hearing range at all tested thresholds (See Table 2). The post-season threshold data for two participants was not collected due to Covid-19 complications.

Pure-Tone Threshold Assessments Averages (RIGHT EAR)

Frequencies	Pre-Season Average	Standard Deviation	Post-Season Average	Standard Deviation
250 Hz	10.69 dB	6.23	7.06 dB	5.52
500 Hz	10.14 dB	6.60	7.65 dB	5.80
1000 Hz	10 dB	6.76	6.76 dB	4.75
2000 Hz	9.17 dB	8.06	6.47 dB	6.34
4000 Hz	7.64 dB	9.14	5.44 dB	5.82
8000Hz	0 dB	8.70	-3.24 dB	6.95

Table 3

Pure-Tone Threshold Assessments Averages (LEFT EAR)

Frequencies	Pre-Season Average	Standard Deviation	Post-Season Average	Standard Deviation
250 Hz	7.08 dB	5.65	6.62 dB	4.56
500 Hz	7.64 dB	5.54	6.03 dB	5.47
1000 Hz	6.81 dB	5.37	5.88 dB	4.52
2000 Hz	7.08 dB	4.53	6.62 dB	5.74
4000 Hz	3.75 dB	7.31	3.53 dB	6.80
8000Hz	-1.94 dB	8.97	-2.21 dB	5.93

Table 4

All participants that presented with thresholds in the hearing loss range in the pre-season data presented with thresholds in the normal hearing range in the post-season data. The averages of the pre-season and post-season pure-tone threshold results are recorded on Tables 3 and 4.

Discussion

At the beginning of the study, participants only had access to standard earplugs provided by the RMB program. For the majority of participants, wearing time increased with the provision of custom earmolds. The data indicated this finding was primarily due to improved fit and comfort.

Sound quality continued to be a concern with the use of custom earmolds. Further research is needed to investigate ways to improve sound quality with custom earplugs so that participants will wear them more consistently. Properly filtered sound quality according to the wearer's position in the ensemble as well as the instrument played may be associated with increased wearing time for individual users. In the current study, all wearers had the same size/shape of acoustic filter. Altering these dimensions might affect wearing time. Perception of volume may additionally change wearing time for individuals, as location within an ensemble can affect what noise levels an individual is exposed to at any given time during a rehearsal or performance (Dinakaran, T., D., R. D., & Rejoythadathil, 2018).

Recall that some studies included an educational component about noise-induced hearing loss and conservation of hearing. In the current study, "forgetting" to wear the earmolds was typical reason for inconsistent use. It's possible that including an educational component would impact the ability to remember to use the earmolds.

Conclusions

Musicians are at an elevated risk for NIHL as they are exposed to dangerously loud sound levels on a weekly basis. The average sound levels across various positions of an ensemble have been recorded at above 98 dB at every position, with peaks of at least 112 dB in every position. The effects of NIHL, including tinnitus and hyperacusis, can cause severe problems for individuals

in both professional and private environments. Despite this research, collegiate musicians in marching bands may not have regulations regarding wearing hearing protection during rehearsals or performances.

The purpose of this study was to determine whether the provision of custom earmolds affected the practice of consistently wearing hearing protection. To determine this, we investigated how consistently the members of the Razorback Marching Band wore hearing protection, the reasons some RMB members do not wear hearing protection consistently, and if the provision of custom earmolds with musician acoustic filters impacted wearing time.

Results showed that providing custom earmolds positively impacted wearing time. A greater number of band members chose to wear the hearing protection.

The main reported reasons for not wearing hearing protection consistently prior to the provision of custom earmolds were comfort, forgetting to wear hearing protection, and the quality of sound. After the provision of custom earmolds, the main reported reasons for not wearing hearing protection consistently were forgetting to wear hearing protection and the quality of sound. Comfort was a reported improvement.

Recall that during the pre-season, 4/36 of the participants had at least one threshold in the hearing loss range. Most of the participants wore the custom ear protection per the reports. In the post-season assessments, 34/34 of the participants demonstrated normal hearing at all tested thresholds. These data indicated that the provision of custom earmolds helped to prevent hearing loss in the musicians who participated.

Future research should explore the use of different types of acoustic filters and their impact upon sound quality perceptions and wearing time. Assessment of tinnitus and reported changes would be valuable in future studies. Including data for thresholds at 6000 Hz threshold would be

beneficial in future studies due to its relevance for musicians. Finally, including an educational component about NIHL may impact the number of members who use hearing protection as well as wearing time.

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Appendix A

Noise Exposure and Ear Protection in Marching Band Students
Consent to Participate in a Research Study
Principal Researcher: Emily Myers
Faculty Advisor: Dr. Margie Gilbertson

INVITATION TO PARTICIPATE
You are invited to participate in a research study about Noise Exposure and Protection in Marching Band Students. You are being asked to participate in this study because you completed the online survey sent to the band, and you meet the requirements to be a participant.

WHAT YOU SHOULD KNOW ABOUT THE RESEARCH STUDY

Who is the Principal Researcher?
Emily Myers (eemyers@uark.edu)

Who is the Faculty Advisor?
Dr. Margie Gilbertson (mlg023@uark.edu)

What is the purpose of this research study?
The purpose of this study is to determine the effectiveness of hearing protection in marching band students through hearing screenings and the use of custom-made earplugs.

Who will participate in this study?
The participants of this study will be members of the Razorback Marching Band with ages ranging from 18-23.

What am I being asked to do?
Your participation will require the following:
-Participate in 2 hearing screenings
-Be fitted for custom-made earplugs
-Wear the custom-made earplugs during rehearsals and performances
-Keep track of your custom earplugs (Please try not to lose them!)

What are the possible risks or discomforts?
There are no anticipated risks by participating in this study.

What are the possible benefits of this study?
You will receive a free pair of custom-made earplugs as well as a free hearing screening.

How long will the study last?
This study will last the duration of marching season, as well as an initial meeting before the season and a final meeting post-season. Each meeting prior and post-season will not last longer than 1.5 hours each.

Will I receive compensation for my time and inconvenience if I choose to participate in this study?
You will receive free custom earplugs by participating in this study.

Will I have to pay for anything?
No, there will be no cost associated with your participation.

What are the options if I do not want to be in the study?
If you do not want to be in this study, you may refuse to participate. Also, you may refuse to participate at any time during the study. Your relationship with the program, the University, and your grade within the program will not be affected in any way if you refuse to participate.

How will my confidentiality be protected?
All information will be kept confidential to the extent allowed by applicable State and Federal law.

Will I know the results of the study?
At the conclusion of the study you will have the right to request feedback about the results. You may contact the faculty advisor Dr. Margie Gilbertson (mlg023@uark.edu) or Principal Researcher, Emily Myers (eemyers@uark.edu). You will receive a copy of this form for your files.

What do I do if I have questions about the research study?
You have the right to contact the Principal Researcher or Faculty Advisor as listed below for any concerns that you may have.

Emily Myers (eemyers@uark.edu)

Dr. Margie Gilbertson (mlg023@uark.edu)

You may also contact the University of Arkansas Research Compliance office listed below if you have questions about your rights as a participant, or to discuss any concerns about, or problems with the research.

Ro Windwalker, CIP
Institutional Review Board Coordinator
Research Compliance
University of Arkansas
109 MLKG Building
Fayetteville, AR 72701-1201
479-575-2208
irb@uark.edu

I have read the above statement and have been able to ask questions and express concerns, which have been satisfactorily responded to by the investigator. I understand the purpose of the study as well as the potential benefits and risks that are involved. I understand that participation is voluntary. I understand that significant new findings developed during this research will be shared with the participant. I understand that no rights have been waived by signing the consent form. I have been given a copy of the consent form.

Signature Date

Instrument Phone number Email (UARK)

Appendix B

Noise Exposure and Protection in Marching Band Students

This study has been reviewed and approved by the Institutional Review Board.

The purpose of this study is to determine the effectiveness of hearing protection in marching band students through hearing screenings and use of custom-made earplugs.

All information will be kept confidential to the extent allowed by applicable State and Federal law.

If you do not want to be in this study, you may refuse to participate. Also, you may refuse to participate at any time during the study. Your relationship with the program, the University, and your grade within the program will not be affected in any way if you refuse to participate. Your continuation and completion of this survey indicates your consent in participating.

Q1 Are you a member of the Razorback Marching Band?

- ○ Yes
- ○ No

Q2 Will you be returning to the RMB in Fall of 2019?

- ○ Yes
- ○ No

Q3 Were you a member of a marching band in high school?

- ○ Yes
- ○ No

Q4 How long have you been playing an instrument in band?

- ○ Less than 1 year
- ○ 1-2 years
- ○ 3-4 years
- ○ 5-6 years
- ○ 7+ years

Q5 Do you use ear protection during rehearsals/performances?

- ○ Yes
- ○ No

Q6 If yes, approximately how often do you wear ear protection?

- ○ Every rehearsal/performance
- ○ About 90% of the time
- ○ 75% of the time
- ○ Less than half of rehearsals/performances
- ○ Rarely
- ○ I don't use ear protection for rehearsals or performances

Q7 If you wear ear protection, is it custom-made or over the counter/multi-fit?

- ○ Custom-made
- ○ Over the counter/multi-fit
- ○ I don't wear ear protection

Q8 If no, why do you not use ear protection? (select all that apply)

- ☐ They don't fit my ears
- ☐ They're uncomfortable
- ☐ I forget them
- ☐ Rehearsals don't seem that loud to me
- ☐ It changes the quality of the sound
- ☐ Other (please specify) _____

Q9 If you had custom ear protection, would you wear it?

- ○ Yes
- ○ No
- ○ Maybe

Q10 Would you be willing to participate in a study that will provide custom ear protection for free?

- ○ Yes
- ○ No

Q11 If yes, please enter your name AND email address in the space provided.

_____

Appendix C

Noise Exposure and Hearing Protection in Marching Band Students Post-Season Survey

Q1 Are you a member of the Razorback Marching Band?

- ○ Yes
- ○ No

Q2 Will you be returning to the RMB in Fall of 2020?

- ○ Yes
- ○ No

Q3 Were you a member of a marching band in high school?

- ○ Yes
- ○ No

Q4 How long have you been playing an instrument in band?

- ○ Less than 1 year
- ○ 1-2 years
- ○ 3-4 years
- ○ 5-6 years
- ○ 7+ years

Q5 Do you use ear protection during rehearsals/performances?

- ○ Yes
- ○ No

Q6 If yes, approximately how often do you wear ear protection?

- ○ Every rehearsal/performance
- ○ About 90% of the time
- ○ 75% of the time
- ○ Less than half of rehearsals/performances
- ○ Rarely
- ○ I don't use ear protection for rehearsals or performances

Q7 If no, why do you not use ear protection? (select all that apply)

- ☐ They don't fit my ears
- ☐ They're uncomfortable
- ☐ I forget them
- ☐ Rehearsals don't seem that loud to me
- ☐ It changes the quality of the sound
- ☐ Other (please specify) _____

Q8 If you wear ear protection, is it custom-made or over the counter/multi-fit?

- ○ Custom-made
- ○ Over the counter/multi-fit
- ○ I don't wear ear protection

Q9 Will you wear the custom ear protection next season?

- ○ Yes
- ○ No

Q10 Please describe your experience wearing the custom ear protection during the season. (How did you feel about wearing them? What was it like to play your instrument while wearing?)

_____

Q11 Please enter your name.

_____