

- S1 00:00 Hi, this is Tim Lifewood, the director of the Huffines Institute for Sports Medicine and Human Performance. I am so excited to let you know that, the Huffines Institute now has apps for your smartphones and your tablets. We have apps for the Apple products, and for Android products. You can go to iTunes or go to Google Play, either one. Download those Huffines apps, and you can pull in our content every week. Now on to the podcast.
- S2 00:27 Welcome to the Sports Medicine Podcast. Brought to you by the Sydney and J. L. Huffines Institute for Sports Medicine and Human Performance, in the department in health and Kinesiology at Texas A&M University. At the Huffines Institute, we're always working to facilitate, apply and bring you the most up-to-date coverage of the wide world that is sports medicine and human performance, all in a language you can understand and share with your friends. And now, here's our host, the director of the Huffines Institute, Dr. Tim Lifewood.
- S1 00:57 Our next speaker is from right up the road, at the University of North Texas, and he's probably going to talk about something that you haven't thought of before, so please welcome to the stage Doctor Kris Chesky.
- [applause]
- S3 01:10 Thank you. Good afternoon, first like to express my appreciation for being invited to this prestigious event and prestigious lecturers, it's quite exciting to be here. I'm a musician primarily, and I started playing music in fourth grade and proceeded to be a professional and then get my doctorate, and now I work at University North Texas. I'm just kind of curious, how many in the audience by a show of hand have been trained in the public schools of music or public schools in Texas, as in band or choir or orchestra? Okay, look around everybody. Well, we're in a new day folks, and that new day is expressing a need to address all the occupational health problems that occur, that are associated with learning and performing an instrument. And a large part, the transformation of the music discipline has come from studies done at North Texas. So, those of us in Texas can be proud that we're, sort of, spearheading this agenda nationally.
- S3 02:13 As Randy Dick mentioned a few minutes ago, the National Association of Schools and Music has adopted, ratified an accreditation standard for all music schools in the United States. So it's mandatory that we instruct music students about hearing loss, mental health, muscular skeletal problems and [vocal?] health concerns. While that's said, we also see the influence of that agenda in our public school. In fact, the teaching requirements in the state of Texas for fine arts, are now requiring teachers to address the same things. So, as we start moving into this new arena, we recognize that the musician community is vastly understudied and underserved. We don't know much about what to do. We have very little research. And at the same time, we have some agendas that are, perhaps productive but maybe in some cases not as productive as we would like. I want to showcase a little bit through an example of how some of these models, that are being applied to address hearing health, because they are not really specific to musicians, can create more problems than solve them. The big message is that as we think about applying sports models and theories, and

applied approaches to help musicians, we need to really understand the musician community thoroughly before proceeding. That's the idea here that, if we pick the protocols that are developed to walk you through a factory, and apply them to a music ensemble, or a music school, would they be appropriate? Before I get into that, University of Northern Texas says that 10 - 15 year history in addressing hearing loss, and if anybody is interested in reading about that history, I'd recommend that you go to this particular journal article.

S3 03:59

When the United States federal agencies of OSHA and [NAIGE?] decided that it was important to deal with this, a lot of them deal with exposure levels in factories. A lot of the approaches were based on the idea that this hazard is something you don't want. So somebody going into a factory, or a mill, or a ship yard, and the noise is loud, the noise is undesirable. The approach is to mitigate that hazard are relevant to the quality or the importance or the desire to have that noise. That is one of the primary reasons why we think some of these approaches are counter productive. But unfortunately, some of the models that come from this particular industrial hygiene perspective are being applied to music. For example, somebody would take a meter like that into a music school, which is called [dosimeter?] and apply these standards and determine whether or not there's a hazard. As recently as 2011, CDC went out to a school in Alabama and applied these methodologies, and after two days of measurement they concluded, "Wow, this is a hazardous situation." We need to build a new building, we need a new hall, we need acoustic modifications, and until that can be figured out everybody wear earplugs. What's the problem with that? Well, because we track sound levels in our [ensembles?] at the University of North Texas everyday, and we've been doing it for many years, we've got hundreds of exposure level [indices?] for ensemble classes, we know that two days is insufficient to label anything other than that one day. You can't generalize that kind of data. What you're looking at here, is a 15 week semester of dose data, that red line represents 100% of allowable noise exposure, as defined by the National Institutes of Occupational Safety and Health. Over the 15 week period, these two different ensembles practiced four times a week, in the same room, the same type of music - in this case it was big band - and the same seats, the same instrumentation. What do you see? You see huge [variability?] from day to day. So go ahead and pick any two days, and try to generalize whether or not that's risky. More importantly, we also note that while there're some that are over that red line, there's a lot that are under that red line. So what's going on under that red line that we might learn about and modify instructions so that we don't exceed that red line?

S3 06:40

So this is what we've been doing at University of North Texas. Here is [Kenton?] Hall, our prestigious lab band, a rehearsal space, named after Stan [Kenton?]. And you can see on the right hand side, an active real time monitoring system, that's not only logging and tracking and analyzing the data, it's also providing in real time [?] instructor. This is the dissertation by a computer science PhD student. Right now we've got other engineering approaches to helping us understand what is going on. Before we start applying this industrial hygiene approach, and saying, "Hey, wear earplugs or get a new building," we need additional research, and understand that, the primary factor for elevated risk is our musical behavior. All of you in music know that when we make music, the outcome of it is how we make our music, and if we're an ensemble, it's depending on the instructor.

S3 07:34

In regards to earplugs, I want to read a couple of quotes here, that are from prestigious audiologists at the University of Pittsburgh's Medical School - Music Clinic, up there specifically for musicians. She has written in the same words in both of these

magazines or journals. "So we would not consider allowing our youth to play football without a helmet." Fair. "Yet every day we allow our children to participate in a school-sponsored instrumental music activities without hearing protection. The most successful music education programs require the use of earplugs as opposed to making hearing protection optional." So this is suggesting-- and I believe there's actually some schools in Pittsburgh where they're making kids, middle school and high school, put earplugs in they're ears before and during rehearsals. I don't know of any studies that have quantified any effect of that, or have actually quantified the levels that were deemed that environment to be sufficient or warrant ear protection. It's a little bit of the cart before the horse. Another problem with this, is that we're not sure that these earplugs actually function the way they do. Now, the CDC report specified musician flat attenuating earplugs. Now, for those in audiology or in the music world that pay attention to this, know that that refers to a very specific product line, this trademark. The musician earplug product is a trademarked product by Etomotic Research in Chicago. They make this custom version. It costs \$200, \$300. Audiologists squirts some silicone in your ear canal, makes a mold, bores out a hole, puts a cap on it, and you put it in your ear and you're supposedly able to hear the music as it would normally sound but at a lower level. And then there's a non-custom version of that. It's patented and trademarked, and it's sold under various names, but it's the same product. This is the kind of thing that's marketed to public schools all across the state of Texas and the nation. It's sold under various names and by a company, Fender. You might be aware of Fender amps, Fender guitars. Vic Firth is a drumstick company that's now selling these products. It's a gigantic industry that's reaching out to the music community. So we can ask ourselves, "Well, what's the deal with these? Do they actually work, or are these appropriate for our students?"

S3 10:02

And the reason I'm asking that, is, because the testing protocol that the EPA requires for all earplugs, again was designed with the intent that an earplug would go-- be used by a person in a factory setting. The standard for measuring these earplugs were developed in the fifties and what they're measuring is the frequency range that's specifically connected to what would go on in a factory. It was never intended to provide a measurement or assessment of how an earplug would function if it was in a music environment. But when you look at an earplug package, and if you look at these products, you'll see these graphs and this comes from this procedure called real ear at threshold which is the required EPA standard for testing. What's interesting about this is that the frequency range like I said may not be sufficient to understand music. Give you an idea, here's a piano. Those red vertical bars are the test points, with the frequency-specific testing protocols, that are assessed or [?]. It goes down to 125 hertz, which you can see leaves out much of the bottom part of the piano. And the testing protocol because it requires humans to perceive the lowest level of sound at these frequencies, is very difficult to do that even below 400 hertz, which is where the end of that bracket with the question mark is. So imagine putting your finger over your ear, or something in your ear, and trying to detect the lowest level of low frequency sound - it's very difficult. So basically we don't know if these products are protecting people, with these low frequencies that are a major component of the music that we produce in our bands.

S3 11:48

So a couple of years ago we started testing these objectively, using a protocol that was much more refined, much more likely to pick up the nuances of musical spectral components, and we measured all the way down to lowest frequencies. We see something very different that's marketed to the students. More concerning, we see that, for some of these products the low frequency energy does go through these

plugs without being blocked. Here is an example of the data that we have, this is for the ER15 custom plug. This line represents the difference between the sound inside a simulated ear canal [with-without?] plugs. If it was a flat attenuating plug, that line would be flat. It means that the reduction of sound would be equal across frequency. You can clearly see that that line is not flat. Those vertical bars are the test points, that the [?] procedure uses, which is the APA requirement. And if you look, and you connect the dots according to the [?] you would get that kind of line. But What's missing? All this, all that, all that, all that and most importantly, when you look at specifically at this ER20 plug, the one that's mass marketed to our public schools. We can see here on the left, the sound level energies inside of the canal, and you can see its very, very high on the low frequencies. And you can see the energy measured inside the canal with the plug, which is the green line, and you subtract those two lines you get the one on the right. That's far from flat, and it lets those low-frequency energy levels through without being blocked. When you calculate how much protection you're getting, you can see that its not giving you 20 decibels of protection only 4.8, which a major problem. So, all these marching band activities, where people are putting in these earplugs believing they're getting protected aren't. Especially those who are playing things like bass drums and tubas and trombones, low brass. All that low-frequency stuff is being unattenuated.

S3 13:53 So, as we're moving into this new era of the music field, we need to generally think about the applicability of certain protocols, when we bring it in into our world of music, and this also includes sports science-- the way we might prepare an athlete for endeavor, maybe inappropriate to prepare a flutist for a concert. We don't know we haven't done those kinds of studies. Before we jump too far into the future, let's set up some research and figure it out.

S3 14:22 So if anybody is interested in following up with this particular discussion, we've written two papers that are going to be published in the next issue of the journalists - published by the Music Teachers National Association - it's coming out literally in a week, here is the table of contents. And what we're doing here, is that we're trying to create awareness that this is a major problems within the performing arts, and the music, and the audiologic communities, by drawing attention to this issue. In addition to calling for new standards, which we're doing with National Institute of Occupation Safety and Health, we're also trying to develop some protocols. It's very difficult to establish what a new plug might be. And earplugs are probably a very valuable tool that all musicians should be aware of. But before we start developing, we need appropriate metrics to evaluate them. So if anybody's interested, this would be where you would look. Thank you very much.

[applause]

S1 15:24 I'm over here.

S3 15:26 I didn't bring my harmonica [laughter].

S1 15:29 So, a great topic Chris. We have a couple of questions that we've received from the audience. One of them-- is there any way to regain hearing?

S3 15:39 No. There are studies that are looking at pharmacologic interventions to slow the degenerative process of hair cells in the cochlear, soon after extensive exposures. But there's no reversing this.

S1 15:55 I just have another one here. Being a former drummer-- this is from Kimberly at Texas AM [?]. Being a former drummer and using ear plugs before while playing it has

affected my playing. Has researched being done for percussionists using ear plugs?

S3 16:10 Well there is a lot of concern within the performing arts community to the extent that, when you're using ear plug you may play louder to compensate for the decreased ability to hear what you're playing. We know that drummers have wrists problems and back problems, stuff like that. In many cases due to the excessive forces the biomechanics are playing. So if you're playing with air plugs you may actually be bearing down on your instrument with more energy creating a Muscular-skeletal problem. The alteration in the sounds haven't been studied that much, not that I'm aware of with drums. Although we did one anecdotal study with a small percussion group and UNT, where we gave them all these ER20 plugs, and we had them use them for a couple of weeks, and we came in and recorded their rehearsal playing the same music with and without the club, and we didn't analyze the data, but you could clearly hear there was something different about the quality of the music. So we asked them to do it again, and they talked amongst themselves, "Let's do this piece." And what was really fascinating is that, this next piece included vocal stuff, so they're playing their hand drums, and it kind of sounded the same. They did it without the plugs and it was beautiful, and then they put the plugs in and it was the same difference, and then they started singing. And they were looking around at each other like, "Wow," because they were having a hard time understanding whether they were balanced. And you could clearly hear the level of their vocalization change.

S3 17:35 There's another study out of Poland recently, where it looked at the spectral outputs of brass instruments with and without the custom-fitted plugs. So musicians were trained to be able to play something repeatedly, and have it look very much the same, and then they would start comparing that to what it would look like with earplugs. And you could clearly see a modification in the spectral content, as you would expect based on the data I'm showing you to the tone output, and that's a huge issue. So the primary thing, the primary stimulus that a musician requires is the sound, everything is based on what they are hearing. So if you have some alteration in this pathway to really get in touch with these tonal characteristics, you can have a major serious effect on the development of tone perhaps, and that's why I'm concerned about having kids wear these while they're learning how to do that. But also modifications. So if I tell you, "Hey play this [?] but, by the way, your tone of your base is going to sound different, you will probably be less enthusiastic.

S1 18:40 So it's a conundrum. You want to save your hearing, but yet you want to save your tone is well.

S3 18:43 Yes.

S1 18:45 We are going to leave the audience for that.

S3 18:47 Thank you.

S1 18:47 Thank you Chris. Please join me in thanking.

[applause]

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