

>> Welcome to another music and the brain podcast. I'm Steve Mentcher. And I'm talking today with Jane Stanley, a professor at the Florida State University where she has a joint appointment in the Colleges of music and medicine and where she's been on the faculty since 1976. Welcome Jane.

>> Jane: Thank you so much, Steve. I'm honored to be here.

>> Steve: Now, in a minute we're going to go into some detail about your innovative use of music and the treatment of premature babies and other work that you're doing. But first I'd like to ask a little bit about your own musical interests and musical training. Are you a musician and were you trained in music or exposed to a lot of music growing up?

>> Jane: Absolutely. I was a French horn player. I learned about music through the public schools and the music education program. I was planning to go into nursing when I was a senior in high school. My band director said you have a great deal of talent, you should be a music major and you should go to Florida State University because they have one of the finest programs in the Southeast. He made a phone call, I sent an audition tape and got a scholarship and that's how I became a music major. I really didn't know what I wanted to do in the field of music but I happened to discover music therapy at Florida State. It was one of the first bachelors and masters degree programs in the nation and I just happened, luckily, to have gone there to school and immediately became a music therapy major from the time I was a freshman. I played the French horn all the way through my graduate degrees but then, uhm, became very involved with research as a faculty member. So I don't play as a musician any more.

>> Steve: Wow, that's a great story. Do you miss the performing?

>> Jane: I love performing but I also have learned to love research and it was a wonderful education and I'm so grateful for the community I grew up in that had such wonderful music programs in the schools and I find it such a tragedy today that those are the kinds of things that we cut, uh, when budget issues come into play because I think it makes life so fascinating for people who have diverse love of the arts or other areas that are not purely academic and it was wonderful for the schools to offer that.

>> Steve: Now, music therapy hasn't always the respect that other forms of therapy enjoyed. I imagine there has been some suspicion in the field of psychology because -- partly because it's hard to measure the advances that are gained by music therapy and therefore that was part of why it was hard to gain recognition for it. So tell me about some of the solutions to that problem for people in your field.

>> Jane: Well, I think one of the issues too is it's called music therapy as opposed to the content area that it's trying to rehabilitate for instance. Speech therapy is dealing with communication disorders. So we're not doing rehabilitation of musicians, which the name might indicate, but using music in a rehabilitative function. And so I think the issue is, first of all to explain. It's much like psychology in being a general therapeutic technique that's applicable in many disciplines and

areas. And our tradition has been in mental health and special education and gerontology but today the fastest growing areas of music therapy are in medicine and hospice programs at the end of life. And so I think that the way that we have overcome those issues is to be very specific in our applications of music with evidence based clinical procedures and research to document the outcomes that we claim would happen as a result of music therapy.

>> Steve: Tell me a little bit about the science. I know there are some distinctions, you know, not everybody who would be going into music therapy would get deep down into the latest neuroscience research. And yet, I imagine that in your program when you're training music therapists you expose them to this research, you let them know that it's out there, and you probably go into a lot of depth.

>>Jane: Absolutely. And we start from the premise of the field of information in psychology of music about how music is acoustically different from all other stimuli. So we have to start with a description of music from an acoustic basis and how the brain perceives music and response to music in it's own unique way and we have been able to observe that across the ages but now this whole new field of neuroscience of being able to image the brain and actually watch the brain change in response to music is a fascinating research area. So much of what neuroscientists are doing is going back, they are going back and looking at some of the clinical outcomes that we have discovered in music therapy to actually find out specifically what is going on in the brain. But things that we know is that the brain responds to music with pleasure responses in all cultures and therefore your history with music, your familiarity with a particular type of music. Your preference before a particular type of music makes it very powerful in terms of a therapeutic benefit. We know that people learn information to music, it will be stored in a special part of the brain if information is learned to music. So we use that principle in special education. We know that music can improve recall if people have had neurologic disability or damage, that we can sometimes help with rehabilitation by doing physical rehabilitation motor movement to music. The rhythm of music will help structure motor movement. We know that patients with Alzheimer's disease have music memory embedded very deeply in the center part of the brain and we know that music memory will last longer than memories about their family or relatives and that we can use that information to help access communication with them as they go further into the Alzheimer's dementia process. So there are certain principles about how the brain stores music or responds to music that we use in trying to accomplish therapeutic objects with people.

>> Steve: Now one of the interesting things that you said that I'm picking up on, is the fact that music therapy was in some ways ahead of the science. That you were doing the sorts of things that you were getting the sorts of results that told you that things were working. And it's only now that this neuroscience, that the imaging is helping to sort of catch up and be able to help you explain, well, we did this. This worked and now we know sort of why it worked.

>>Jane: Well, absolutely. In the clinical approach before we could not image the brain, we could only do autopsies after someone died and that did not give us a great deal of information for any type of therapy of what was happening as we tried to assist people. But now with music and all other forms of therapy we can actually watch the brain change in response to clinical procedures we are trying, but we've always been able to watch the clinical results. So if someone is having aphasia and having difficulty talking, but they can sing information and recall words that they would like to say by singing, we can see the difference with music in their behavior. In the clinical setting we just could not see what parts of the brain were actually being activated until we had the imaging techniques.

>> Steve: Now, tell me a little bit about the training and qualifications of the professional music therapist that you are running through your program. Because I'm curious how someone today becomes a music therapist. What do they need to know?

>>Jane: Okay, well the profession is over 60 years old; it's an organized profession in the United States. One can get a bachelor's degree in music therapy and practice at the bachelor level or get graduate degrees at the masters or PhD level. The music therapist is trained with classical music skills, music theory, music history, applied music lessons. But they're also trained with a minor in psychology and then other psychological background, child development, special education techniques, anatomy and physiology, neuroscience. So the person is trained equally in therapeutic techniques. The music therapy course work itself starts with the psychology of music and the brain's responses to music and proceeds into the methods and procedures of using music in a rehabilitation mode. The person finishes all of the course work and then must intern for six months under the supervision of a qualified music therapist. And then when they finish that they're eligible to sit for a national certification test. If you pass the test you may use the initials MTBC, music therapist board certified in the United States as an indication that you're fully qualified and trained.

>> Steve: And about how many music therapists are there in the US?

>>Jane: There are about 6000 in the United States that are actively practicing today.

>> Steve: Now where did you get the idea that music therapy might have some uses in very, very young children, even premature babies?

>>Jane: My specialty area in music therapy has always been with children with developmental delay or learning disabilities using music to teach academic and social information that children need to learn. Helping children achieve developmental milestones that they were having difficulty with. And as, over the years, the laws change to provide funding for early intervention in order to help children develop those skills as soon as possible. I felt that that was the most efficient use of therapeutic time. The earlier you can interact with the child the greater the impact you can have for their lifelong outcomes. And so instead of waiting until a child has a severe disability and trying to

rehabilitate it, I had always been doing research with early intervention. And then in working with small babies I found out that prematurity was on the increase in the United States and that being born prematurely increases the incidence of need for special education by about 50 percent. And so we began looking at how early could music begin to have an impact for babies to help them develop to their fullest potential.

>> Steve: Tell me a little bit more about this device that you helped develop. The musical pacifier. What is it, what does it do and how is it -- in some ways, a possibly life saving tool.

>>Jane: Well, it grew out of the other research that we were doing and there are a couple of music therapy procedures now that have been documented in the research for premature infants in the neonatal intensive care unit, that are playing music for masking the aversive stimuli in the environment and just being able to do that and helping the brain be nurtured and relaxed and not overly stimulated allows babies to be discharged sooner and we --

>> Steve: And now let me just interrupt you. Aversive stimuli in the environment sounds like a fancy term for the harsh buzzing of lights and the churning of machines and the clicking and the --

>>Jane: Yes, and the beeping of monitor alarms. The slamming of the door into the nicu, turning on the water faucet every time one of the medical personnel needs to wash their hands for sanitary or hygiene purposes. There are a lot of auditory stimuli that create stress in the nicu because of all the equipment.

>> Steve: And the nicu is?

>>Jane: The neonatal intensive care unit. Acronym for neonatal intensive care unit. So we had been doing research to show that the babies oxygen saturation increases while they're listening to music, they relax and breathe more deeply and there's more oxygen in the blood stream. That's important because too rich oxygen in the blood can cause detachment of the retina and can cause vision problems. So it's important that the babies have as much oxygen saturation as possible while adding as little oxygen as you possibly can. We have worked out massage and singing programs for singing is used to pacify the infant. And then we help the neurological system tolerate increasing levels of stimulation. But we had been doing a number of research studies and developing clinical procedures and I kept sitting in the interdisciplinary team listening to the nurses talk about babies whose medical problems were solved, they were ready to go home from the hospital but they were not independently nipple feeding. They were refusing to be able to suck or feed because the brain is so neurologically immature until the 34th gestational week. That it can't support suck, swallow, breathe in a coordinated sequence. And so the babies have to be fed by tube until that point. So some babies are being born as early as 23 or 24 gestational weeks and that means that they were being tube fed for about 11 weeks. And by the time they're now neurologically ready to be able to feed by mouth, they have no rooting reflex, they have not been tasting milk. They're not motivated to suck

and so they may fail at learning to feed by mouth and if you think about how do you teach a baby to suck on a nipple, it would be very difficult. There are therapists that try to close the mouth around the nipple and get a seal and then they try to touch the face or cheek, to stimulate a suck. But I was sitting there thinking this is a very difficult problem. If I were trying to teach this how would I go about this as a music therapist? And it occurred to me that perhaps music would reinforce sucking if, when you sucked on a pacifier it would cut on an electrical source that would cut on music. And that the music would go away if you failed to suck. So we have an engineer in the college of music at Florida State named Ataro Komiguchi and I went to him and said, can you build me a device with an air pressure transducer connected to a pacifier that connects to an electrical circuit. And he invented this, we were able to put timers on there and pressure monitors for sucking and be able to set criterion for suck. And taught the babies that with the pacifier if they sucked on the pacifier they would be able to get music. And then we did a series of research studies. And what we found out was that music will reinforce sucking, that it takes about two and a half minutes for the premature babies to learn to keep the music on constantly. They start sucking with a very steady pace. We can increase the pressure levels they have to suck at so that they're sucking the pacifier hard enough that they will be successful when they are sucking for formula or for nutritional sucking. And then we did studies to show it actually had a powerful impact on their feeding ability at the next feeding so one interval of being reinforced with music leads to the ability to independently feed. And we were able to identify that 34 gestational weeks is exactly the time at which you would use this device. The babies go home from the hospital sooner. The babies do better at home than in the hospital and they -- the cost in America for a baby in the NICU per day who has no serious medical problems but is just being cared for until it's ready for discharge is about \$2000.00 a day. So if the baby goes home sooner you're saving a great deal of money in medical cost. And it is life saving to be able to move the baby from having to be fed by tube to being able to independently feed by mouth.

>> Steve: Wow, and now you have about 10 years worth of experience with this device?

>>Jane: Yes. It was patented by Florida State, it's been licensed out for commercial development, it has FDA approval to teach feeding skills to premature infants as a medical device.

>> Steve: And about -- do you have any numbers about how many babies have actually used this device?

>>Jane: Well, only the babies with our experimental models because it's still in commercial development and the people who have licensed it are still looking for the total funding to go into production. So it's -- they're saying within six months but they're still raising funds from investors to actually set up the business to produce it. So it's in the works but it hasn't actually come out and it's not commercially available throughout the United States yet.

>> Steve: But we should be looking for this pretty soon.

>>Jane: They say within the next six months. That would be wonderful because it has been 10 years since we started the line of research but we've done a series of studies so it's taken a while to get the evidence that this is really highly effective.

>> Steve: Boy. Now, let me ask you one more question before we go. You talked about the use of music all the way down to premature infants. Have you done studies or are you familiar with good studies about actually playing music for children in the womb?

>>Jane: Well, we do know a great deal of information about what children are hearing in the womb. And so hearing is one of the first senses to develop in the fetus and from about 25 gestational weeks forward, a term infant is 38 to 40 gestational weeks. So during the third trimester the fetus is listening to what the mother is saying as she talks and what is in the mother's environment. And they have done research to show that the baby is hearing with only about a 15 decibel attenuation what the mother is hearing. So the baby is hearing everything in the mother's environment, what she's watching on television, what music she's listening to. Anything that she sang or books that she's reading out loud. The baby is listening and developing information and they've been able to document that [inaudible] on the first day of life recognizes the mother's voice. Prefers women's voices to men's voices. Can recognize a specific Doctor Seuss book that was read during the last month of pregnancy and can identify that book from all the other Doctor Seuss books. Has linguistic information. The baby can detect grammar errors in its native language. It can detect language sounds that are not native to its native language. So for instance if you have an American baby listening to the English language if all of a sudden there's a Japanese word in there the baby will alert to that, and in essence its behavior tells you that it is responding and so that's an unfamiliar stimulus. So babies come into the world with a great deal of information about language and music if it has been in their environment while they were in the womb. And, uhm, you know, for a while it was popular to put microphones on the mother's abdomen while she was pregnant, but actually the decibel attenuation is so slight you probably don't need to do that. If the mother is listening to music in the room the baby is probably hearing it.

>> Steve: Oh, that's great. And what -- you know, might be any other results of this other than sort of that they're getting used to these sounds and they're getting to, in some sense, perhaps enjoy them?

>>Jane: Enjoyment. There are very savvy mothers that have heard about this and they do things like, if I'm going to lie down at night to rest and go to sleep, if I play the same musical lullaby for my quiet time, what I have created in the final month of my pregnancy is a cue to the baby that this lullaby is a quiet time to lie down and go to sleep. So it can be an immediate cue when the baby is born to now it's time to sleep. I have fed you and diapered you and I'm going to put your lullaby on. And the baby's learned this is quiet time, go to sleep. So the baby comes with a lot of information and discrimination and it offers the mothers the opportunity to use that knowledge and awareness. It can be

preference, I have a favorite song I want you to know, I can sing it to you or just like I can read you a storybook or I can use music as a part of structuring how you're going to be in the environment in your life when you start life.

>> Steve: Wonderful. Well, thanks. This has been another one of our fabulously interesting, to me at least, and I hope to some of our listeners. Music and the Brain podcasts. I'm Steve Mentcher. I've been talking today with Jane Stanley, a professor at the Florida State University with a joint appointment in the Colleges of Music and Medicine. And thanks so much for taking time out to talk with us today.

>>Jane: Thank you Steve, it was a great pleasure.