# Health and Human Science Matters Season 4, Episode 5: Susan Mingils

Susan Mingils: So I really like that I get to see research from a really wide range of disciplines that are all contributing to this larger goal of improving health and wellbeing of people and their communities. And even within our occupational therapy department, we have people conducting research on so many different topics, from basic neuroscience research, what I'm doing, all the way to community-based research. And it's just really cool to see how research at each of these levels contributes knowledge to this broad overarching goal. I think that's really unique about our college. And of course I'm also really grateful for my funding from the College of Health and Human Sciences, and the Dean's Doctoral Fellowship has been just an awesome opportunity, and helping make my research possible.

Avery Martin: Welcome to Health and Human Science Matters, a podcast by Colorado State University's College of Health and Human Sciences. I'm your co-host and digital media strategist, Avery Martin.

Matt Hickey: And I'm Matt Hickey, Associate Dean for Research in Graduate Studies. In our college, we make it our mission to optimize human health and wellbeing through discovery and innovation. Don't just take our word for it. Each episode, we sit down with people who fulfill that mission, our college faculty and staff. Today we're lucky enough to have Susan Mingils with us. Susan is a PhD student and a Dean's fellow, I note. She comes from the Department of Occupational Therapy. For our listeners, Susan is in a rehabilitation science PhD program, and I want to give a plug to the unit because they have a new cohort of clinical doctoral students that started this fall in an OTD program, but we make the distinction. Susan's pursuing a PhD in rehabilitation science. So Susan, welcome. We're delighted to have you with us.

Susan Mingils: Thanks for having me. Yes, the full title of our PhD program is Occupation and Rehabilitation Science. And we like to say that because we're the only occupation and rehabilitation science PhD program in the country.

Matt Hickey: Excellent.

Susan Mingils: It combines both of those perspectives, occupational science and rehabilitation science.

Matt Hickey: Perfect.

Avery Martin: You need a plug, for sure. And happy to do so.

Matt Hickey: So my first question for you, we want to talk about big problems. When you think about your lab, the lab you're training in right now, what sort of big problems does your research address?

Susan Mingils: So in the brainwaves research lab, the big problem, very broadly is understanding brain behavior relationships. So understanding how the brain functions and how that relates to behavior so we can apply that knowledge in clinical settings. So as a music therapist, which is my background, I ultimately want to improve music therapy interventions. So there's research showing that people's motor skills like walking often improve when they move in time to music or simple rhythms. But studies measuring how well this intervention works have had mixed results. And there's also some evidence that moving in time to rhythm can improve cognitive skills like attention, but we don't really know why that happens. So if we can understand what's happening in the brain when we move in time to rhythm and how that relates to behaviors like motor skills and cognitive skills, we might be able to improve music therapy interventions.

Matt Hickey: That's cool.

Avery Martin: That's fascinating.

Matt Hickey: Now I have a couple of related questions I know the answer to, but I'm working to ask them anyway. So can you tell me a little bit about who are you're training with? So who's your primary mentor? The mentoring team? And I know you've got a really cool opportunity to straddle both the College of Liberal Arts and [inaudible 00:03:20] Health and Human Sciences.

Susan Mingils: Yeah. So in the brainwave research lab, the director of the lab is Dr. Patty Davies. So she's my mentor who guides me in data collection, analysis and is the main person who's helped me plan my dissertation and everything like that.

Matt Hickey: And a guest of ours.

Avery Martin: Yes, season two guest.

Susan Mingils: But the lab is made up of people from a lot of different departments and areas. So we have professors and PhD students, master students, undergraduate students from occupational therapy, music therapy, neuroscience and psychology who all are in the lab. And it's really a collaborative effort. So if you're in the lab, you're not necessarily just working on one project, even though some people primarily work on one. There's a lot of sharing when people need help. So everyone pretty much assists with data collection and analysis and collaborates to help each other out with training new people or filling in gaps where they're needed on several different projects that we have going on right now.

Matt Hickey: Now this really strikes me as an example of interdisciplinary research at its best. So we're three colleges off the top of my head that are involved. They're liberal arts, natural sciences where our friends in psychology are found, and of course health and human sciences. So it's an neat opportunity because it's not always that way. And one of the things that has struck us sort of the first couple seasons is the breadth and depth of the research that goes on in this college. It really is quite an expansive range. I have a related question in terms of particular populations that you study, are we talking developmental issues? Are we talking sort of healthy aging? Is it the full gamut of people's brain waves that we're interested in?

Susan Mingils: So for me and my research, I'm researching neurotypical populations. So that's mostly going to be college students on campus. And that's because there's a lot we don't know about how the neurotypical brain processes music and rhythm. And I think we need to understand that first before we can start looking at how music is processed in the injured brain. But that's generally what I'm hoping in the long run to move toward is brain injury populations. But yes, in the brain ranges research lab, there's also research with children. And Jacqueline Stevens does research in the lab on sports related concussion.

Matt Hickey: Right. So a lot going on there.

Susan Mingils: Yeah, there's a lot going on in there.

Matt Hickey: Now I have to ask you in a side, are you a fan of a particular genre of music?

Susan Mingils: I can't really pick a genre I think that I'm a fan of. I really like folk music and that kind of thing. More mellow kind of music. That's my personal taste. But as a music therapist, you have to know a decent amount of songs in pretty much every genre. Because in music therapy, preferred music is ideally what you're playing for the patient. So you have to learn to appreciate all the different genres so that you can authentically engage in that genre with the patient.

Matt Hickey: And of course you have goals in mind, right?

Susan Mingils: Yeah.

Matt Hickey: So we're not going to play maybe the fight song from the football team if we're looking for a relaxation platform or something along those lines, right?

Susan Mingils: Exactly. And you have to get a little creative sometimes, depending on what the person's preferred genre is in the goal, you might have to adapt the music a little bit to make it fit.

Matt Hickey: You must have quite a library on Spotify. At your fingertips, that's great.

Susan Mingils: Yeah. And that's why live music is best for music therapy too, because we can take a genre that maybe we wouldn't normally think of as relaxation, but then if we can play it on guitar and sing it, we can adapt it toward that goal.

Matt Hickey: Indeed. That sounds awesome. I can do neither sing nor play, but I do appreciate music for sure.

Avery Martin: Of course.

Matt Hickey: So I want to know a little bit more about you. So tell us a little bit about yourself, how you got to this point, and this is going to be sort of the educational trajectory, this sense maybe of familial or early educational sort of moments or mentors that pushed you along this track. And then I'm always interested in the question, was there a moment when the light bulb went on and you said, I'm going to get a PhD?

Susan Mingils: So I would say the journey started just with growing up, music always being a big part of my life, singing in choir, dancing, performing in musicals. So initially I decided I wanted to be a music performance major. Started to realize that wasn't exactly the path for me. So I went on to double major in music and psychology and completed a couple of research projects related to music and language processing as a little baby researcher, senior in college.

Matt Hickey: Now, where was this, if toy don't mind me asking?

Susan Mingils: This was at Stetson University in Florida. In DeLand, Florida.

Matt Hickey: And are you a Florida native?

Susan Mingils: We moved to Florida when I was 13, lived there up until we moved to Colorado.

Matt Hickey: Okay. Super. Carry on.

Susan Mingils: And so after Stetson I went to Florida State University in Tallahassee, Florida. And so that's where I completed my degree in training for music therapy. Then I got my certification in music therapy and I worked kind of in the Jacksonville and Daytona Beach, between those two cities for a few years. And I worked in a lot of different settings. Most of the time it was inpatient rehab, worked a lot with stroke and brain injury patients, especially. But I also worked with older adults in the kind of skilled nursing assisted living memory care kind of area. Pediatric rehabilitation and mental health and a little bit of special education too. So I was kind of...

Matt Hickey: My goodness.

Avery Martin: A little bit of everything.

Susan Mingils: A little bit of everything, which kept things interesting. And I really wanted to use a neuroscience based approach to my practice. So I went on to complete the neurologic music therapy training. And I found the techniques really helpful, especially for patients with motor impairments because of brain injury or something like Parkinson's disease. But I found that for patients who had to relearn cognitive skills, it was a little bit more challenging and it felt...

Matt Hickey: Would these be post stroke or post TBI?

Susan Mingils: Post stroke, post TBI, especially traumatic brain injury is challenging. But I could see that music therapy could be helpful for a lot of those goals, but sometimes it felt a little bit too much like trial and error. There's always some trial and error I think. But it felt a little bit too much like trial and error where maybe we can start to have a little bit more guidance on how music therapy can address cognitive skills. And I started to realize this was partly because we still don't know a lot about just how the brain processes music, but also brain behavior relationships in general and how the relationship between cognition and behavior. So that's what led me to pursue a PhD in occupation and rehabilitation science because my research could be applied to music therapy in some way, but I could also learn more about rehabilitation on a broader scale I think, and kind of get new perspectives. And the occupational science perspective has been really enlightening too.

Matt Hickey: A professional experience had to really enrich your perspective. I came from a pathway or straight through and I often lament not having had the opportunity to get out and actually smell the roses or work as a professional before I pursued a doctoral program. I'm curious, did you come from a musical family?

Susan Mingils: A little bit. Yeah. So neither of my parents are musicians professionally, anything like that. But my dad has a very nice voice. He grew up singing in church and would sing to us all the time and make up songs and things like that. He also played trumpet, and so he would play his trumpet sometimes and things like that. And both of my parents would just really like music and play music all the time. So I think I might have been one of the first to pursue a degree in it, but there's some extended family, I think, in places that have been music teachers and things like that. But one person who initially got me interested in music therapy was actually my neighbor across the street who was a music therapist. And so that was how I initially learned about music therapy, which is still very new to a lot of people, don't know about it.

And I think my interest in music and the brain, something that initially sparked my interest in that was actually reading Musicophilia by Oliver Sacks. So I love Oliver Sacks. So that book was one of my initial introductions to that world. And I had also heard a podcast episode, Radiolab episode, about musical illusions. So researcher, Diana Deutsch, psychology professor at University of California in San Diego. And so her research on musical illusions was what became the basis for my senior research project in an undergrad. And so those were some of the initial things that kind of sparked my interest kind of along the way. So I don't know that there was a particular moment when it clicked and said, I want to get a PhD. I think it was a lot of things that led up to it.

I think it kind of started in undergrad and then my time doing clinical work as a music therapist, eventually it came back around to it, I guess. I realized I really enjoyed it, but I remembered that research was, I think, where my true passion lies. I really enjoy clinical work and it was very valuable, and I might go back to doing that at some point, but it was a reminder of the connection between research and clinical practice and figuring out where I would fit best along that continuum and that cycle, I guess that happens between research and applying it in clinical practice. And then also I think clinical practice inspires research. So the cycle between the two.

Matt Hickey: So you have this rich familial experience. I close my eyes and picture your dad's singing now, and I'll probably have that memory, which will stay with me for a while. Those are gifts for sure. And then you have this educational experience. You get your undergrad, your masters, you're out in clinical practice, and as you just described, you sort of go full circle, realize you want to think about building a bridge between clinical practice and neuroscience/music therapy related research. And somehow from sunny Florida, Fort Collins gets on your radar screen. So how did that happen? How is it that you landed here?

Susan Mingils: So my now husband and I had been wanting to move out of Florida for a little while when we were living in Florida, working in Florida. Just felt like we'd been there long enough, wanted to see some other parts of the country. Colorado was definitely on the list of places. And then when I was searching for PhD programs, CSU was just very high up on the list for me because it checked a lot of boxes. I wanted to be able to get a PhD that was applied research, I guess, versus... I also thought about going the route of a cognitive neuroscience PhD or something like that. But felt like the applied sciences was a little bit more toward my interests, but where I could also learn some neuroscience research skills. And put in touch with Patty Davies, Jacqueline Stevens, reached out to them and they had funding. So that just worked out. And also that there is a music therapy program here on campus that's really well known, great program, and just kind of worked out that Patty had already been collaborating with the music therapy department too.

Matt Hickey: With [inaudible 00:15:31]?

Susan Mingils: With Dr. [inaudible 00:15:35]. Yeah. So it was a little bit of planning and research on my part. And then just everything just seemed to be falling in place in terms of fitting my needs.

Matt Hickey: It's interesting, and I suspect many [inaudible 00:15:48] listeners will not fully appreciate the extent to which timing matters for applications to graduate schools.

Susan Mingils: Oh yeah.

Matt Hickey: It doesn't just happen often. The majority of the cases, you've got PIs or mentors who are funding you on NIH grants or NSF grants or something along those lines. And they may have every desire to take somebody on and not currently have the wherewithal to make it happen. So there's a number of pieces that go into that puzzle, for sure. I have to ask you, so you spent several years working as a professional, was there any anxiety about heading back into academic life or was it sort of full steam ahead?

Susan Mingils: I think it was both. I think it was full steam ahead because I really liked school and I was excited to get back into school. And of course it was coursework at first, and so that was really exciting. Learning new things. There was some anxiety about getting back into reading really dense material, writing skills and things like that, which I was rusty on. So things just took a little bit longer at first, but it had only been three years or something. So it wasn't too bad. It was an adjustment at first, but I just kind of accepted that I'm not as... I guess when you're younger I feel like you can easily just cram material and things like that. But I definitely have had a different approach after being a little bit older, pacing myself or trying to.

Matt Hickey: Clearly been successful.

Avery Martin: Yes.

Matt Hickey: We have three cohorts now of Dean's Fellows, and you were in an early cohort. We have seven members of that August body now. And of course we hope to continue to grow those Dean's Fellowship opportunities. So we say congratulations again, that's a sign of really doing neat work. And I want to talk a little bit about the work you've been doing here at CSU. So when we talk about these big problems that we opened up with a few minutes ago, how are you getting after that in terms of the work you're doing that will be part of your dissertation?

Susan Mingils: I want to start by explaining a little bit about moving in time to music. So give a little bit of background on that. So for most people moving in time to rhythm happens automatically, when you tap your foot or bob your head along to a beat. And so I call that, and a lot of people call that rhythmic entrainment. There's different terms, but I like to call it rhythmic entrainment because I think it describes pretty well what's going on. You are entraining to the rhythm. So we know that there are connections between auditory and motor regions of the brain that help us move in time to rhythm, but the mechanisms of that aren't fully understood. So in my research, I'm aiming to understand more about those mechanisms.

So to do that I use EEG, which stands for electroencephalography, measure the electrical activity of people's brains. We place sensors on their scalp to do that, and we measure their brain activity while they tap their finger along to rhythmic tones. And then we analyze that data and see if there are changes in how different areas of the brain communicate and synchrony during rhythmic entrainment.

Matt Hickey: Now I have to ask you again for the listener who may be wondering, how does this all work? So you shave their heads before they go into the lab and then... I'm kidding, of course, but can you just...

Susan Mingils: Absolutely. So there's a lot of different EEG systems out there. What we use in our lab is a cap system. So put a cap on their head, which kind of looks like a swim cap or a water polo cap, but it has all these little holes in it. And we place electrodes, or we call them sensors in our lab since we work with a lot of children. And we put a little bit of some gel, which we call a liquid wire, serves as a liquid wire too, that amplifies the signal. So then we place all the sensors in the little holes and make sure that there's a good connection between that sensor and the scalp. And to apply the gel, just kind of move the hair out of the way a little bit to get down to the scalp. And it tends to work pretty well, even with people with different types of hair. So actually people with shaved heads are sometimes a lot more challenging because they've built up a thick layer on their scalp. So sometimes it's harder with them.

Matt Hickey: That's great. Thanks for unpacking that a little bit more.

Avery Martin: Yeah, that's great.

Matt Hickey: Avery's looking at my rather egg-shaped head here and thinking, Matt would probably have no problem, doesn't have any hair to move, right? Thanks for that. I appreciate it. So who funds the work that you do or the work that Dr. Davies does?

Susan Mingils: Well, of course, my research project's funded by the College of Health and Human Sciences, Dean's Doctoral Fellowship. So that provided some funding for the work I'm doing. But the lab that's also had funding from National Science Foundation and National Institute of Health over the years that have helped secure equipment and resources in the lab that we're still using. And the School of Music Theater and Dance has contributed to the lab and the Department of Occupational Therapy. So it's been a lot of different funding sources.

Matt Hickey: And this, again, is so typical and I think it's easy to dance past the day-to-day activities in the labs. They don't just happen. You have to live and eat and pay your rent. So there's a tier layer of salaries even sometimes for undergrad interns depending on whether they're volunteering or actually paid as part of that process. But then there's the equipment. Your liquid wires are not free. We have to pay for these sorts of things, right? There's equipment, some of which can be quite expensive, and labs are quite busy. We might need to clone things. I need two sets or three sets of X, Y or Z because of the number of research participants we see. So it doesn't just happen. And I think it's always useful to point out that we need help as investigators and that help is competitive.

So you competed again for this fellowship and Dr. Davies has competed successfully for monies from NSF and NIH and elsewhere. And this is an important predicate that again, I think we often sort of skirt by and we would talk about the fun stuff and forget to mention that it happens on the back of a lot of sweat equity and creativity and imagination and hard work. So there's a research team you've already alluded to and I just hinted at that again. Can you about... So you head into the proverbial lab on any given day, and what does the research team look like? And again, maybe some representative examples of here's a day of data collection or a couple of hours where somebody comes to the lab, what does it look like and who's involved?

Susan Mingils: Absolutely. So when we're collecting data in the lab, it looks a little different if it's with an adult or with a child participant. I mostly collect data with adults and students on campus. But usually that looks like one person who is leading the data collection and that person is giving instructions to the participant and being more of the person overseeing other things that are going on. And then there's always a second person assisting. So both of us will be doing all the setup, putting the cap on, everything like that. And then the person assisting sets up, runs the computers while the lead person gives the instructions. And so one thing that's important in our lab is making sure that those roles are clear so that it's just clearer for the participant. They know who to look to, to ask certain questions or just so that things move really smoothly too.

It can take a long time at first to when you're learning how to apply the 64 sensors that we have on the cap and the participant has to sit there kind of still for a while. So if that's a child, you need to be even more efficient. And also making sure that they're comfortable and there's things that look a little bit scary and kind of medical equipment. Even for college students, I think we use applicators that... They are the plastic part of syringes and have a little tip we put on the end that looks kind of like a needle, but it's not. So even with adults, we're careful about how we present those things and just making sure people know that we're not going to be hurting them. That's the intention.

Avery Martin: You all know what you're doing. Doing safely.

Susan Mingils: Yes. That we're doing it safely, reassuring them. And we collect our EEG data in a, we call it the booth, but it's a electrically shielded sound attenuated booth. So that helps us get clean data. And a lot of times if we're training new research assistants, then we'll also have that third person there and they might be observing or stepping in and trying things.

Matt Hickey: That's cool. Great.

Avery Martin: So let's hear about some of those research assistants, whether they're grad students or undergrad. I know that you are under the mentorship of Dr. Davies. So what is it like to be an in-between mentor mentoring some of these assistants?

Susan Mingils: Yeah, I think I am at the point now where I feel pretty comfortable in training new research assistants. There's always things that come up where I need to still go ask Patty questions and I'm always learning new things. But it felt like that was a long way off when I first started and there was a lot to learn. And now I really like training new research assistants because I like to see them grow in that process and see them become more confident with it over time. And I think at first everyone's very scared to make a mistake. And so I try to make sure they are careful with the equipment and I don't want to say that they're taking things seriously I guess, but that they're following the protocol that we have and taking that seriously.

But most of the time I think we need to pull them the other way. I think most people there are nervous about making mistakes and knowing that it's important what we're doing in research and we want to get clean data. We want to make sure the participant is safe and everything, but at the same time, it's not life or death, and it's okay to make little mistakes here and there. Most of the time we can fix those mistakes and that's just part of research anyway. Nothing ever goes perfectly.

Avery Martin: That's so true.

Matt Hickey: Yeah, you sound like an excellent mentor as far as I'm concerned. We have these tensions, what we call responsible conduct of research, which we take very seriously of course. We're interacting with vulnerable human volunteers. Even if they're not vulnerable in some of the legal senses of the word that they're giving of their time, they're in a setting where I'm seeing things that don't look like home to me and et cetera. And so we have to blend those two in a way that respects our institutional commitment to responsible conduct to research and our respect for human participants. It's an important lesson to learn, the balancing act there.

Avery Martin: So speaking of those undergrads, you of course were an undergrad at one point as well. So let's look back a little bit and think about some advice that you would give to your undergrad self, younger Susan.

Susan Mingils: The main thing I would say is show yourself compassion. So I think that's the main thing that I needed to learn, and that would've been helpful for every aspect of my life, pretty much, personal and professional. That I would say take time to explore a wide range of interests. I think I did that to a certain extent, but I think there was also this mindset that I had that I need to figure out my path and what is the right path for me and the right thing, but I'm not sure that that exists and that it's okay to make mistakes and take time to find what your passions are. So now I feel like I have a better understanding of that, and it took time. So I think I'd go back and say, you're not going to have it all figured out by the time you're done with undergrad, and that's okay.

Matt Hickey: Yeah, that's good advice, for sure.

Avery Martin: Definitely.

Matt Hickey: Forgiveness goes a long way.

Avery Martin: Absolutely.

Matt Hickey: I'm interested in impacts, and so I should reflect a little bit on the impact your work might presently be having. And I want to frame this a little bit in the context of the challenging work that you do. When we started this a little while ago, this sense of understanding how the brain works and in any way, shape or form, let along how it responds to different forms of music, particularly in clinical population, is not an easy thing. It's not simple. So it's conceivable the impact is down the road. And so if that's the case, again, project us some 10 years in the future and talk about aspirations you hope your work might be having.

Susan Mingils: So I think of the research I'm doing right now as a small piece of the puzzle, learning more about the relationship between brain and behavior in general and how neurotypical and injured brains process music. And I view this as a first step for me toward a line of research where I can study more about what's happening in people who have some kind of brain injury or neurologic based disorder, and eventually use that to help develop new interventions, study those, and improve the effectiveness of music therapy interventions.

Matt Hickey: Hear hear. To improve lives, right?

Susan Mingils: Exactly.

Matt Hickey: Yeah, that's neat. So a couple closing questions. When you think about working at a land grant, CSU embraces its land grant heritage, we have certainly been embracing that as part of our first couple of seasons. We take it seriously as an opportunity, a calling in some ways. So what do you love the most about working at a land grant as a doc student?

Susan Mingils: So I really like that my experience here has been more holistic. I've been able to focus on my research a lot, but I've also benefited a lot from having student focused education. And that's allowed me to explore a lot of different topics which are related to my research, but also beyond my research, other things that interest me.

Matt Hickey: If you decide to stay in the academy and do what Patty is doing perhaps somewhere, would you be keen to be at a land grant yourself, if at all possible?

Susan Mingils: I think so, yes. I really value having that more holistic approach and in the future having opportunities for community-based research and things like that.

Matt Hickey: Hear hear. Last one is about our college. So tell us a little bit about what you find the most rewarding about being a member of the College of Health and Human Sciences?

Susan Mingils: So I really like that I get to see research from a really wide range of disciplines that are all contributing to this larger goal of improving health and wellbeing of people and their communities. And even within our occupational therapy department, we have people conducting research on so many different topics from basic neuroscience research, what I'm doing all the way to community-based research. And it's just really cool to see how research at each of these levels contributes knowledge to this broad overarching goal. I think that's really unique about our college. And of course I'm also really grateful for my funding from the College of Health and Human Sciences and the Dean's Doctoral Fellowship has been just an awesome opportunity and helping make my research possible.

Matt Hickey: Congratulations again. It's our pleasure to support you and we're glad you're part of that cohort. So thanks for your time today. We really appreciate it. I hope you enjoyed it.

Susan Mingils: Thank you.

Matt Hickey: Yes, of course.

Susan Mingils: Yeah, hope you got what you needed.

Avery Martin: We definitely did.

Matt Hickey: It was great.

Susan Mingils: All right, sounds good.

Matt Hickey: Another great interview is in the books. Thank you for listening to this episode of Health and Human Science Matters.

Avery Martin: Stay tuned for the next episode. It's on the way. In the meantime, go listen to our episodes from seasons one, two, and three. And if you want to learn more about our CSU College of Health and Human Sciences, go to www.chhs.carlosstate.edu.