



The Victory Summit® Virtual Event: Mental Health and Wellness
Music and Rhythm For Parkinson's: Improving Mental and Physical Well-Being

with Alexander Pantelyat, MD

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Davis Phinney Foundation

Polly Dawkins:

Welcome to Dr. Pantelyat.

Alexander Pantelyat:

Thank you so much for the introduction. I'd like to briefly talk to you today about the use of music and rhythm in Parkinson's disease to improve physical and mental wellbeing. So for those who are interested we at this point have some social media information to share on Facebook, Instagram, and Twitter, but the traditional website is listed here and these slides, of course, we're happy to share to anyone who's interested. The vision of our Johns Hopkins Center for Music and Medicine can be summed up by the motto music as medicine, medicine for musicians. So our mission is to bring music and medicine together by making music and rhythm an important part of treating illnesses, such as Parkinson's disease and by improving the health of musicians, the world round. So I will briefly speak to you today about how music affects the brain, give you a few examples of music-based interventions, and we'll give you two slides towards the beginning and again, a recap at the end, that real action steps that you could take later today and tomorrow to try to improve your life using music.

And then I hope despite the late start, to take a few questions at the end, and here I'd really like to start with a quote from Shakespeare. "Music do I hear ha ha keep time how sweet, excuse me, how sour sweet music is when time is broke and no proportion kept." And I should have asked this at the beginning, can everyone hear me? Okay? Can I get a thumbs up or someone?

Polly Dawkins:

I can hear you fine.

Alexander Pantelyat:

That's perfect. We shall move on then. So this is a busy slide, but it's one that I like to show at the beginning of my talks on music, because it's a really useful in bringing home the point that music and rhythm impact so many different places in the brain all at once. So to frame this slide, I want to give you a real-world example that I hope will resonate with many people listening. Imagine hearing a song, or the song that you danced to at your wedding, you know, your main dance as new as a newlywed. So keep that in the back of your mind when we go through some of the areas that hearing the song will activate. So as any sound, music activates the basic auditory pathway, which is outlined green circles. And I should have said that what we're looking at here is a side view of the brain and the left-hand panel, and a cutaway view down the middle of the brain with the front of the brain over here on the right-hand side and the back of the brain on the left. Bottom is at the bottom and top is at the top. So you have a side view of the right hemisphere over on the left-hand side, and then a cutaway view down the middle of the brain.

And I often get asked this, so I'll say this, address it upfront. Although we're looking at the right hemisphere for this slide, most musical processes are actually processed on both sides of the brain. One exception is pitch and melody processing, which is mostly in the right hemisphere, which is why they're showing this right hemisphere here, my colleagues in this paper. So the green circles indicate the basic auditory pathway. This is what music has in common with any sound coming into the ear. It's processed in the superior temporal lobe, which is over here. I hope you can see my pointer.

Then you have more complex elements of music that are processed in a more distributed way in a key area called the temporal plane or the planum temporale in Latin. And that's in turquoise over here in towards the back of the temporal lobe. But you also have areas near the motor cortex and the frontal lobe. You have the superior temporal gyrus inferior frontal gyrus, which is relevant for language production as well. And so there are some overlapping areas in terms of understanding music as melody and understanding speech. And that overlap is very important and pertains to the ways that we could use music, to treat people with speech difficulties, then moving on to attention and working memory. We know that that is often a difficult thing. Loss of multitasking abilities, difficulties focusing and paying attention are part of Parkinson's disease for many people.

So music, hearing music, and certainly making music can activate those areas that are dedicated in the brain to attention and working memory, focusing and keeping track of the music and its beat in time. So you have the dorsolateral prefrontal cortex and other pink circles over here in the inferior parietal lobe, the cingulate gyrus, then moving on, we have the episodic memory network in darker purple circles, again, involving multiple areas in the parietal lobe, angular gyrus over here, the middle temporal gyrus and the temporal lobe, and some key areas that Alzheimer's disease affects. Alzheimer's disease, as we know affects memory. And the precuneus and hippocampus are key hubs for memory formation. Those areas are known to be activated when we hear music. So when you hear the song that you dance to as a newlywed, you are going to have activation of these areas in the brain.

If it's music that has a nice catchy rhythm and beat, or if you're actually singing or playing a musical instrument, then you can be sure that you also have activation of your motor cortex and that's in dark blue, not only motor, but also the sensory cortex. So imagine I play the violin and you know, I get almost real time feedback from the sensory cortex, which is over here on the picture as my fingers hit the strings. And that feedback from the sensory cortex tells me, I may need to adjust in a very minute quick way, the way that I place my fingers on the string and the fingerboard of the violin in order to produce the sounds that I want to produce. And so there's this immediate, almost real-time feedback between the motor cortex, making a voluntary plan movement, then the somatosensory cortex.

And yes, both of those areas are activated by hearing music, particularly music that is danceable. And that has a nice, strong beat to it. Then last but not least, you have circles over on the right-hand panel that are in orange that involve processing of reward and emotion. And so here is where things might split. If you hear the song that you dance to as a newlywed now, and you have a happy marriage, 20 or 30 years later, you will have likely very positive pleasurable associations. And there will be areas in the brain in this network of reward and emotion that will be active, such as the nucleus accumbens experiencing pleasure and reward. On the other hand, it's not one size fits all. The same song is not going to be experienced the same way in different people's brains. If you had a bitter divorce five years after your marriage, and then you hear the song that you danced to as a newlywed, you might have a very negative associations with that song.

So instead of the nucleus accumbens, you might have the fight or flight center in the brain activated, that's the amygdala over here. So I just want to emphasize that to say it's one size does not fit all when it comes to music. But the argument here showing you this busy slide is that there is something from

music for everyone that potentially can be gained. On the other hand, the challenge in terms of studying this as a researcher is, since so many areas of the brain are being activated simultaneously all at once, by listening to a given song, it's difficult to separate the effects of music and rhythm on these distinct separate networks in the brain. So there is a hypothesis that was actually described about 10 years ago by Annie Patel from south California that really draws upon this overlap, I mentioned between hearing speech and processing music.

The benefits of music are driven by adaptive plasticity in the brain, in speech processing networks. And this plasticity occurs when the following conditions are met and the conditions are framed by an acronym O.P.E.R.A.

So O stands for overlap. As I already mentioned, there's an atomical overlap in the brain networks that process the acoustic features that are used for both music and speech.

P stands for precision in the acronym. Music on average places much higher demands on these shared networks between processing melody and regular speech compared to speech in terms of the precise timing that you need to pay attention to. And so the fact that there is a higher demand for precision might mean that people who are exposed to more music during their lifespan may actually retain the ability to understand and process speech a bit better with age than those who haven't been exposed to the same degree of music and there's some evidence for that.

E in the acronym OPERA stands for emotion and as already mentioned, musical activities that engage the emotional network and elicit very strong, positive emotions. But I would add to this also very strong negative emotions, again, to harken back to the example I gave of dancing to a song at your wedding, and then having a bitter divorce than hearing the song after the divorce.

R stands for repetition, the musical activities that engage in this shared set of networks are frequently repeated. In other words, practice makes perfect. And if you don't use it, you lose it. That's the reverse, the inverse of that. So you have to repeatedly be exposed to a music-based activity or rhythm-based activity like dance in order to gain the rewards.

And finally, A stands for attention. The musical activities that engage the shared network are associated with focused attention. You got to pay attention to the music in order to reap the full benefits. Now, the idea that music can change the brain over time, this idea of neuroplasticity is not new. One of the founders of neuroscience from Spain, Santiago Ramón y Cajal wrote in 1904, and this is a quote,

“Everybody knows that the ability of a pianist to play an adaptation to a new work requires many, many years of mental and muscular gymnastics. To understand this phenomenon it's necessary to accept that in addition to the reinforcement of pre-established pathways, [those networks that I showed you in a prior slide], new pathways are created by the ramification, [that means branching] and progressive growth of terminal dendritic and external processes.” So many decades before cat scans and MRIs of the brain were developed this neuroscientist in 1904, postulated that a pianist or somebody a singer, somebody practicing an instrument or singing is actually forming new pathways in their brain over time. And now we actually have modern methods in science to show that that's the case. So an updated quote from Michael Thaut, who was the founder of neurologic music therapy, which I like, is “the brain that engages in music has changed by this engagement.” So we could use musical activity to activate the areas of the brain that are either not affected or less effected by neurological disease, like Parkinson's disease, possibly allowing us to get around the problematic pathways in some of those networks that I already showed you in the prior slide. So what can we do? Let's cut to the chase. Here's an example of neurologic music therapy, it's called Patterned Sensory Enhancement or PSE. It could improve posture by stretching, such as stretching the arms high above the head as we follow a melody. So imagine an exercise where you hear a melody {singing} and then going down, {singing}, so the direction of movement here in this type of music therapy parallels the direction of the musical line. Patients, including those with Parkinson's disease have reported increased quote, “freedom of movement” with PSE in order to including improved range of motion and ability to exercise longer.

And I hope all of the people listening in today know the importance of aerobic, physical exercise in slowing down the progression of Parkinson's disease. Now what about actual therapeutic instrumental music performance? This is something that we have really focused on for patients with Parkinson's disease at our center, through our trials from 2015 onward. The goal is to optimize and improve both fine motor skills in the fingers and gross motor skills in the larger muscles by using this concept of rhythmic entrainment, I'll go into in a moment. The instrument itself think of a drum or a tambourine can be a target of movement. So you're reaching to hit a target. And that is part of the therapy. And it's nice because you get immediate auditory feedback. So if you aim to hit a drum tambourine with your foot or your arm a certain way, and then you missed, or it doesn't sound the way you like it, you get immediate auditory feedback, including sensory feedback, as I showed you in that slide, the sensory cortex is involved, and you can adjust the way that you're playing almost in real time.

Now, what about something that anyone, whether we have, whether one is suffering from Parkinson's disease or not can do right now? Music assisted relaxation. We know that stress can exacerbate symptoms of Parkinson's disease. And we know that calming music that approximates normal resting heart rate about 50 to 60 beats a minute, that tends to be instrumental. So not involving words because those could produce additional associations in the brain that have lower pitch frequency. So not too shrill, that have little variation in volume pitcher rhythm tend to be calming for most people. This is a generalization, but that generally holds true. And we know that patients and care partners often report decreased stress and symptom improvement during music listening.

And there are multiple studies now across different conditions, neurological, and otherwise that measure cortisol levels, the stress hormone levels, cortisol, for instance, and that clearly shows to be reduced even in the short term, after listening to relaxing music. Now, I promised you action steps. Here's the first slide. We're going to repeat this before the end. What can you do today or tomorrow? Well, you can march to music that you enjoy using a playlist from your favorite app like Spotify for example, or Pandora. You can enroll in a dance class. When I first joined the session, I overheard someone mentioned Dance for PD, something we have in Baltimore, Maryland you know, by me and that's something that we very strongly support and it's a fantastic international program now. You can consider joining a choir. Nowadays during the pandemic, our choir called ParkinSonics that we spun out of a study, the first study of the Center for Music and Medicine actually meets weekly on Wednesdays, via zoom and people are welcomed. And the fact that it's via zoom has really expanded access beyond the confines of Baltimore.

And then also last but not least think about seeing a music therapist, look up AMTA American Music Therapy Association and see if there's a local music therapist who can offer virtual or in-person consultations. This is something that we are starting up at Hopkins, and I'm very happy to say that finally, we're doing that now. I'm going to really gloss over this slide because I think people on this call are quite familiar with Parkinson's disease basics. It's the second most common neurodegenerative disease after Alzheimer's disease. We know that there are the four Cardinal motor signs, but for many people, the motor issues are really not that high up on the list of problems, but for the motor classic findings is T for tremor, R for rigidity, which is muscle stiffness, A for akynesia, which is really loss of fine motor speed and control and P for postural instability, which is walking, posture, and balance difficulties.

And so that's the TRAP mnemonic we teach medical students, trapped by Parkinson's disease. And I emphasize in italics, the postural instability and walking difficulty, because as many of you know, our current interventions for symptom control, whether it's levodopa, other medications or even deep brain stimulation surgery tend to be less effective or not effective at all for the postural balance issues that can develop in Parkinson's disease. So how might music and rhythm help people with Parkinson's disease? I already mentioned therapeutic music performance, and I mentioned rhythmic entrainment. So what is that? We define rhythmic entrainment as the patterning of body processes and movements to the rhythm of music. To put simply, if you're at a concert and you got to catch a melody and you'll find yourself clapping along or tapping your foot to the beat, you are rhythmically entraining to the beat. And that is happening in your brain.

A very impressive example that I always use is imagine pre pandemic, or hopefully, you know, soon to come a big concert, a rock concert that you're attending there are thousands of people in a field and the performers on stage want you to start clapping along. So they start indicating this. And before you know, it, the huge crowd is clapping along in a remarkably coordinated, rhythmic way within seconds, often. That is a wonderful example of rhythmic entrainment. And there is evidence that this is happening in the brain within seconds to minutes of starting to hear a strong beat. So the brain follows along, and brainwaves actually line up, align themselves relative to what the rhythm that you're hearing is that's coming through your ears. So again, the idea is to either get around or strengthen the pathways that are affected by Parkinson's disease.

So here, just to show you a picture again, this was a sagittal slice from one ear to the other, a cutaway of the right hemisphere. Front is here, back is here top and bottom. So the classic pathway for internally generated movement is in yellow. And that's the pathway that is affected by Parkinson's disease, the externally cued movement pathway, which kind of goes around the back, if you will, from the cerebellum to the thalamus, to the parietal cortex in the back to the supplementary motor area. And finally the primary motor cortex, which music and rhythm of course effect, as I mentioned in the prior slide, it's a way to get at the same final area to activate the muscles, to activate and create voluntary movement by getting around the faulty pathway the yellow, in Parkinson's disease. So that is not proven yet, but that's a hypothesized way that music and rhythm may be able to help people with Parkinson's disease.

So what's been studied the most is rhythmic auditory stimulation or RAS. Typically it's used for walking and balance, exactly the type of symptom in Parkinson's disease that is less responsive to known treatments. And we use rhythm as an external timekeeper. So these are auditory sound cues. And you know, traditionally in the seventies, when this started to be used, the metronome was used to keep pace. Nowadays, we use an app or you could walk to recorded or even live music that has a strong march-like 1-2-1-2 beat. And the idea is to entrain your brain as I mentioned, through rhythmic entrainment and anticipate the next step by following the beat, each step is a beat. Sometimes actually verbalizing and counting to yourself. 1, 2, 1, 2, or singing to yourself like row, row, row, your boat, gently down the stream. Believe it or not, those things that I just mentioned, they've been studied in Parkinson's disease, and there's clear evidence that they may improve multiple aspects of walking and balance.

And so these are things that could potentially help. Now, what about drumming? Well, we know that drumming has long been a part of traditional healing rituals in many cultures across continents. And when I was still in training at the University of Pennsylvania, a group of patients told us that they had a significant improvement in their sense of overall wellbeing after a single 45-minute class led by a west African drum instructor, this was an annual retreat retreat that UPenn puts on for patients with Parkinson's disease. So when I heard that I was tantalized, and I put together a pilot study that sought to see if drumming can improve wellbeing and movement in Parkinson's disease. So we designed the drum PD study published in 2015, and we had 10 drummers and 10 folks with Parkinson's disease who served as controls, pursued their usual treatment, including medications and physical therapy.

And we assessed people at the beginning of the study, six weeks later, in the case of drummers that was after 12 classes twice a week for six weeks of drumming. And then we repeated the assessment at 12 weeks. So six weeks after drumming was over for the drumming group. And what we found was on the PDQ 39 quality of life questionnaire, we saw significant improvements, lower bar in green actually indicates an improvement in those who drummed without significant improvements in those who pursued their usual care. And importantly, after six weeks of not drumming people, weren't all the way back to baseline but they were close enough to where statistically, there were no changes in quality of life that people reported. So that indicated to us that you've got to keep doing it in order to keep experiencing the benefits from drumming. So this is what we concluded.

We also, interestingly, looked at things like timed up and go test to see if there was improvement in speed of walking and some aspects of balance. And there was a trend towards that as well. This was a very small pilot study, but certainly something we're interested in following up if you can imagine sitting down with a drum and you know, beating a drum, your own drum, but following with an instructor and actually having some gait improvement. That is a trend that we observed. We also saw that there was actually some improvement in mood, but this was not statistically significant in our pilot study for drum PD.

Next, I want to just share with you another example of a study that involved therapeutic, instrumental music performance with guitar, we call the guitar PD, you see a theme. And so we had two groups of patients with Parkinson's disease who were assigned randomly either to a guitar class first or a guitar class after six weeks. So again, they had twice a week classes for guitar and group 2 received the guitar classes six weeks after group one. And so there was a kind of a crossover design. And so we evaluated everybody at the beginning and then six weeks, 12 weeks, 18 weeks. Across all of the participants, again, the summary index score for Parkinson's disease quality of life questionnaire improved from baseline to week 12, which is when the drumming cutoff for everybody and remained improved at week 18, but this didn't reach statistical significance. So trended in the right direction but didn't quite get there. And then we looked at depression scores with the Beck depression inventory. That's BDI two, and that also trended toward improvement after six weeks.

And there was improvement in apathy. In other words, increased motivation, also trended toward improvement after 12 weeks. Interestingly, we had significant improvements in the MDSU PDRS, the motor assessment, which is standard for Parkinson's disease. There was a significant improvement in that at 12 weeks, and that remained improved at 18 weeks. So the motor function did seem to improve in terms of dexterity of playing guitar, but we also looked at an everyday outcome of typing, both accuracy and speed, one hand at a time for 30 seconds that did not statistically improve. Although again, it moved in the direction of improvement. People actually in this study, our participants seem to do pretty well with over 90% accuracy, even at baseline in typing. So we did not see statistically significant improvements there. And what about music therapy for voice? Well, we know that therapeutic singing can be used to help improve breathing, counteract the soft and fading volume and monotone voice that sometimes is a challenge for people with Parkinson's disease.

The overall goal is to improve understandability. So we did the ParkinSonic study and we recruited 32 participants with PD, randomly assigned them to a weekly choir for about an hour versus a weekly facilitated Parkinson disease support group. And we did this over 12 weeks, included a track diary of home singing exercises. And then those who did the support group after 12 weeks crossed over into singing. And those who did the singing first crossed over into the support group. Again, we looked at some of those same outcomes I mentioned previously and the people assessing those outcomes were blinded as to which group a participant was in at the time. So 26 out of 32, over 80% of patients completed our ParkinSonic study. This was a six-month study, and there were significant improvement from baseline on average loudness on the cookie theft picture, which is basically seeing a picture and for 60 seconds describing what you see and we measured the loudness from a recording, as well as a sound pressure level device.

Also, we had people read a paragraph, a standard paragraph, and there was improved minimal reading volumes at 24 weeks, which is the end of all interventions and 30 weeks, which is six weeks after the end of all interventions in the study. Minimal loudness and the rainbow passage reading was improved as well as on the description of the cookie theft picture. And interestingly, we saw some movement improvements between baseline and 24 weeks and 30 weeks, regardless of the order in which people got singing. So what we cannot conclude with a hundred percent certainty from this study because of the design is to what extent it was only the singing that could be blamed for these improvements versus actually being engaged in a support group, because that probably helped as well. But clearly there were improvements in the overall group that are encouraging. So we concluded that weekly group singing is a feasible intervention that can improve some aspects of voice volume in Parkinson's disease and some improvements were actually seen at least six weeks after the intervention is completed.

And so weekly group singing seems to be feasible. And we went on to create a ParkinSonic program that continues weekly. It was in the same church in Baltimore city where we did the study, but now it's via zoom and it's open to patients with all Parkinsonian disorders and even care partners. So this is funded through our movement sort of center and the center for music and medicine and going forward in the future we plan additional assessments of voice, motor function and quality of life. So now as I head towards the end of my talk, I want to just give you a couple of highlights for our center for music and medicine. So we are about to submit a paper on the short-term effects during clinic assessment of rhythmic auditory cuing and atypical Parkinsonian disorders. So those are the evil cousins of Parkinson's



disease that don't have really effect of treatments. Levodopa doesn't work well, DBS can't work and they progress more quickly so I focus a lot of my research on that.

We are in the midst of a pilot home trial of MedRhythms. It's a device delivering rhythmic cueing through music, through a playlist. And the playlist on the phone is linked to sensors on each foot. The sensors via Bluetooth send updates on participants, walking and balance metrics and the song speed as well as the rhythm is adjusted every 20 seconds on the basis of each individual's walking pattern. So we're doing that. We have started zooming drumming classes for people with Parkinson's disease, and that's going strong since February and then our partners at the Peabody School of Music through Hopkins are offering subsidized group guitar lessons for individuals with Parkinson's disease. That unfortunately has been on hold until recently but should be starting up during the fall semester.

Also, I'm proud to tell you, on the hospital side, I am a consultant on the music for pain project, through the school of nursing, where we are going into specific units and offering Spotify playlists to improve pain control, hopefully medication use for pain and reduce anxiety in patients, not only in neurology and psychiatry, but other units as well. We have submitted a paper and personally selected music for men undergoing radical prostatectomy, which is something that we found encouraging results for, again, reducing pain and anxiety. And I'm proud to say that we have created together with several partners across Hopkins, the Baltimore racial justice concert series, where we have three concerts planned per year with local Baltimore performers and each concert is effectively a fundraiser for a Baltimore base racial and social justice organizations.

I'm proud to tell you that there's an NIH Kennedy center partnership that was formed back in 2017. And there are research opportunities through the NIH to use music for healing. This is something that I've been privileged to review grants for. Renee Fleming, by the way, I'd be remiss not to mention has a wonderful webcast series you could look up called music and mind through this NIH Kennedy center partnership. And there is a broader movement afoot, particularly starting in the UK, which we hope to really spread around the US as well, the British health secretary at the time, Matt Hancock, who has since resigned in 2018 proposed to enable the doctors in the UK to prescribe therapeutic art or hobby based treatments for ailments, including dementia. So this concept is called social prescribing. So when you come to see me, in addition to prescribing medications, I could give you a script to join ParkinSonics, or a drumming group, or a community orchestra, or start taking music lessons or go to an art gallery or museum for therapeutic purposes. The evidence is growing that this could prolong life, not just improve



quality of life. And there are provinces in Canada who have been starting this as well. And shortly before the pandemic, Massachusetts launched the pilot social prescribing program as well.

So now let me reiterate some of those action steps you saw before. What can you do to help yourself? March to music you enjoy through a playlist, enroll in a dance class, think of dance for PD, join a local choir virtual or otherwise, pick up a musical instrument, whether you've played one in your youth, pick it up again, or challenge yourself with a new instrument or start voice lessons. Consider seeing a music therapist. At this point, I will stop. Thank you so much for your attention. And I have a few minutes for questions.

Polly Dawkins:

Thank you so much. If you'll stop sharing your screen, I can ask the questions here. They're starting to come in. The first question that I neglected to ask you that I asked the other presenters as they started is tell us, how did you get into the field? How, what drew you to this work and how have you specialized in this?

Alexander Pantelyat:

Well, I'm going to try to be very brief to allow for other questions. I have been playing violin since I was seven, and it's a very big part of my life. That's what I would be doing professionally if I weren't in medicine. As I like to say now to my patients, I hope for your sake, I'm a much better physician than I am a musician, but nevertheless music remains very near and dear to me, and is a big part of what I do and I'm very fortunate to be able to combine my two passions from a professional standpoint, at the center for music and medicine. In terms of what drew me to this kind of work. My mother, who's a neurologist as well, told me a story early on of grand rounds at her medical school, where a patient with down syndrome, who was in his forties patients with down syndrome, unfortunately are at a very high risk of developing Alzheimer's disease very early on. And he developed Alzheimer's disease to the point of having very limited speech, and he essentially lost his ability to speak, but had a lovely voice. And earlier in his life had taken voice lessons and learned several Italian opera Arias by heart, foreign language for him.

So he lost the ability to speak his native language, but retained even in the throes of advanced dementia, the ability to perfectly sing with excellent diction Arias in Italian. That was truly an inspiring

example for me that I heard from my mom. And then there were inspiring examples during my career as a resident at Penn. Two patients came in, believe it or not, one night apart, one of whom was a professional singer. The other had no music exposure, both had severe strokes affecting the speech center in the left frontal lobe. And they were mute. They were unable to speak, but right away the attending started he was a bit off key, but nevertheless, he's saying happy birthday to you. And they were able to sing it right away, even, you know, in the subacute phase, after a stroke, not able to speak at all, they were able to recruit the music processing and music making areas of the brain to actually reproduce meaningful sounds in speech. So those are just a couple of things that really motivated me and inspired me over the years.

Polly Dawkins:

That's great. So you mentioned he, wasn't a very good singer of happy birthday. What's the, you know, people say, oh, I'm no good at music. I can't sing. So probably music or music therapy, wouldn't be beneficial for me. How would you answer that?

Alexander Pantelyat:

I'm so glad that you're asking this question. Probably the most important question to ask. This is what people in our studies, particularly the ParkinSonic singing study were coming up to us during screening and during the study itself and saying, I was discouraged from a young age by my parents, by teachers, by others saying, you know what? You have no talent. You have no place singing or playing a musical instrument that cannot be farther from the truth. There is, I hope I've helped convince you after my brief talk today, something to be gained for everyone, regardless of musical ability when it comes to music and rhythm exposure. So yes, it's true that from a genetic standpoint, from an exposure standpoint, everybody's starting at a different point in terms of where you are, but there's no question. And this has been clearly shown that music and rhythm-based interventions can help people across the full range of musical ability. When it comes to true tone deafness, it's called a musia. Actually, it's actually very, very rare, less than 1% of the population. So we're talking about 99 plus percent of us who are able to process melody to at least some extent and can glean things. And even for those with amusia, they could still process rhythm. So something like dance for PD or beating to a drum can still be therapeutic for those folks. So please do not be discouraged. And what I'm saying is it's never too late, regardless of age, to start activating parts of the brain that have been dormant and start leading to

neuroplasticity and hopefully creating new pathways to get around pathways that have been damaged, that are in the process of being damaged by aging Parkinson's disease or other diseases

Polly Dawkins:

You mentioned music therapy. Can you describe briefly what does a music therapy session look like?

Alexander Pantelyat:

Yes, highly individualized and something that I didn't realize myself until I worked, started working closely some years ago with some talented music therapists. So training is still a bit variable depending on where it's done, the big differences between north America and Europe, for example. But certainly if you think of a psychotherapist, a talk therapist, let's say who uses cognitive behavioral therapy techniques probably familiar to most listening, that is an aspect of what a music therapist can do. And that's very important for so many people, isn't it? However they incorporate it and use it through music, whether it's therapeutic instrumental music performance, patterned sensory enhancement, rhythmic auditory stimulation, music assisted relaxation, and many, many other examples of music therapy that a music therapist could show you. These are all things that could be incorporated and are highly adaptable and individualized to a particular patient. So this is what I've seen in my experience, referring to a music therapy. And by the way, I want to add that during the pandemic of course, there's so many other things, music therapy has shifted largely to virtual interventions, and we are very interested in doing studies of this. And I think it has there's a lot of potential of using music therapy virtually, which is why we have these virtual classes.

Polly Dawkins:

Yeah. And is music therapy covered by insurance?

Alexander Pantelyat:

Well now we're asking you about a question that really gets into social prescribing. You need to look state by state. In May of this year, I'm happy to say that Maryland became the 11th state to approve a licensing board structure for music therapy. That is a crucial step on the pathway towards unique code creation for Medicare and other health insurances, to be able to bill. As of now, what music therapists in most states do typically working in a hospital setting is an occupational or physical therapist does an



initial evaluation. There's a determination that a music therapist can help. And they piggyback on the same codes that occupational physical therapists use for follow-up visits, which is obviously inefficient and doesn't always get covered. So the answer is it's very different state by state. And you know, certainly you might guess, east coast, New York, Massachusetts, other new England states are the ones that have led the way here.

But my goal in my lifetime is to hopefully have all 50 states get the licensing and that this is national and that there's a universal reimbursement for it because frankly, to something that has arguably little if any side effects and has a lot of upside, including not only quality of life, but actually changing rate of disease for certain diseases. I think there's a lot of upside from a health economics standpoint and in the US we need to make the health economics argument to get the bean counters to get this covered. And that's, that's what we're working on in the coming decades.

Polly Dawkins:

Yeah. Does music help with apathy or depression? That was a topic we just talked about before you came on with was depression.

Alexander Pantelyat:

Wonderful segue. So if I'm going by the studies, a couple of which I summarized for you today, it seems like mood is what improves across the board and quality of life is what seems to improve across the board. Apathy specifically, it's interesting. So we know that music activates those areas of the brain that are affected in diseases like Parkinson's disease, which leads to apathy. So you definitely are getting that activation from repeated music exposure, paying attention, and then assuming it's enjoyable music, again, that's the caveat. You gotta find what you enjoy through a playlist for example, then you're going to be motivated. Chances are you're going to be motivated to come back to it and exercise to music or play an instrument, do things time and time again, that's the motivational aspect. And in fact, I think that's a key part of the value that music-based interventions add on top of something like a standard LSVT big therapy or loud therapy, which can be very effective, but people lose motivation to do over time.

Polly Dawkins:



Yeah. Are there many physicians like you who understand the benefit of music, or are you unusual in your understanding of those two fields?

Alexander Pantelyat :

That's a little bit difficult for me to answer, certainly in terms of throwing statistics out, I could say that our center, I think is unique in the United States for its breadth, arguably USC and UCSP, San Francisco have you know centers of similar scope. But certainly things, let me put it through this way. Things have moved in a good direction. So the fact that I just gave the example of a licensing board approved for music therapy in the state of Maryland, just in May of this year during a pandemic, I think speaks a lot to the fact that people are generally paying more attention to the potential benefits of music. The other really encouraging thing, which drives things is the fact that the NIH is putting real money behind this kind of research. \$20 million in 2019. And we still have to get the final budget, but hopefully at least another 20 million for projects that will move music and health research forward in this fiscal year. So these are key things that indicate there's forward movement in recognition of importance of what music and rhythm can do for health.

Polly Dawkins:

That's really exciting. A couple of more questions. If you have a few more minutes, do you have advice for people here who are listening as to how to find Parkinson's choir or singing group, or does it have to be Parkinson's specific? How, how do you encourage people to get involved in their community singing?

Alexander Pantelyat :

Fantastic practical question. So I think the first thing as always to pretty much any question as Google. Beyond that if you have, it depends on disease stage, this is kind of like rock steady boxing classes with different, with different degrees of difficulty. If you're early on in the disease course, you're not a couch potato, and you've been an avid exerciser your whole life, especially if you've had prior boxing exposure, then I wouldn't recommend a class for PD. I would recommend the regular class so that you really push yourself to keep up with those without Parkinson's disease. And yes, I have patients just like that with PD who are keeping up. Now, same thing can be said for joining a serious or rather a choir of people without PD. Other than that in the Dallas area, for example, there's an amazing choir.



It's called the Parkinson's Voice Project. I don't have it on the slide, but the Parkinson's Voice Project, they have a lot of funding at this point. They couple their singing with LSVT, which is just fantastic. And they've been spreading Iowa, in rural Iowa, I believe in Iowa State University. There's a growing number of choirs that the Elizabeth Steggemoller, who is a great partner of mine and a colleague who has been moving forward, obviously the Baltimore choirs and Philadelphia, there's a choir that I started before leaving to Baltimore, still going strong. So you want to Google, look around carefully and seek and you shall find.

Polly Dawkins:

One of the singing groups we know of here in our local community is called Tremble Clefs. And I've heard, I've seen those in different communities as well. So that may be something people could, could Google as well, Tremble Clef.

Alexander Pantelyat :

Yeah, by the way, as a side, the ParkinSonics was a name voted on by these study participants. We thought that was very important to use the democratic process because often a lot of discussion goes around you know, you don't want to have any stigma attached to the name of the choir. So ParkinSonics is people really agreed upon.

Polly Dawkins:

It's a great name. Thank you. One last question that I'm going to close with a couple of comments we've heard to your session, actually, two questions. Is there a difference between listening to ambient music or using earbuds or headphones? Any, any difference in efficacy?

Alexander Pantelyat:

Fantastic question. The short answer right now is no, in terms of what's used in studies, typically it's through headphones because if there's other ambient noise, that's superimposed on top of what you're listening, if you don't have headphones, then you know, it's being mixed up. So it's hard to tell the effects of intervention, whether it's music or something else. So we use headphones typically, or earbuds, but certainly for just the, you know, do it yourself at home. If you prefer to not have something in and around your ears, there's nothing wrong with that at all.



Polly Dawkins:

Oh, great. And what is your advice about a drumming class similar to the singing, like to find one Google it?

Alexander Pantelyat :

Yeah. Well, I have to be honest. That's going to be a little tougher, but look, I mean, for people who are interested because our drumming classes via zoom, I think we have a few more spots at this point for our wonderful talented drumming instructor. So I'm happy to have interested that people email me and I will pass that along to Jason Armstrong Baker who leads it.

Polly Dawkins:

Super. And one of our ambassadors up in Massachusetts does a drumming class as well. So when we follow up this recording today, we'll follow up with links and we'll get that link for you, for people to contact the drumming class.

Alexander Pantelyat:

They would very much love to see that series of links because we can incorporate it, share it on our social media. That's okay. And just get the word out better.

Polly Dawkins:

Absolutely. Absolutely. Somebody asks do I have to give up guitar? I have trouble keeping rhythm at this point.

Alexander Pantelyat:

Wow. So this is very tricky. And in my experience, this is where prior level of expertise plays into it a lot, because there's a lot of frustration that goes into somebody who was professional or a serious musical performer on an instrument, and then losing that ability is very stressful and frustrating. So at that point, I would say, let it go. For everybody else who doesn't have that level of you know, hours of practice, 10,000 hours for expertise, commitment. I would encourage you as much as possible to never let it go, keep plugging at it. I just showed you results from our guitar PD study. Obviously, they're not a slam dunk and more studies need to be done, but that's true for most things, but for behavioral

interventions, certainly. But clearly, we have directional results, even for things like typing, there was some accuracy improvements. So it seems like there may be some carry over effects, certainly mood and anxiety are likely to improve if you are doing this on a regular basis, at least twice a week. So I would urge you not to give it up

Polly Dawkins:

Many of our community don't really understand how to develop a set list and what that looks like, a playlist, is that people can just put on an old record or a cassette tape or, and listen to music. Right?

Alexander Pantelyat:

Well, certainly, yes, it's all about what's personally preferred and selected. I was giving examples from applications that happen to be free. You know, Spotify, there are paid versions too, but you could build a Spotify playlist very easily. You could build a Pandora playlist. I use this with my kids all the time, and they're just crazy about these things that run on repeat.

Polly Dawkins:

So ask your kids to help build you a playlist if you don't know how to do it.

Alexander Pantelyat :

What a wonderful way to pick up on what I was implying. Yes.

Polly Dawkins:

Exactly. All right. Now, a personal question for you. What's your favorite music?

Alexander Pantelyat :

Me? So I was, you know, I'm biased. I have to profess my bias to classical music because that's what I was trained in. Since then, I've really branched out. I play some bluegrass, some jazz, some blues. So I love all of those different kinds of music, but I don't want to pretend to say that those types of music I just named are going to be best for everyone. That's just not true.

Polly Dawkins:



Yeah, that was just a personal get to know you question, all right, the world opens back up. You have the opportunity to go to one concert. What will it be?

Alexander Pantelyat:

Me? Oh my God. Well, I think it's pretty easy. Cause we were just thinking about this it's to see its Hak Perlman performing with the Baltimore symphony. So that's, that would be my short answer. He's an idol of mine.

Polly Dawkins:

Awesome. Awesome. Well, we really appreciate you being here today and sharing this. I want to give a closing comment from one of our our audience today who said, "This is so exciting to hear. I have early onset Parkinson's and will be retiring soon to explore what I love, music and art, movement and design. I thought it would help. And now I'm sure it will. Thank you."

Alexander Pantelyat:

Thank you for the beautiful comment. I couldn't agree more that this will be very helpful going forward. I hope to many, many people listening today.

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