Western Faculty Profile: Dr. Jessica Grahn

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Background

Jessica Grahn is an Associate Professor in the Brain and Mind Institute and the Department of Psychology at Western University. Her research focuses on how movement and rhythm may be connected in the brain with a practical focus on how music influences the dysfunctional movements of Parkinson patients. She currently supervises music neuroscience MSc and PhD students in the Behavioural and Cognitive Neuroscience program and the Neuroscience program at Western University. Emerald Liang, a member of the academic affairs committee for WURJHNS, had the pleasure of interviewing Dr Jessica Grahn to find out a bit about her unique career choice and to acquire some insightful advice for current undergraduate students.

Interviewer: Can you tell me a bit about your current research, what implication it has in the medical field as well as the impact it will have on other neurological or musical fields of development?

I'm really interested in the role of the motor system in our perception of musical rhythm. This comes a little bit from the question of why music make us move? Other sounds from our surrounding system do not cause us to start tapping our foot or nodding our heads. What makes this type of sound special? Why does this type of sound enable us to move along to it?

I've done brain imaging studies to look at the brain responses to musical rhythm and we find that even when you're staying still, the movement system is active when you're passively listening to music. This suggests that the movement system is doing something important that shapes our response to rhythm. We're using a couple of other methods to really probe this, one is to look at other species that don't seem to have this response to move to rhythm and see how their brain responds to

rhythm. This will tell us whether it is motor system activity itself or communication between the motor system and auditory system in humans that leads us to move along to music.

Some other research that we're doing is to stimulate parts of the motor system to see if we can use a causal method (transcranial direct current stimulation) to enhance or impair people's perception of rhythm based on their movement system activity. If we enhance their movement system activity, do we see improvements in their ability perceive or feel rhythm and if we impair it, do we see decrements? This is a stronger method of testing because it allows us to infer some form of causation compared to brain imaging where we just see activity in response to listening; fMRI is a more correlative method.

In terms of applied research, we see these motor area responses due to rhythm. One idea is that you can actually then turn the whole idea on its head and use rhythm to help change motor activity for people whose motor activity has problems that lead to movement disorders. We have some work with Parkinson's disease and we also have some work with stroke patients where we use musical rhythm or music with a very clear beat to try to improve their walking speed and their ability to walk more normally. And that's really interesting because we're finding that healthy people have a huge variability in their ability to move accurately to the beat, and that has lead us to develop some tests for beat perception ability. We're finding those with poor beat perception ability, those who struggle to synchronize to the beat, respond better if we just play music in the background and don't tell them to synchronize their movements to the beat, than they would when we instruct them to synchronize their steps to the beat. Whereas those with good beat perception ability do show improvements in walking when instructed to synchronize to the beat.

Something we learned from our basic research is the variability in the way healthy people perceive rhythm may have clinical implications. You might change the way you deliver this music intervention based on the patient's beat perception ability.

Interviewer: What I find really interesting is how you're able to bring this theoretical knowledge about neurological connections into the practical field. How do you come up with these experiments and apply your ideas?

In general people often think that scientists come up with ideas in a vacuum, just sitting at their desk staring out the window when brilliance suddenly comes to them.

And you write a grant on the basis of that brilliance and you're done. My experience has been that my ideas come from reading other work, talking to other people and also reading across different domains of research. So I might find a technique or an approach that's being used in a different area of psychology that can actually be helpful or informative to what I'm doing now.

So usually, the way these ideas develop is a process. You run an idea by someone and they say "Oh, but what about this?" or "Wouldn't you have this problem?". And then you go away and say "yes I would have this problem" maybe I can try it this way or maybe this manipulation will fix that problem and you present it again to other people or discuss it. So it's a really interactive process, you bounce ideas off other people and learn from their experiences. And that's often why the interdisciplinary side works so well. You have people with intuition in lots of different fields, and you can take the parts that will help you. When you're thinking about applications, I have found that when you talk to the public about your research, they often have ideas that

will be interesting and they see connections that they can bring up to you. And also when talking to other colleagues, they will often say “oh have you tried this?” or “I’ve heard about this application for something else, maybe it can also serve your purpose

Interviewer: From what you’ve mentioned so far, it seems that science is a very interconnected field with what appears to be a pre-established web of connections. For the current undergraduate student who wants to go into research, who may find it a bit daunting to start making these connections, who won’t know where to start, do you have any advice to help them get started?

In general, I find that reading is a great way to go about it. There are actually a great deal of video resources now, people post lectures online about their research and what they do. There’s a music perception and cognition site that has resources of labs from all around the world that are doing research in this area that people can visit the sites of and learn about.

Social media sites like twitter, where people are posting things they are interested in, are also a nice way in. People are often posting links to articles they’re interested in and also to blogs, which can be an easier way to understand a topic if you’re not familiar enough with the field to read a paper. Instead of getting a completely unbiased view, you actually get someone with an opinion and that can be a really nice way of learning about the topic. People who are expert are helping you think about the issues in that field. In general, I would get information, talk to people, attend talks that are in your area.

Interviewer: Now to move on towards your current research. Since you’re doing a cross-interdisciplinary research in music and neuroscience, something that not a lot of people will think about, can I just ask you what lead you to your current research?

Basically, I was interested in the brain from a pretty young age, from my teenage years. It’s pretty rare that someone has an interest that really carries through that long, but I did. I also did a lot of music, I played piano, and cello in a lot of orchestras. then it came to choosing an undergraduate degree, I found places that would allow me to do two degrees so I wouldn’t have to choose. So I didn’t intend to combine them at all, I was just unsure what I wanted to do. At the end of the four years, I realized that I enjoyed neuroscience a lot and that it was a lot easier to be an amateur musician than it was to be an amateur scientist. And then I spent my first year of graduate school still not intending to combine them. I was very interested in motor memory and how it is that we learn skills and remember those skills. But of course, that is very related to music performance, since you’re doing a lot of motor skills in music. So I found myself using my experience as a musician to inform what I thought about motor memory and what experiments I thought it would be interesting to do. Then as it happened, I ended up transferring schools. I started to work in the US, then I transferred to England and when I was there, I chose a new project. While I was there I realized in that first year that I was really thinking of my neuroscience work from a music perspective. I decided to allow those to combine. So my advisor at the time and I backgrounded a few topic areas: one was brain plasticity and musical experience, another was rhythm and beat perception. My advisor was a neurologist who worked with Parkinson’s patients and he was really interested in rhythm and beat side of it, so that’s what we decided to do.

Interviewer: It’s really interesting to see how your own interest and the people around you have such great influence on what you end up doing. Sometimes it isn’t about what you started out intending to do, but rather where the situation takes you.

Not at all. I think following your interests is also very important, so I started my undergraduate doing neurobiology and after a couple of years realized I didn’t really care about the research that was going

on at the molecular level. I thought it was interesting and important and rigorous, but really I was interested in humans and thoughts, and that was more psychology than neuroscience, so I ended up doing a combination of the two. I got it wrong the first time, I thought I would be more interested in neurobiology, but instead, I was more interested in cognitive neuroscience. It's not until you have a chance to expose yourself to these fields that you get an opportunity to realize "Oh this is what I want to be doing, not that".

Interviewer: There are so many undergraduate students who are dead focus on one career path right now, they think "I have to do everything I can to get into the one career path, all my extra-curriculars have to be focused on this one thing or else I won't be able to succeed". Do you have any advice for these students?

Some good advice I got was "If you do what you love, you'll never work a day in your life". So doing extracurriculars because they energize you and fill you with passion and time flies when you're doing them – fantastic, then you're making good use of your time. Doing it to pad out a CV or because you think it'll be perceived well? It's pointless because anything you do with passion, you will do a million times better and that passion will show through, it's magnetic compared to doing something you're doing for a CV. Often as an undergraduate, you'll try things out, and that's what an undergraduate experience is for, I would absolutely say your job as an undergraduate is to figure out what you love. What things do you do with your time that you love, that you don't even realize how much time has flown by? And how can you find degrees or jobs that really maximize that type of activity.

Interviewer: To end this interview on a lighter note, can I ask for your happiest memory while doing research?

I'm not sure I have any specific super happy memories, I mean I'm sure I do, but nothing is coming to mind. I think one of my favourite things about what I do is when you run a lab, you hire the people. It's amazing over time how much I feel like "It's so much fun watching this group of people you put together do things that you never thought possible" and how much I enjoy their company and their conversations and their insights. It's certainly been one of the fun things. Running a lab is more about the people than it even is about the science. The people and how much fun we have together are what makes it worth coming to work every day.