

Kessler Foundation Podcast Transcript: Helen Genova on Cognitive Issues in the Brain

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- ANNOUNCER: 00:04 Welcome to this Kessler Foundation podcast. The foundation is a global leader in rehabilitation research that seeks to improve cognition, mobility, and long-term outcomes, including employment for people with neurological disabilities caused by diseases and injuries of the brain and spinal cord. In this episode, we're talking with Dr. Helen Genova. She is the Assistant Director of the Center for Neuropsychology and Neuroscience Research at Kessler Foundation. She spoke with Rob Gerth, the foundation's communications director.
- ROB GERTH: 00:38 So you know where I want to start. Are you from New Jersey? That's where I want to start, and I have a reason. Go ahead.
- S3: 00:42 Yes, absolutely. I'm from Jersey, born and raised.
- GERTH: 00:45 And proud. I can tell.
- GENOVA: 00:45 And proud, very proud. I love Jersey. Never going to leave.
- GERTH: 00:48 I asked because you went to Seton Hall and you went to Rutgers. And so there was never a thought like, "I'm going to go to Wyoming and go to--"
- GENOVA: 00:54 No. No. When it came time to apply college, I only applied to Seton Hall. My parents both went there. They met there. So I said, "There's where I'm going." And so fortunately, I got in [laughter].
- GERTH: 01:04 Who can say? You're a legacy maybe, and that helps. So speaking of your family, was there anybody in your family that-- you ended up in science, and we'll talk about how you got there in a second. But how did that happen? How did you end up in science?
- GENOVA: 01:19 Actually, yeah, there's nobody else in my family who is a scientist. We have a lawyer, we have other professions, but it just was something that I became interested in. I always enjoyed it growing up. And while I was in college, I really started to feel like that was a place where I needed to be.
- GERTH: 01:38 Well, that's funny. Did you go into college as knowing where you kind of wanted to go? You had an idea, or you just-- liberal arts--?
- GENOVA: 01:46 So I went into college thinking initially that I would be a psychiatrist. I went in as pre-med. And that's mostly because I've just always been fascinated by the brain, particularly what happens when things in the brain go wrong. That was always something that fascinated me. And so I studied a lot of abnormal psychology and those kinds of classes and clinical disorders and depression and anxiety. And so I just thought I'd eventually be a physician who treated those problems. But somewhere along the line, I became more interested in doing the research, probably because I liked the idea of being able to test new hypotheses and then maybe that the results would be applied by physicians as opposed to me just treating the disorder. I thought it would be cool to actually have a hand in discovering more about it and making new interventions and so--
- GERTH: 02:43 Fixing it. You wanted to fix it. Yeah.

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- GENOVA: 02:43 --fixing-- exactly. Yeah, absolutely. Yep.
- GERTH: 02:46 Yeah. I know. I get that. So let me ask this though. And so the whole STEM world, right, so science, technology, engineering, math, is known for not really including-- women have a hard-- it seems to be a hard time for women to get involved in that for whatever reason. What's your experience with that as a woman growing up?
- GENOVA: 03:07 Yeah. I think it's very interesting. I think that in society, without even realizing it, we sort of push boys and girls into these roles. And I think that there has been a number of studies done which have shown that teachers, without even knowing it or realizing it, will tend to push their male students into the more STEM-based subjects, and they'll tend to not encourage girls to do the same. So there have been studies showing that teachers tend to call on boys more than girls in subjects like math and science. And I just read this study that showed that if a girl hands in a test and her name is removed so that you don't know what gender she is, she actually would score higher on a math test than if the teacher knew that she was a female; she would actually score her lower. So it's really interesting how I think that just we as a society tend to envision that girls should be in certain subjects and boys need to be in the math and sciences. Fortunately, my parents actually encouraged me.
- GERTH: 04:19 I was going to ask if you give your parents credit.
- GENOVA: 04:20 Yeah, yeah, yeah, absolutely. I mean, they encouraged me to go to an all-girls school. So I went to the St. Elizabeth's Academy in Convent Station, New Jersey. And that was a really wonderful experience because there was no bias towards encouraging the boys more versus the girls. It forced the girls to have a voice and to exceed in whatever subject they wanted to and not have to worry about coming behind a boy in class or not getting the opportunities that the boys were given. We just got to choose what we wanted to exceed in, so.
- GERTH: 04:55 And I wonder if anybody's done a study on that. Women that have gone to all-girls schools, are they more-- is there a higher percentage of them involved in STEM or not?
- GENOVA: 05:04 That's a really good question. I don't know. One thing I will say is that I went back to my high school last year to speak at Founders' Day. And I got to see some of my classmates and what came of them. And they were all really successful professional women, not necessarily in STEM, but just above and beyond in terms of their success and professions. So that was really exciting to see.
- GERTH: 05:31 Yeah, that's cool. If you want to work on that study, you can have that. I'll give that to you.
- GENOVA: 05:34 Okay, awesome. Thank you.
- GERTH: 05:35 That's yours to do [laughter]. So Seton Hall, tell me about that. So your parents obviously influenced you a little bit. So why psychology, again? Why was that?
- GENOVA: 05:48 Again, I was just interested in the brain, and growing up, just becoming fascinated by why people act the way that they act. And is there something that happens in the brain that makes one person act one way and another person act a completely

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different way, even though, for example, they were raised in the same household? And so I was just really fascinated by why and how the brain influences behavior. And that was really why I studied psychology at Seton Hall. But I always felt like there was a little something missing. I wanted the science aspect of it. And so at the same time, I was taking a lot of science classes. And in my senior year, I decided to combine science and psychology and really focus on neuroscience. So that was when I started to look into applying to graduate schools and looking into becoming a scientist in that field.

- GERTH: 06:43 It's interesting because it's not the first time I've heard this story from someone in your position, where they started out studying psychology and then got so involved, they wanted to go to the neuroscience. I wonder what it is about you scientists, you researchers.
- GENOVA: 06:56 Yeah. I don't know why. I think maybe there's the wanting to look at the mechanisms in the brain as opposed to psychology, you're studying behavior. You're studying the phenomenon. But to study neuroscience, you're looking at what specifically is happening in the brain that causes the things that we see in psychology.
- GERTH: 07:17 So then at Rutgers, what was your focus? Did you have a focus there?
- GENOVA: 07:21 Yes. So I started-- I went into the neuroscience program at Rutgers, and I focused on cognitive neuroscience. So I was looking at neuroimaging of clinical populations, such as multiple sclerosis and traumatic brain injury. And all my work was done under the mentorship of John DeLuca.
- GERTH: 07:39 Oh. Was that before he was Senior VP of Research and Training here?
- GENOVA: 07:43 Yes, yes, absolutely. So in graduate school, John was actually my advisor. So he was the director of the neuropsychology and neuroscience lab. And I--
- GERTH: 07:54 At Rutgers?
- GENOVA: 07:55 At Kessler.
- GERTH: 07:56 Oh, at Kessler, okay.
- GENOVA: 07:57 Yep. And then I was given the choice of which professors I wanted to work with most closely, and I approached John and just said I was really interested in his research and could I work with him? So he took me on and he became my advisor throughout grad school. So that was really cool.
- GERTH: 08:14 And I guess he was your chief mentor then?
- GENOVA: 08:16 Yes, absolutely. Yeah.
- GERTH: 08:18 Was there anybody else that influenced you at that point?
- GENOVA: 08:20 Yeah. I think there was one other person that I would say had a real influence on my wanting to become a scientist. And that was back when I was at Seton Hall. There was a professor there named Dr. Matthew Petersheim. And he was my chemistry professor. And it's interesting because when you're a biology major or a chem major,

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the most intimidating class is organic chemistry. And everybody is terrified of this class. Nobody wants to take it.

- GERTH: 08:49 Even communication majors are terrified of that class even though they're never going to take it. They're like, "Ah, I don't want to get anywhere near that book." You just look at the book and go--
- GENOVA: 08:56 You look at book and you get scared.
- GERTH: 08:58 That's crazy.
- GENOVA: 08:58 Exactly. So he was my professor in that class as well as other classes. But he just approached science with such a passion and a joy and an enthusiasm. And he was so supportive. And he actually-- at Seton Hall, he started a scientific conference that had never existed before he got there. So he told the directors of Seton Hall, "I think it's important that science be put at the forefront of what we're doing here." So he formed this scientific conference that was going to be held annually. And I actually presented at it when I was at Seton Hall. And I just recently went back as a mentor. And I had a student who was presenting her research at the exhibition. It's called the Petersheim Exhibition because sadly, he passed away while I was at Seton Hall. Yeah, so it was a real loss for the community, but.
- GERTH: 09:49 So you've taken up the mentorship reins, and I guess you're doing that now you're--
- GENOVA: 09:57 That has been one of the most rewarding parts of being a scientist, I think, is mentoring the next generation of scientists coming up. That has been so exciting. To take the skills that I've learned as a student and help other people achieve those skills has been really rewarding.
- GERTH: 10:12 And, I guess, other than the emotional satisfaction of helping somebody, I guess you get something out of it because the young folks, they bring something to the table too. Right?
- GENOVA: 10:21 Absolutely. Well, they have a lot of energy, they have a lot of new ideas and a lot of skills that they're learning, and they're innovative, and they're creative. And so I love that aspect of my job, is working with the younger generation and seeing what they can bring to the table.
- GERTH: 10:38 And here we do a lot of that. I mean, there are a lot of RAs that are involved in our research. There's a huge percentage of our employees are--
- GENOVA: 10:45 Absolutely. Our research assistants, we have interns, and then also our postdoctoral fellows have been-- all of them are amazing.
- GERTH: 10:53 So how did you-- since we're talking about Kessler Foundation. How did you end up with Kessler Foundation? I'm sure it has something to do with John DeLuca.
- GENOVA: 10:58 Yeah. So after I graduated, I was really sad to think that I could just stop that line of research that he and I were doing together. I really wanted to continue to study individuals with multiple sclerosis and also to continue to learn from John because he was a huge influence. He was always pushing me to be better, to step outside my comfort zone, to be braver as a scientist. So I really wanted to continue to work with

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him. So after graduating, I just asked him if there was something that I could do at Kessler, and he and Nancy Chiaravalloti offered me a position. So I started working as a research associate, and the rest is history.

GERTH: 11:45 As they say. So you do a lot of work studying cognitive issues in patients and subjects, especially around the topic of MS, multiple sclerosis. First, define what that means, cognitive issues. What are you looking at?

GENOVA: 12:02 Sure. So cognition is literally any process that's going on in your brain that helps you think, make decisions, do things. So for example, if you are reading the newspaper, that's a cognitive process. If you're deciding whether you're going to have turkey or chicken for dinner, that's a cognitive process. So literally anything you do during the day that involves thinking is a cognitive issue. And people with MS tend to have certain cognitive problems. So slowed thinking, they'll tell you, "I just don't think as quickly as I used to. Things seem to be sort of slow for me." Executive functioning problems, so having trouble with deciding between one thing to do versus another, trying to inhibit something that they should be inhibiting, and attention, memory. So all of these problems seem to be impacted by multiple sclerosis.

GERTH: 12:56 And we don't know why.

GENOVA: 12:58 Well, we do know that it's due to neuropathology. I think that there's a lot of issues concerning the white matter tracts in the brain just being attacked by the immune system. And so that is definitely a contributor, but I don't think we have a full understanding of why they experience the deficits that they have.

GERTH: 13:18 And then what is-- tell me if I'm asking or repeating the question. But social cognition, is that a different piece of this?

GENOVA: 13:27 Yes, yes.

GERTH: 13:28 Go ahead. Tell me about that.

GENOVA: 13:29 Yes. Absolutely. So social cognition are the mental processes having to do with navigating your social world. So right now you and I are talking, and if I were to smile at you, you would smile back. If I were to shake my head no at you or look upset, then you would respond appropriately. So it's literally any type of process in the brain having to do with your interactions with someone else. It can be understanding the emotions on somebody's face. So if you walk into a restaurant and you see your friend is waiting for you at dinner and they're looking angrily at their watch and looking back at you, you might say, "Oh, I'm sorry I'm late." And it's also understanding the beliefs and the thoughts of other people. So for example, if somebody-- let's say you stepped on someone's foot, and they said, "Oh, gee, thanks." You know because you understand what they're feeling that they're not truly thanking you. That's their way of being sarcastic. But that is actually a skill that can be impaired in people with MS in terms of understanding other people's emotions or what other people are truly feeling. That is something that can be impaired in MS and other clinical disorders. So that's the area that I really focus on now, is social cognition.

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- GERTH: 14:42 And is that called social blindness or emotional blindness or--?
- GENOVA: 14:45 Emotional blindness is a term that people have started using describing this research. I don't actually love the term because I think that people with MS-- it's not that they can't identify the emotions of others. It's not that they can't understand the beliefs and the feelings of others. I think that it may take them longer. And I think they may find it more difficult. But I don't think that they are "blind." So I think it's something where we have to study it in a bit more of a nuanced way. It's not a yes or no. It's not like they don't know when people are sad. Of course they do. But it may take them longer to understand if someone is sad.
- GERTH: 15:28 Yeah. And words are important to me. I mean, if you put a term on something, sometimes that slants not just how people react to you, but even slants the researcher. Yeah, yeah.
- GENOVA: 15:40 Absolutely. And I think too, it's important to be accurate because I think when people hear the term emotional blindness, they get a sense of what that looks like. And they may envision somebody who just totally is unaware of other people's feelings. And that's just not the case in MS. I think it's way-- it's not a black or white. It's way more of a gray area that we're studying.
- GERTH: 16:03 So with this giant gray area in front of us, how do you study? How do you even think of a way to determine-- because I guess you're trying to get at the root cause. So how do you-- what paths do you go down? And you can talk about some of the recent work that you've been doing.
- GENOVA: 16:19 Absolutely. So we have a variety of tests that we use. So we've been using-- there are some paper-and-pencil or some computerized measures where you have a participant come in. They sit down in front of a computer. They look at a picture of a face that's showing an emotion, and you ask them, "Which of these emotions is that person displaying?" So that's a really easy way of going about it. I don't know how applicable that is to real-life skills, so there are other tests that you can use. We have tests that have them looking at videos of actors talking, and then they have to identify what the feelings are of those actors. That's a little bit more real life. So those are the measures that we use generally, is either pictures or videos of actors showing an emotion and then asking people with MS or TBI to tell us what they feel those people are feeling.
- GERTH: 17:17 And I've done some interviews about spatial neglect. And the question I asked is, "Do people with spatial neglect know they have spatial neglect?" And the answer is, "Not necessarily." So I'll ask you the same question. Do people with these cognitive issues-- do they know they have them? Or can you tell them they have them, and they'll be like, "Oh, I get it"?
- GENOVA: 17:41 That's a very good question. And I don't think the answer is all that clear. I don't think that anybody walks around with the awareness that they're not understanding other people's emotions. I just don't think that that's the thing. I think that they may be experiencing interpersonal issues. So for example, somebody with MS may feel like they're not connecting with their friends anymore. Maybe they're having difficulty with their significant other. But I don't think that they quite understand why that

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would be. And maybe it's possible that social cognition problems are at the root of those issues that they're experiencing. We don't have research yet to show that. But those are the sorts of things that we are studying is, what are the downstream effects of social cognition problems and MS? Are they causing problems with significant others? Are they causing problems with friendships and social networks? Those are all things that we're looking at.

GERTH: 18:40 So you could potentially be in a position of, "Oh, I just got diagnosed with MS. And my whole life seems to be falling apart." But it might not just be because you were diagnosed with MS. It could be because of some of the things the MS is doing to you and you're not even realizing. You're just thinking, "My life has really gotten crappy."

GENOVA: 18:58 Yeah, absolutely. Yeah. There's a lot of-- unfortunately, the cognitive issues in MS can have an extreme impact on the lives of the people who have this disorder. And we just actually published a paper that shows that people with social cognition problems also report greater levels of depression, greater levels of anxiety, and greater levels of fatigue related to being with other people. So not just physical fatigue, but fatigue that you would experience being around others. And so there seems to be a link between people who may have trouble, for example, identifying emotions from faces and depression. We don't know. It's sort of like a chicken or the egg kind of a scenario. We don't know if the social cognition is causing problems with depression, or if the more depressed you get, the more you have problems with social cognition. We simply don't know yet what the direction of the relationship is. But we do know that there seems to be these two. These problems are associated with each other. They're linked in some way.

GERTH: 20:03 And my Bachelor of Arts degrees tells me that maybe the fatigue is also coming from having-- their brain having to work over time to try to figure out what's happening in front of them.

GENOVA: 20:13 Absolutely. I mean, if you went to a party and you simply had trouble connecting with everyone there, if you really felt like you weren't quite getting it-- you weren't understanding, for example, if somebody told a joke and you just didn't know why it was funny, but everybody else is laughing. So what do you do? You have to pretend to laugh or maybe you don't. After a while, that would get tiring. You may start to say to yourself, "I don't really want to go to parties anymore. I don't seem to fit in." So it's possible that these problems are going to lead to even greater issues in terms of interpersonal relationships and in being integrated with other people.

GERTH: 20:50 And in even keeping your job, I assume.

GENOVA: 20:51 Absolutely. Yeah. I mean, I don't think that there have been any studies looking at social cognition deficits and employment issues, but I'm sure that that plays a role.

GERTH: 21:00 And then what about how far-- a lot of the people I've talked to since I started doing these podcasts were like, "We're over here." And it's like, "But this also applies over here too." So talk to me about some other places where your research might apply, whether it's traumatic brain injury or spinal cord injury or--

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- GENOVA: 21:16 Sure. Yeah. So we actually-- the social cognition problems, we look at them in traumatic brain injury as well. A lot of people with traumatic brain injury experience these issues. If you talk to a caregiver or a significant other of a person with traumatic brain injury and you ask them, "What kinds of problems are you and the person you care for-- what are you guys facing?" a lot of them will start to talk about things, and although they don't label them social cognition problems, the words that they're using indicate that that is the case. So for example, they'll say, "I don't know, my husband has no empathy anymore. I'll come in, I'll tell him I'm having a horrible day, and he just doesn't seem to care. He just stares at me." Or you'll have a husband say, "My wife, I'm literally crying in front of her, and she's just staring right through me. It's like she doesn't even get it." So they don't know why these things are happening, but it's possible that the person who has a traumatic brain injury simply is just not understanding the social cues that the other person is giving off.
- GERTH: 22:20 And since we moved into other subjects, tell me about-- I know you do some work around autism. Tell me a little bit about that. And what got you interested in that?
- GENOVA: 22:31 Sure. Well, Kessler Foundation recently partnered with Children's Specialized Hospital. And that gave us the opportunity to take what we're learning in adults and then go study them in pediatric samples. So autism is a population that I was really interested in particularly because one of the defining characteristics of this disorder are social cognition issues. They do have a lot of problems in the social domain, whether it's understanding other people, whether it's acting appropriately in social situations, picking up on social cues that other people are giving off. It is just something that people with autism tend to have difficulty with. So it was a pretty easy movement from my work in MS and TBI into the autism world. It was a pretty easy transition. So that's how I got interested in that population.
- GERTH: 23:28 So tell me about some of the work that you're doing there.
- GENOVA: 23:29 Sure. So we recently got a grant funded by the Governor's Council of New Jersey. And it is to apply a virtual reality intervention to improve job interview skills in adolescents with autism. So the really exciting thing about that is kids with autism can have so much to offer society. I mean, they're smart kids. They can have talents, skills, etc., all these things that they can offer a place of employment. The problem is because of their social difficulties, they may never get in the door. And a lot of that happens at the first step, which is the job interview. So when you go into a job interview, you have to know how to sell yourself. You have to be polite. You have to be socially appropriate. You can't come in and-- if you say to somebody, "So tell me about yourself," you can't give an answer like, "Well, I had an argument with my mom this morning because I didn't let the dog out." You're not going to get very far on a job interview. So you have to know what topics are socially appropriate during a job interview, what topics to definitely stay away from. And it seems that kids with autism find the job interview particularly difficult. This is an area where a lot of people with autism have identified as a problem area for them, something that they would like to improve in.

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- GENOVA: 24:56 So what I did was I partnered with some scientists at the University of Michigan who had developed a virtual reality intervention called the Virtual Reality Job Interview Tool. And that project was actually funded initially by Kessler Foundation. And we paired together. This tool has been used in adults with autism and adults with psychiatric disorders, such as schizophrenia. And it's shown to be really effective in improving job interview skills. So what we decided to do was take it, use it in a school system. So we actually went into a school system, we gave it to a group of teenagers, and we looked at whether or not it was effective and improving job interview skills. And our initial findings show that it is very effective. So that is really exciting. I'm really excited about getting that work published. And then we have a follow-up study, like I said, that was funded by the Governor's Council to get a larger group of kids. We're going to look across different school systems, so not just looking in one school but looking across multiple schools in New Jersey. So I'm really excited to continue with that research.
- GERTH: 26:09 So the kids-- you would put them through the training, and at the other end of the training, you would evaluate them-- before and after you do.
- GENOVA: 26:21 Yeah. So what we do is we actually do a mock job interview, where we have one of our staff members sit down with them, ask them questions as if they're really on a job interview, and we record that. And then we do that after the intervention to see if people have improved pre to post.
- GERTH: 26:39 So normally, I would assume this kind of training would happen with role play. So explain to me what the virtual reality piece of it is. What does that look like? Do you actually put goggles on? Do they--?
- GENOVA: 26:50 So we don't put goggles on. But you're right. Role-playing has always been sort of the gold standard to help people prepare for job interviews. I know that I've even done that where I've sat down with someone that I trust and tell them to ask me questions so I could practice answering them. It is certainly effective, but it is expensive if you're doing it with, for example, a therapist. Because some therapists would be willing to do that with you. It can take up a lot of time. And also, there's a certain amount of bias that occurs in that-- let's say you were role-playing with your mom, right? She's not going to be hard on you, right? You're--
- GERTH: 27:27 Yeah. You don't know my mom [laughter].
- GENOVA: 27:29 But if you're interviewing with your mom, you're probably going to get the job. So what virtual reality does is it allows these students to practice job interviews with a virtual human who doesn't take it easy on them. They actually have different personality types where they can come into an interview and be sort of grumpy and ask really hard questions. They may look disappointed in your answers. You may get a virtual human on one day that seems very sweet and is very nice. So the wonderful thing about this intervention is you're really getting a variety of experiences. And you don't have to hire a therapist. You don't have to bother your mom. You don't even have to ask a teacher. It's all just being done between the student and the virtual human, which is part of the virtual reality program. There are no goggles, which actually is a bonus because, as you know, kids with autism can have sensory issues. So

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the goggles may bother them, may make them nauseous. So this is actually they're just looking at a screen, and it almost looks like a Skype interview, where you were interviewing somebody who was in another location. But the kids really feel like they're interviewing with a person. They do sort of become immersed in the experience. So it's really, really neat.

GERTH: 28:51

And does the interviewer wait for answers? How does that part work?

GENOVA: 28:55

Yeah. So with this particular program, they ask questions, and then the students are given a variety of answers to choose from, ranging from completely socially inappropriate to really appropriate. So for example, the interviewer might say to you, "I noticed you were late today. What happened?" And the possible answers range from, "I couldn't get out of bed," right, which is not the right answer, to, "I'm sorry. I didn't realize that the address was in this town. So I got a little confused, but after, I realized I was on my way, and I could find it." So it's okay in an interview to admit to wrongdoing, but there's a way that you do it in a way that sells yourself and makes you look as if you are responsible, you're going to be great to work with, you're honest. So yeah. So they give them a range of responses, and the kids learn very quickly what are the good responses to give and what responses don't get such a good outcome.

GERTH: 29:55

Because I would assume the interviewer has a response based on what the person that's training responds.

GENOVA: 30:01

Absolutely, they do get feedback. And they have a little actually-- they have the interviewer who will get grumpy if the answers are not appropriate. But then they also have a little job coach, which gives them a thumbs-up or a thumbs-down. And we'll give them feedback like, "Yay, that was a great answer because you sounded honest and productive." Or, "That's not such a great answer, because you sounded like you were not dependable." So they're learning quite a bit, a lot of different skill sets, how to sound honest, a team player, productive, etc.

GERTH: 30:33

And right now you're gathering data to see if it's effective. And then I assume you would roll it out at some point? You said you're going to expand it to other schools for part of your testing. What would be the ultimate-- what's the end use?

GENOVA: 30:46

Yes. So the ultimate goal, I think, is to get the results out there so that school systems, for example, know that they can begin to put it into their curriculum. A lot of schools, especially for children with special needs, may have transitional programs where they're training kids how to go out into the job market. So this could be definitely one aspect of their education, could be training with this program. So that's definitely one end goal. You can also access this program privately. It's a kind of thing where you could log into the internet and to buy a license and to practice at your own comfort level. So I think the point of the research is just to show it's not something we think will be helpful. The research is showing, yes, it is helpful, so.

GERTH: 31:36

And where do you think the whole virtual reality thing is going to take you? You're kind of in the forefront with this.

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- GENOVA: 31:42 Yeah, yeah. I really love the virtual reality stuff. I think what's really wonderful about virtual reality is, as a scientist, we use a lot of tests, and the tests are-- sometimes they're papers-and-pencil tests; sometimes they're computer tests. Most of the time, they're laboratory tests, meaning we have no idea how they translate into real life. So for example, if you tell me you're having problem with your memory, and I say to you, "Okay, I'm going to give you a laboratory test. Remember these 10 words, dog, horse, orange, apple," and then I ask you to recall it, and you have a problem. So that's interesting to know. But we don't actually know if that means you're going to have problems later when your child says to you, "Mom, I have these three things to do for homework, and I have to pick up tissues for my teacher and I--" so you get a list of things that you have to accomplish in the evening. Do you have problems there too? We're not sure how those two things translate. So virtual reality actually puts you in a real-world like environment. But it's helpful from a scientific point of view because it's very highly controlled. We can control what aspects of it that we want to control. So it's not totally real life, but it mimics real life so that the person feels as if they're doing something that's more like what they would do in a day-to-day situation.
- GERTH: 33:11 Yeah. Because I would assume that trying to do your-- get through your daily life in a laboratory and not having any of the stresses of the dog barking or, yeah, it's a little bit different than out in the world.
- GENOVA: 33:23 Absolutely, yes. So virtual reality is really wonderful in that you can control the environment, but then also make it look like real life to the participant.
- GERTH: 33:32 So what do you think, technology-wise-- virtual reality we talked about. But what other technologies are you seeing in the future?
- GENOVA: 33:40 So at my training, I was trained to be a cognitive neuroscientist. So one of the things that I did was learn how to use neuroimaging, so functional magnetic resonance imaging, diffusion tensor imaging, all of these tools which help you look at different things in the brain. So for example, fMRI enables you to see what parts of the brain are active when someone's doing a certain task or when someone is thinking about a certain thing. Diffusion tensor imaging is the same sort of thing. It's done in the MRI magnet, but it looks at what types of brain damage we're seeing to the white matter tracts of the brain. So I would love to combine neuroimaging with some of the interventions that we're doing to see what happens in the brain after you give someone an intervention. So for example, as a student becomes more confident in job interviewing, do you see not only a change in their behavior but also in the brain? Have we been able to somehow change the brain and have more long-lasting effects? Something that will last them for, hopefully, the rest of their life. So I think those are the sorts of questions we can answer with neuroimaging. So I'm really excited about that part too.
- GERTH: 35:02 And is the neuroimaging at a spot where it can keep up with that?
- GENOVA: 35:07 Oh, absolutely. I think that there's a lot of really cool stuff that's up and coming with neuroimaging. For example, there's machine learning, you may have heard about, with neuroimaging, where you can actually use these brain activity measures such as fMRI or MRI, and you can predict who will benefit from an intervention. Because not

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every intervention is going to help every single person. But you could look at someone's brain activity at baseline, and then using machine learning, you'd be able to identify, will this person benefit from an intervention? Yes or no. And that's happening now. I think that's something that we could definitely start doing. So that's a really innovative application of imaging.

GERTH: 35:52 And I guess with-- I know here at Kessler, we're in the midst of real-time MRI, which I guess also is going to help identify things in a faster, better-- and there's my scientific words again. Faster, better way. You say it better than me. Go ahead.

GENOVA: 36:11 Sure. Well, real-time fMRI is going to allow us to look at the brain. Typically, historically, when we used fMRI in the past, you put the person in the scanner, and then they leave the scanner, and then you analyze the data. You look at the data. So you're sort of looking at something that occurred in the past. With real-time fMRI, you're looking at the data as it's occurring. And then the cool thing is with something like neurofeedback, you are giving the participant a job that they then start to learn how to control their own brain activity. It's not something that I do, but it is something that I've been reading a lot about. I think it's really exciting in that people can actually-- for example, calming yourself down. If you were having a really anxious moment, you could use neurofeedback to learn how to calm your brain down. And you would be looking at your own brain activity and actually saying, "Okay, what do I need to do to make this brain activity go lower?" for example.

GERTH: 37:13 Yeah, good. That's great. What about-- we've been throwing research subjects around like they're fish at a fish store. But I assume that the tough part of your job is getting people to volunteer to get involved in the research.

GENOVA: 37:31 Yes, absolutely. Yeah. It can be very hard because we are asking a lot of them, I think. One thing I want to say is that we are so appreciative of anybody who volunteers to be in our research because we're doing this for them. We're doing this with them as our partners. So I truly appreciate anybody who gives up their time to participate in our research. But yes, it can be difficult. Sometimes you're asking them for a considerable amount of time. You're asking them to travel. So all of those things are difficult. But I would say that it's worth it because they are helping us understand the problems that they are experiencing better. And one really, really cool place that I think research is going more and more-- we as scientists are asking the people with these problems and with these disorders, what research do they feel is meaningful? It used to be, historically, research was just done to somebody with TBI, and they just had to take our word for it, "This is going to help you." But I think what we're doing now is we're actually asking people with TBI, "Is this what you want? Is this something that you feel is important?" And that is really exciting. And I've seen that grow more and more in recent years, that we're partnering with the people we're studying. We really want to know their feedback and what they think is important.

GERTH: 39:01 That's cool. And of course, if you go to kesslerfoundation.org in the upper right, there's a big button that talks about-- that will help you find what studies we have available right now and even for healthy people. We need that as well, control studies. What are you excited about right now? In what you're doing or what you're

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reading in the other research, what makes you go? "Oh, yeah, that's cool. I want to keep doing this"?

GENOVA: 39:26

I think my work with all of the populations that I study with MS and TBI and autism-- I think anything that involves treating a deficit and seeing if people improve, that's what really makes me excited because it's not just studying a problem. It's trying to fix a problem. Kind of going back to--

GERTH: 39:49

Your [crosstalk].

GENOVA: 39:49

Exactly. Going back to why I originally got into this. I didn't just want to study the problem. I wanted to see how we could make it better. And so for example, in autism, the thought that you have a really talented high school kid, right-- so just imagine a kid in high school who is exceptionally smart, maybe has an awesome sense of humor, and would be amazing at a particular job. But he just can't seem to ace that job interview. The thought that after this intervention, he can and he can actually go in there, sell himself, and have the people say, "Yeah, we want to hire this guy," that, to me, makes me so happy. The thought that we could be changing the future for these kids and allowing them to be productive citizens, allowing society to value them more and to see what's great about them, that's the part that really excites me.

GERTH: 40:46

And what keeps you here at Kessler Foundation?

GENOVA: 40:48

I think with Kessler, it's kind of two-fold. Number one, I love the people I work with. So you come to work every day even if some days are more exciting than others or some days might just be boring. You're working on a manuscript, etc. But if you're doing it with people you love, I think that really-- that makes it a joy. The other thing is, I would say that what makes Kessler unique is that they are so supportive of innovation and creativity. I've never brought an idea to Nancy Chiaravalloti, who is the director of my lab, or to John DeLuca, who's the vice president of research or even to Rodger, who is the CEO-- I've never brought an idea to them and said, "Hey, I kind of want to try this out. What do you think?" and had them say, "No, I don't think so." Most of the time, they're like, "Yeah, that sounds great. Give it a try." And when you're allowed that freedom to be creative, I think that's when the really awesome ideas start to flow. As opposed to just being told what you should study, they allow you to kind of make that determination for yourself. So that's really what keeps me here and keeps me devoted. And just that we truly are improving the lives of people that we're studying. I've seen so many wonderful things and advancements at Kessler, where I'm like, "Wow, this is really going to help somebody." And so being able to contribute to a company where you know they're making a difference, I think that's huge. And feel very fortunate to be here.

GERTH: 42:23

Well, we're very fortunate to have you, Helen. Thank you so much.

GENOVA: 42:25

Thank you.

ANNOUNCER: 42:27

This is Joan Banks-Smith, the show's engineer. Stay tuned for a bonus question I got to ask Helen. For more information about Kessler Foundation, go to kesslerfoundation.org. Follow us on Facebook, Twitter, and Instagram. Listen to us on Apple podcasts, Spotify, SoundCloud, or wherever you get your podcasts. Here's my

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bonus cut. Can I ask you a question? Just going back to people with MS who have social cue issues. Did you say that you think it could be from the white matter?

GENOVA: 43:05

I don't know that I drew that link in the interview, but that's certainly a possibility, as white matter pathology is linked to cognitive issues generally. So it is possible that that's just another area of cognition that's affected by white matter damage.

ANNOUNCER: 43:25

Yeah. Would that be this holds true for those who have Asperger's or autism or [anything?]?

GENOVA: 43:30

I don't think so, because MS and TBI, the way I think of it is, it's something you had but you've lost. With autism, it was never there to begin with. You know what I mean?

ANNOUNCER: 43:44

Yes.

GENOVA: 43:44

And that's why I think they don't even look the same. You know what I mean?

ANNOUNCER: 43:47

Exactly. You're right.

GENOVA: 43:48

It's almost like autism was never aware of it. And you have to make the decision. And it's funny, it used to be, "Well, you have to make them aware of it." And I feel like society is changing. And like, "Is it so important that they become aware of it?" Maybe you just let them be who they are and work with what you have. That's a very new idea is, don't try to fix them, because they're not broken. But whereas MS and TBI, I think you do want to fix it because they have this whole history of having had it, and especially with somebody with a brain injury who comes home from the hospital, and they're just a different person. And their wife is like, "This is not the guy I married." If we can get back some of those skills, I think that's worth it.