Updates in Rehabilitation in Rare Neuroimmune Disorders

You can listen to the audio of this talk at: https://youtu.be/YupEoyDxgfM

Dr. Cristina Sadowsky: [00:00:00] Hello to all my friends. Thank you, Ben, for such a riveting talk and for such a clear message, and I hope that, that message is being carried and amplified by all of us that are attending this meeting today, and our friends, and we tell it, to our friends and family. And we can stamp out what, this vile disease that is really affecting how we live, love, and work.

[00:00:32] I will be talking about advances in rehabilitation. I have no conflicts of interest. The objective of this talk will be to address neuroplasticity, activity-based restorative therapy principles, and become familiar with some technology, because technology is really advancing very quickly.

[00:01:03] So, some key concepts that I want to put out forth in the beginning, that care and cure are going together. There is a big difference in between hope and hype, and the most, many of the people that are on this conference will have to manage a chronic condition that lasts life life long. So with those key concepts let's move forward.

[00:01:38] I will be making the case for activity and exercise as a tool of enhancing or changing neuroplasticity. Previous speakers, Janet Dean, made the case for activity being good for bowel and bladder. Dr. Abbatemarco spoke about activity and exercise being good for pain management, Dr. Poon about activity and exercise being essential for spasticity management, and Dr. Galli spoke about the influence of activity and exercise to recovering function.

[00:02:17] I will be telling you a little bit about activity, as a tool to make the nervous system learn, or re-learn functions that were lost or never developed. And I will be talking about activity-based restorative therapies. Then I will touch a little bit on the central nervous system stimulation, both spinal stimulation and neural stimulation. And then we'll just give you some data about acute intermittent hypoxia.

[00:02:51] Why activity? Because I personally believe that it is the fountain of youth. Whoever hears me speak, I'm always going to say the same thing. We have reached, we know what the fountain of youth and health is. It's just that it's not so easy to apply it all the time. But truthfully, in between good diet and good activity, good activity, because there is bad activity too. But in between those two, we can not only restore function, but we also increase our longevity, and we live a better quality of life.

[00:03:31] And people with disabilities do have less opportunities to be active. So let's move to activity-based restorative therapies. I'm just going to run through this. What is it? It is repeated near normal activity above and below injury level. Characterized by 100s and 1000s of repetitions, with the goal to restore CNS function.

[00:04:03] There is a difference in between activity-based and traditional therapy, and activity-based aims to restore function versus traditional therapy, which aims to compensate for the lost function.

Key components of ABRT are electrical stimulation with the functional component, locomotor gate training, weight bearing, mass practice, and task-specific practice, with several added components, like, aqua therapy and vibration, et cetera.

[00:04:39] If you can make the video move, this is the FES for the lower limbs. It helps individuals that have, well, it helps individuals that do not have movement, move, despite the fact that they're paralyzed. So there is a component for the lower limbs. There is one for the upper limbs, and the next slide is the one that I want to show you something really cool. If you look at this patient's triceps and fingers, you're going to see that they're moving. She is not having her arms stimulated. It is her legs that are being stimulated. Despite the fact that the legs are stimulated, there is activity that triggers movement in her paralyzed arms. This is my argument to you that FES doesn't only, teaches you how to ride a bike, or do upper extremity abdometry. It actually elevates the activity level in the central nervous system, thus hopefully helping to restore function.

[00:06:05] Locomotor gate training, it follows on four very specific principles. Not all walking is created equal. So doing a specific movement, I told you that there is bad activity. There is a way, how to re-trigger functions or motor patterns that were created and were lost with the injury, but they need to be done in a very focused and supervised manner. And this is the weight loading, which is the next component.

[00:06:48] Weight loading is important not only for triggering those sensory triggers that give information to transmit information to the nervous system. That you are only at the heal of your foot, or you are throughout the gate pattern, you are on the tip of your foot. So those, all those sensory informations are triggering the nervous system to remember how to walk. But it's also helping to maintain, or improve bone mass in the lower limbs, which it's kind of important so you don't fall and break, or you don't break just by doing the simple stretch.

[00:07:33] Mass practice. I alluded to the fact that in order to do something right, you have to practice over and over. 100s and, and 1000s of times, in order to play the piano, you have to practice the piano. And the difference in between the ABRT and the traditional rehab is right there, in the study by Lang. In traditional rehab, you only get half an hour worth, and the number of repetitions are truly low. Transfers, 11 in half an hour of activity. Gate steps, 300. Who learns how to walk taking 300 steps? A child, that learns how to walk at one year of age, which is when it's neuro-developmentally appropriate, practices a football length, a football stadium length each day to get that task.

[00:08:41] So, as I said, the activity is not enough. You need to do it in a massed practice way. And this is the principle of task specificity. If you want to play the piano, you practice the piano. You do not practice the violin. That is the principle of task specificity.

[00:09:05] Okay. We're moving quickly to CNS stimulation. As I said, I'm only alluding to this. This, in between spinal stimulation and acute intermittent hypoxia, these are two newer components, or interventions, that are helping enhance neuroplastic changes. Spinal stimulation can be done transcutaneous or can be done by spinal epidural implant. The epidural implant requires surgery,

and it is only done in a research environment. Spinal transcutaneous stimulation can be done as part of therapy, you just have to have the right therapy center that knows how to do it.

[00:09:46] And then there is the dual spinal and cortical stimulation, in which not only the spinal cord is stimulated, either at the lumbar level or the cervical level. But you have transcutaneous the transcranial magnetic stimulation, or direct continuous magnetic stimulation that is applied in the mora cortex, and it is combined temporally with the peripheral spinal stimulation. So that is also only done in the research environment. But there are, this is clinical research, and there are centers that are enrolling right now.

[00:10:25] Okay, acute intermittent hypoxia basically is depriving you of oxygen for short periods of time, because we've learned that individuals that are under this hypoxic conditions, they actually secrete a bunch of neurotransmitters that help with restoring or recreating neurologic patterns. So basically, we have masks, which by now, everybody's familiar with mask. It's just that this one is, you can't take it out.

[00:11:02] The mask is helping induce a hypoxic state. It is done in short periods of time and under medical supervision. It improves walking for individuals that have an incomplete motor injury. As you see over there, in the next couple of two slides, if you can just glide through them. All of those 11 patients except one improved in their function. Some of them, about three, improved over this max, minimally clinically effective distinction data.

[00:11:55] So, it is five or six sessions of this hypoxia, which is basically a week, or maybe two weeks, if you do it two or three times a week. Makes you walk longer and walk faster.

[00:12:12] A little technology, this is just a cool factor. I don't know if you can see if it works. Does it work? Yes. So if you see, that gentleman, he is moving with his mind, he is moving those robotic arms and playing games. It's with his mind.

[00:12:36] Now, it's true the technology is not good enough to collect that mind waves without having a plug in. But it's coming, it's coming along. There will be that stage. For now you still need to, to be plugged in. The next couple of three slides, I'm going to show you robotics that are helping deliver mass practice at different levels of the body. So this one, this specific myomo is practicing mass activity in the elbow flexion-extension.

[00:13:16] This is practicing massed activity at the hand level. And next one. Is practicing shoulder level hand activity. These are all robotics that are right now available for therapy in numerous centers. Our center has them all in sum.

[00:13:49] This is the robotic for the lower limbs. We have the exoskeleton, but there are four robotics right now. Two of them are actually FDA approved for being used in the community. The only problem with that is that they cost a lot of money. But some insurance companies are paying for robotics in the community.

[00:14:17] Now, I don't know if, and I don't think that they will replace the wheelchair, because the wheelchair is a lot more effective. But when it comes to inducing neuroplasticity, these are doing a very good job. Let's move, because I think this is the end. Yes, yes, yes, and we'll move. I am now

happy to introduce Dr. Michael Levy. He is formerly from Hopkins, and now he's an Associate Professor at Harvard. And Michael, I am so glad to get to pass the baton - the virtual meeting baton - to you.