Stroke SIG & JNPT Collaboration: Discussing Manual Dexterity and its Association with Paretic Upper Extremity Use in Individuals with Stroke Living in the Community Episode 15

*Edited by Julie Schwertfeger, PT, DPT, PhD, MBA December 2021*

*Key:* ***Bold font****=interviewer; Underlined text=definitions*

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**Hi, this is Pierce Boyne, the digital media observed from the Journal of Neurologic Physical Therapy. This podcast episode is part of a new series. Where Academy of Neurologic Physical Therapy Special Interest Groups (SIGs) talk with JNPT authors about their research, unique and unexpected findings, and how to translate these findings to clinical practice. In this episode, the stroke special interest group is interviewing. Dr Amanda de Martino about an article that she co-authored, [and] which was led by Dr. Stella Michelson. This article is in the October [20]21 issue of JNPT and is titled, “Manual dexterity is associated with use of paretic upper extremity in community dwelling individuals with stroke”. Welcome [Amanda], I'm looking forward to the interview.** Thank you for having me. **It's a pleasure. So, before we get into it, Dr. de Martino, can you please explain your background to us now**. I am a research physical therapist with the master’s degree in physiotherapy. I have worked in the motor control laboratory with Professor Stella Michaelson at university of Santa Catarina State since 2012. So, I have been studying people with hemiparesis due to stroke, and there I developed the project with the behavior mapping.

**Great. Can you tell us why you chose this particular study design and why you feel it is important to examine integration or performance of the upper extremity dexterity in participants’ lives?** I didn't find use in the clinic.. in the clinic setting as challenging, and the behavior map allows us an understanding of how people use the paretic upper extremely in real situation in detail. It is time consuming, so using other tests to identify people with [impaired] upper extremity paretic limb integration into activities has great clinical utility. So, first the idea comes to the interest to understand how people after stroke spontaneously, I think, use the paretic extremity. The article can show us that a high level of integration depends on the performance of unilateral activities, manipulation, and digital grasp hand functions. Identifying levels of use is already interesting to understand in spontaneous use. This is use of people who had a stroke and be able to consider results from the tests we use in the clinic that this task that consume less time and that are recommended for this population helps to establish goals in their rehabilitation of the upper extremity and identified use of the paretic upper extremity. **That's it, that's really helpful. I think because as clinicians we all know peoples’ performance in the clinic does not necessarily carry over to home. But that's really what's most important. So, I think it's awesome that you guys focused on this.** It's a challenge for us to understand the use, and if we are able to see [use] in the clinical setting if they used it, it's very helpful and it yet goes and improve the process of recovery in rehabilitation. **Can you explain. behavioral mapping, what that exactly means?** It's a method that directly observed the actual performance. It is based on predetermined categorization of the type of activity the hand function, and we registered how much individuals use the paretic upper extremity and the non-paretic upper extremity, and we can see how much and how people use the upper extremities. So, it's a method of direct observation in [the] actual environment. **So, how did you exactly conduct that in the study and can you define terms like dexterity, grasp, and how you differentiated those in the study as well as in the paper?** They study involved observation of the people in the home for 4-hours. So, we use the break categorization of the tasks if it is in bilateral or unilateral, what is their hand function, type of grasp and posture.

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that people are in when they are doing some tasks at home. For categories, we defined some points like what type of hand function for example.

Stabilization is when we hold onto an object without moving the hand. For example, one hand is holding dish while another is used to wash the dish or the hand holds a plastic bag without moving the object inside the hand. Or another example, like hold a cup to drink something. So, this is stabilization.

Reach to grasp is when the participant extends one or both arms to reach something and this type of classification we also can see the type of grasp when they are doing a whole hand grasp or just a digital grasp. For manipulation, we can see if the paretic upper extremity or the non-paretic extremity.. we can see if the upper extremities are doing stabilization or reach to grasp. And if this this action is with whole hand grasp or digital grasp.

For manipulation we define the task that [they use] the hand and the fingers to exert control over and direct and guide the object in hand so their movement in hand such [as] open[ing a] door handle or open[ing] a bottle, the bottle cap, or tie the shoe laces… so manipulations about this can be unilateral or bilateral when we do with just with one upper extremity or with both at the same time.

Push is when the hand puts force against something without grasping- just push[es]. And these definitions that I was talking about, they are task related actions. So, we need to interact with object to do this type of.. to identify the type…these types of movements.

And gesture and support is more about when we are talking… and gesture… is when we are talking and moving hands but there's is no there's no inter interaction with objects.

And support is just to… an action to keep… to maintain the balance. And i think it's this. **I think it's great. You guys included gestures. Because, I think probably people until they experiencing a stroke to realize how much you use your hands when speaking in it is a very relevant thing in people's lives when they feel like they can't gauge that so I think that's really cool that you guys did that. Why did you use the Blocks and Box Test and the Nine Hole Peg Test?** Because those two are recommended to be administrated post stroke people. They are recommended to use in the intervention research studies and in the clinical setting to be used by therapists or students. Both are simple and fast to apply, accessible, and not expensive. So, they have good measurement properties. So, we think it's a good choice to to try to transfer to identify the use with those two tests. **Is one related more to manipulation deck set, er, dexterity?** The Box and Blocks Test, that is more about the gross dexterity we need to ..nd they Nine Hole [Peg Test] is the fine dexterity. So, the Nine Hole Peg Test are more… is more challenging. **Got it, okay.** Because this goes over the fine dexterity. So, we want to see if these twp tests are enough are sufficient to… I think, to translate the use because we want to know if we need to, ah a task more difficult or more simple to…to…to do. **Can you explain how you identify the different categories that you put people into?** The first study was to identify where when people start to use the paretic upper extremity. So, if they use or if they not use. But, using two recommended tests like the Box and Blocks Test and the Nine Hole Peg Test. We want to

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We wanted to identify, what's the point or the result people have to achieve in this task that represent they use the paretic upper extremity even in only one task. But just identify[ing] the use was not enough for us. I mean, if the person use or does not use the paretic upper extremity is not enough. But [we sought to] understand the levels of using. It is interesting, because it's not about use or does not use, but is about how they use. Because, when we have the data from the behavior map, you can see how people use the upper limbs, the upper extremities, and we can see how they interact with the objects in the environment. So, we can see how complex these tasks are and how complex they perform. The people perform these tasks so the idea of exploring deeply the data came from the review. We started to separate the behavior. Considering the activity of the upper extremity, if it is unimanual or bimanual. Because, it's not that unimanual tasks requires more motor control, ah, I think is better. We start to separate in unique unimanual activities. After that, we look at the hand function and if it is they do manipulation or stabilization or reach to grasp activities. We can see that people who has a better integration of the upper extremity, they do more unimanual tasks with manipulation and reach to grasp things with digital grasp. We start to look at the data, and we could see the behavior, it wasn't…it was not something we…we thought at the beginning of the study. It was something that show up to us when we are writing and analyzing the data. So, it's a interesting thing for us. Because, at the beginning we want to see just if they use it or if they not use. But, we can see more…we could...we could see more after the doing the data collection. **Yeah, I guess it breaks down the degree to which they're using it, and kind of what…what movements would mean they're more integrated.** **Can you explain what the area under the roc curve means and how this correlates to your study slash what we can green from the studies area, under the ROC curve?** The area under the curve (AUC) represents the ability of the tests to discriminate between those with or without the condition assessed. In our case, if our analysis discriminates the participant with or without certain level of integration using the Box & Blocks Test and the Nine Hole Peg Test. In our study, we have six values of categories linked to six distinct points. All of them are high-end and zero point eighty -they are great. But, to identify a true cut-off point, they need to understand if the data point has a good ability to identify [both] true and false cases. If the participant who achieved as specific score in the Box and Blocks Test or in the Nine Hole Peg Test … they have the level of integration that they are supposed to have, the level indicated by the cutoff point. Let me give you examples. Corresponding to true positive case of partial integration. It happens when, for example, one person did score higher than sixteen on the Box and Blocks Test and the same person also performed at least ten percent of unilateral activities with the paretic upper extremity but performed less than ten percent off reach to grasp function or digital grasp. So, this is a true positive case.

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I score higher than sixteen, and true partial integration of the paretic upper extremity. When I talk about the ability identified the through cases, it is sensitivity. Specificity is the ability to identify the true false cases. We are talking about the ability to identify a condition. In our case, a level of integration that[where] the cut-off points from the test is supposed to identify correctly. Keeping this in mind, just look[ing] at the accuracy was not enough for us to recommend they cut-off points we found. When we look at the data points from Nine Hole Peg Test, we realized it was not enough. Because in our results, this test has low sensitivity. We can see that the ability of identify for sure that one person has limited or partial integration into activities was weak for the Nine Hole Peg Test. What I mean is, using the cut-off point of the Nine Hole Peg Test, I have a big chance of saying that a person does not integrate the paretic extremity into activity when it happens [they do integrate the limb into activity]. The value of cut-off point lower than sixty nine seconds or ninety six seconds have a poor meaning because people who took a long time to do the tasks such as [indecipherable] jamuna stay, they actually can integrate The paretic extremity in complex activities. So, shows unilateral or manipulation. It's very important when we have more chance of truly identifying integration, because we can apply the right evaluation at the clinical practice with confidence and it helps to… to set goals for the recovery process. **It appears the study didn't take into consideration hand dominance when they measured…measured use of the upper extremities in unilateral activities, if the paretic extremity was not the dominant hand could this impacted results by showing that they were not integrating the upper extremity into daily life?** We didn't take into account for an in depth discussion because of the number of the participants. But we don't think the hand dominance is the only factor that could influence in the use of the paretic upper extremity. I think it's part of it. When we look at the figure 1 of the study, we can see that the behavior of the data is not clear. The dominant hand does not doing more task most of time regardless of the level of integration. When…when I was doing the data collection at the participants home, I could see that there are people who don't have a worse motor impairment, has great upper extremity capacity, and none or few activities at home. It's difficult to understand. I kept thinking about intrinsic factors like motivation and emotional state or extrinsic. Extrinsic one is like a having someone else to do the house work or if they have already adapted the behavior to use mostly their non-paretic upper extremity into activities. I don't know. I still have this question in my mind as someone who worked with rehabilitation, it's challenging to understand the use of the upper extremity and how, in…in the clinic, I can….I can provide strategies to for a greater spontaneous use of them. I really think it is a feud we have to explore, motivation, emotional states, what happened to this people that they do not use, and why maybe give strategies to improve self-efficacy, to teach the patients how to participate or engage in the recovery process in the rehabilitation. **It would be interesting to see if the same results held true in other environments such as the community or the workplace.** **Do you feel the results would have been similar? Why or why not?** Perhaps there is a big difference but about the workplace. Most of participants in our study are not working and due to their condition. So, I think it could be challenging to collect the data. In addition, the same task can be repeated many times during the…due to the type of work the person does. So, I think It could be difficult to generalize if we collected the data at the workplace. About the community environment...

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Yes, I think it could be interesting to understand what they do when they are not home. But, observ[ing] someone outside home could be very challenging [also]. **Tell us about how you feel the study's results speak to the importance of strategies for self management, promoting self efficacy, and self resilience?** I think about what interferes with a person's behavior beyond physical components such as motor impairment or numbness, even dexterity. This is my opinion. We can discuss. But, during the data collection we realized how important is to talk to patients and provide enough information for them to understand that they are part of the recovery process, that having a very a… a motor condition is important for motor improvement but they need to engage in the rehabilitation process so that they can integrate and explore the potential. They have to return to activities. I understand that are a huge area that the behavior belongs. In this study, we explore the physical components that could be related with performance slash behavior. I would say if we want to understand why some people with greater recovery potential do not use the paretic upper extremity at home, we must look at fiscal aspects but also those aspects involving integration with the environment. **Based on your findings, what do you think are the key messages you want clinicians to take away from this paper for** working with patients post stroke? The key message, I would say, we must give to the patients enough knowledge to understand the recovery process after stroke. This article can help about… we have good clinical tests like the Box and Blocks Test that truly identifies the level of integration of the paretic upper extremity in activities of daily living that truly helps to define treatment goals with the patient. Another key message is the level of integration of the paretic upper extremity depends on the type of activity that the person performs, if it is unilateral or bilateral and depends on the hand function performance during the tasks. **So, thank you everyone for listening and thank you Dr. de Martino for being with us today and speaking to us. If you want to listen to more podcasts, you can find them on ANPT Synapse or wherever else you find your podcasts.**