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Individualizing Balance Programs Across the Degenerative Diseases

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- [Calista] Today's course is "Individualizing Balance Programs Across the Degenerative Diseases". It is my pleasure to welcome back Mike Studer to physicaltherapy.com. Mike is the owner and lead therapist at Northwest Rehabilitation Associates in Salem. He was also Salem's first board-certified clinical specialist in neurologic physical therapy, and he has been since 1995. Mike is the only therapist in the nation to be awarded the Clinician of the Year by the Neurology and Geriatrics section of the APTA, he has authored over 30 journal articles, six book chapters and is a recognized national, international speaker on topics including aging, stroke, motor learning, motivation and rehabilitation, cognition, balance, dizziness and Parkinson's disease. So thank you again, Mike, for presenting for us today. And at this time, I'm gonna turn the microphone and the classroom over to you.

- [Mike] Thank you so much, Calista and Kathleen, and everyone at Continued and physicaltherapy.com. I'm really looking forward to tonight's presentation, we are packed with a ton of information. Please know that if you miss anything, need clarification, would like to ask a question directly to me but not to the group, you do have my email address as one of the last slides in your handout, and I'm ready to fire away, let's get ready to get started and talk about each one of the degenerative diseases and how we can specifically help them. In an effort to ensure that your continued education credits are fulfilled, let's at least do the housekeeping that is required and we will read the objective outcomes. Thereafter, we will not be reading slides to you and I'll be happy to move at a pace that respects all of your professionalism. So, by the end of this course, I would expect all of you to be able to list at least three key factors to individualize a balanced prescription for individuals with degenerative diseases, I would like for you to digitally be able to describe at least two evidence-based reasons for modifying interventions for persons with dementia, impaired attention, and we see these often with persons in Alzheimer's disease,

multiple sclerosis, and a few of the really truly the Parkinsonisms as well. Additionally, we would hope that you would be able to list principles in the International Classification of Function that consider motivational and psychological characteristics of the person in front of you, and then finally, I would like you to be able to identify at least two future technological advances that are applicable to this area of rehabilitation. So, starting off with, we have a list of hyperlinks that I will share with you as a function of this course, you'll see this page and you'll additionally see the next page. ‘

Depending on the time and questions, et cetera, we may be going through some of these and a majority of these hyperlinks, I'm sharing them to you today, so that in the case we don't, or if you'd like to be able to look back with them, you have them at-access. They're part of our YouTube channel, and you are welcome to those as well. On the timeline, we're gonna talk about the degenerative diseases, go over some abbreviations so we're all on the same page, talk about how to use objective measures, and then really go through each one of the DDs and talk about what is specific to them. Now, what's not gonna be too surprising to you is that balance, even for persons that are just aging, is a very weighty topic for us. This topic is really dominating a lot of the medical expenditure in the United States conversation right now.

The U.S. Senate actually took feedback on how to be able to reduce the number of falls in our elderly this year, and that's a very unusual thing, but we know that the incidence of falls increases dramatically for persons with degenerative diseases. So this page right here, certainly some viable data for you, getting ready to be updated again off of the 2016 data very soon there, but we certainly know that we're talking probably in the neighborhood of about \$43.8 billion at this point with time adjusted now. So, what we're going to do here, is actually I'm given a cue, we're gonna pause for just a sec. Very good, well, as I was saying, we know that the equation and amount of dollars that are being spent for persons with aged-related falls, and especially those

with degenerative diseases, is an enormous amount of dollars spent in the U.S., we know the frequency of falls increases dramatically for those persons with degenerative diseases. So let's really find out what is the actual physiology of normal aging, and then let's separate that out from what we understand about degenerative diseases. So first and foremost, these are the facts, folks, this is what we truly know about what age-related declines are going to be obligatory for persons that cause them to be at increased risk for falls. We know that the conduction velocity of nerve fibers from a sensory standpoint, going up to the brain to alarm of a fall, that conduction velocity actually slows down, which increases our response time. We additionally know the conduction velocity going down to the muscles to send an action potential to elicit the motor units, is actually going to slow down as well.

So that in total increases dramatically our reaction speed peripherally, but additionally, we know that the attention networks in our brain cortically, actually begin to slow down a little bit with some disuse and with aging. Additionally, we know that the Type I and Type II muscle fibers with greater preferential loss, and Type II muscle fibers with age, again, strength and power fibers are going to go down even a little bit more. So even if you react accurately, your ability to powerfully put a limb out and stop yourself from a fall should be an implication of falls increasing with aging. Then obviously the two that you see down here, hearing, visual acuity and some strong suggestions now that we do lose some capacity, really even in the peripheral inner ear organ with aging.

Now, with that said, just having Parkinson's disease really certainly understands from the statistics, that 60% of persons with Parkinson's disease report at least one fall and 39% report a recurrent falls. We know this is really an area of intervention for us to be able to tackle, this is potential and room on the table. You may additionally be surprised that persons with multiple sclerosis fall more than 50% annually, and then what we see here, and this is a great citation that really is actually even updated and confirmed with recent information, that more than 35% of them fall multiple times per

month. So then let's additionally say, sometimes falls isn't just about the movement system, such as in Parkinson's disease and movement or sensory system in multiple sclerosis, but additionally cognition. And we look at these statistics that I won't take the time to read to you for Alzheimer's disease, and we know the incident is pretty dramatic and the falls are more than two times as likely. Keeping these things in mind, we have to know that personalization is very important and ever more so important in the degenerative diseases. The way we're going to try to reduce frequency of falls must be specific to the type of condition that this individual has. So we're gonna talk about the interventions now. And to ensure that all of you are on the same page with regard to the time-saving abbreviations that are commonly accepted that I'm going to use tonight, please do feel free to refer back to slide number 17 just in the case that you're not certain what abbreviation is on the slide. I think they'll be pretty well-accepted and we'll move on from there. So keep in mind, people with Parkinson's disease, MS, Alzheimer's disease, and even spinocerebellar ataxia, while they are at higher risk risk for falls, we also understand that there is some neuroplasticity available in some of these conditions.

So, we wanna take full advantage of the fact that because the brain is degenerating in one area does not indicated that they will absolutely not have neuroplastic capacity's potential to rewire and motor-learn in some other areas. So it takes some supply and demand, it's going to take certainly some hope and some expectation, we need to allow these individuals to have some experience of success. As we'll certainly learn, there are many different conditions within the degenerative diseases where people are actually worse because of what they expect themselves not to be able to do or what they choose not to be able to do out of fear as compared to what the disease actually takes from them. So there is potential in every degenerative disease. My job here today tonight is to take you through each one of them, and to unearth, and discover that potential. So we know that no one actually is ever stronger than they need to be, and in some of the degenerative diseases, we can actually improve their muscular strength.

Point by point as we go through here today, I want you to be looking at these eight different opportunities to be able to reduce someone's fall risk as a function of intervening into these areas. So the opportunities are gonna vary from disease to disease, but we're in luck, we're actually not going to just take that as a blanket statement, we're gonna dive into each disease. So here's my caveat here, understanding that even one other thing is important to understand here that even though we can make a prescription that is a best-laden prescription for any one of the degenerative diseases, I don't wanna make it seem as though tonight that we have to depersonalize this and say that everyone with Parkinson's disease needs this, and everyone with multiple sclerosis needs that. What I really want to understand is that there are some predictive and clinical prediction rules that can happen here, but there's potential on the table that we certainly wanna utilize.

So the important things here, we need to understand that every single one of those eight variables gives us an opportunity, it's going to take dedication and daily work to keep these individuals as healthy as they can be. I've mentioned a couple of these other parts along the way, but I wanna take certainly just a moment to call to your attention that there are some neuro chemistry opportunities available in an effort to try to maximize attention, in an effort to try to help one of our individuals gain some capacity in an arena that they didn't think they could tap into, and when they see some success, we get some dopamine, we get some serotonin, and we get individuals excited about the potentials that they can make.

So let's move on here. And we understand we're gonna start with the topic of strength, and in each one of these, I want you to notice the organization that I've put into the course, by looking at each one of the main areas. This is not a comprehensive list, but the main degenerative diseases that can benefit from the topic that we're gonna have here. So we'll see SCA, and I think you guys all know the abbreviations here at this point, right, and then you will additionally see that after you've seen that category,

strength, and we're gonna talk about endurance, and you'll see the conditions we're gonna use it in, then we're gonna take, here's the prescription. So each one of the next six slides we're gonna follow with the same organization at this point. All right, so we know that if we are actually following the American College of Sports Medicine with regard to true dosage for strengthening, we need to be following that even in persons with degenerative diseases. And I'm gonna really love the fact that some of you are actually going to be asking me questions today, and during and after the course, about whether we actually can truly load these individuals with the type of dosage that is prescribed through the American College of Sports Medicine.

And the answer is going to be nearly definitively yes and absolutely yes, even in multiple sclerosis. So we wanna give these individuals the opportunity to be able to show us what is a one-repetition maximum. I'm gonna talk with you about how to do that functionally, and then give them a dosage that's built off of that one-repetition maximum. I'm not going to go through the rest of this, only to say we are doing these individuals a disservice if we do not tell them ahead of time to expect some soreness and we talked about that a little bit, very briefly last night, if you were in the webinar that we presented last night as well, there is very little, but some overlap there, because it's true for acute and chronic stroke as well.

Now we're gonna talk about power, and power is something we really didn't talk enough about last night in the stroke, acute and chronic, now we've really gotta get these individuals, especially persons with Parkinson's disease, and I would additionally say the multiple systems atrophy patients, which is a form of Parkinsonism, we need to really build power in these individuals. This is one of the things that in one of the three phenotypes, the subtypes, or variates of Parkinson's disease, we see a huge loss with this, and we see the stimulus, the actual implementation of this, can be somewhat disease-slowing, working on power. So what do we do different in strength versus power? Well, it's quite simple, we can decrease the overall percentage of

one-repetition maximum, and we can, in addition to that, try to give individuals about a five-to-eight repetition palette for that, we give 'em two to three sets at a time, depending on their tolerance, and again, we're gonna expect some soreness. Now, we are going to have some qualifiers on this with regard to the amount of intensity that we can do for some of the persons with certainly some impaired cognition, and I'm gonna show you some functional dosage about that when we look at video tape in just a little bit. Now we're gonna move on to the third arena. Remember we've done strength, and we've done power, now we're gonna look at the third arena and we're gonna talk about muscular endurance. Certainly an area of fitness that we often help out with when we think we're helping with strength, putting an individual on a new step, on a semi-recumbent elliptical, on a SciFit, stepper, latitude, et cetera, that's a great thing to do if you're trying to get some muscular endurance. Even if you turn up the resistance and give them only three or four minutes to work on it, you may feel like you're getting a much better dosage of strength.

The reality is you're living in this area, when you can do 15 to 20 repetitions, and more, of a given exercise, you're working muscular endurance and you're no longer actually truly stressing the system to build strength and power. Now, as we see here, it's important to live in the muscular endurance realm for these different categories of the degenerative diseases, you'll notice, very pointedly, these are very studied and very intentional, we did not put amyotrophic lateral sclerosis up here, and that's for a good reason for that, but muscular endurance is intentionally actually prescribed here in MS.

What we're going to be looking at later on, as I've alluded to once, is that persons with multiple sclerosis, by and large, and evidence is showing us, their level of deconditioning is often a learned non-use and not a direct function of the disease itself. So understanding again, that when we want to prescribe for muscular endurance, we need to be living in this number of repetitions and we need to understand that there is some capacity to accumulate the affects, especially in these two arenas. So this is a

very important point to understand. A person with any one of the degenerative diseases is always going to be at much higher risk to fall when they get fatigued. I'm gonna give you a moment to think about that, muscular endurance can have a direct impact on fall risk purely by reducing the fatiguability of the patient in front of you. That is to say, if you were to test an individual on one of your favorite balance tests, maybe you're gonna use the BESTest, or the Berg, you would find that after fatiguing them, as should anyone, it just happens much more quickly for a person with degenerative diseases, after fatiguing them, their score should go down significantly. Now, remember, fatiguability is got some trainability with regard to nearly every one of the degenerative diseases those that are most lenient to some training for fatiguability I've listed up here. So training someone's muscular endurance, in a moment, we're gonna get to cardiovascular, can reduce the likelihood of them experiencing a fall that is more directly related to fatigue.

So when we try to come down here and we understand we've gotta use some a cumulative effects, that means perhaps a person with multiple sclerosis, or other forms of degenerative diseases, will be better able to tolerate, to consume, it's more palatable for them to do maybe just one set, maybe two sets, maybe another set later on in the day, but perhaps two to three sets would be too much for them. So it is very much within our evidence to understand that we can accumulate and build up the positive effects of these sets and this dosage rather than feeling like we've got to be able to pour it into them all at once, okay? It is not necessary to answer the question that some of you may be posing, that we actually induce these sets and deliver the dosage in consecutive order. That is to say, if you're going to work on a functional, muscular endurance prescription and have an individual do 15 repetitions of sit-to-stand from a high surface, you don't need to go right back and do another set of that immediately thereafter, with the same function or even the same muscle group, you can actually put those in a little bit more of a random order and that is the benefit of circuit training, which we will talk about a little bit more as the evening goes on.

Keep in mind, heart rate isn't always predictable for persons with multiple systems atrophy and other types of autonomic nervous system disorder, that's a function of some of the degenerative diseases, we like to use, and research supports the use of, perceived exertion to drive intensity. Now, we'll talk more about that, but really living in that visual analog scale, the Borg scale, and utilizing a six, a seven, and only occasionally an eight on a scale of one to 10 for a modified Borg perceived exertion scale, with regard to intensity. Remember, there's a lot of great opportunities for buy-in for patient autonomy when they get included in making the prescription. So now let's take a moment to look at balance inclusive of muscular endurance.

So if I wanna work on the substrate fitness attribute of muscular endurance, does it mean that I have to do it outside of the realm of balance, no, does it mean I always have to do it inside balance, no, but let's just take a moment to look at some great and easy compensations. So we could actually work on endurance on an unstable surface, here, individuals working in a group setting that are on a Swiss ball, and working on their capacities to keep their balance with single-task focus, perhaps even with some dual-task capacities here, maybe sit to stand, standing up on a compliance surface here for a person with neuropathy, a degenerative disease that we will talk more about, how about some eyes-closed weightlifting, that could happen right here, I mean, that's a great one, too, that's probably a little bit bigger weight than some of our athletes are gonna be able to handle, but you get the understanding there.

Even if you're just talking about using some two-pound weights in the hands and feet stacked real close together. A nice combination that really makes people feel productive, and then obviously yoga and Tai Chi as well. So those would be some nice muscular endurance with balance combinations. Now, related to the area of muscular endurance, we certainly know that we can utilize cardiovascular endurance and we should be utilizing those prescriptions really for every person, with exception of the individuals that are declining in the motor unit capacities for amyotrophic lateral

sclerosis, and that's the asterisk there, is that we don't stay completely out of that, we just don't tax them quite to the area of prescription of that 70 to 90% for these individuals. So this is pretty straightforward, and I know that you'll be able to read your way right through these, very important, again, that we take a look at the highlight points, respecting your professional understanding of these things already, and we'll skip down and take a look at the consideration of cumulative effects. Knowing that we don't have to get 30 minutes all in at once, that we can utilize that art of accumulation, applying 10 minutes, three separate times per day to get that effect as well. Noting again, we're gonna use a modified Borg perceived exertion scale. I additionally want to help you understand that even if an individual is having some delay with regard to their capacity to keep their balance, and perhaps that's because of a neuropathy, as we've got listed here, Charcot-Marie-Tooth, being the most common, familial or hereditary neuropathy, that we understand that sensory neuroplasticity at the central level is viable, and we often forget about that.

And one of the analogies that we certainly talk about is gonna become really eye-opening for you in just a couple slides from now to take a look at the central changes that happen to allow an individual with neuropathy, and with multiple sclerosis, where I can't feel my feet, how am I possibly going to be able to balance, is a question that we can not only answer, but a question that we can functionally make reality for our patients. So I want you to give some consideration now before I begin to answer that question for you, how can we force the brain to create a neuroplastic experience that reshapes where the sensory signals are coming from when we actually have impairments in the peripheral or the central nervous system, okay? We'll talk more about that. Additionally, we often forget that a person with a degenerative disease still has the capacity for neuroplasticity in other aspects of their brain. And it largely depends on exactly what we talked about earlier, demand and supply, it is by evidence shown to be more reality-based when it's task-specific, and additionally requires some repetitions. But they must not only see that challenge to get the

demand, as I suggested earlier, these individuals need to be able to see progress and have some hope. And that's where measurement comes into play. If we can't definitively identify what an individual's capacity is with balance and share a number, a visual for them, what we call a stabiligram, sometimes, using IMUs and body-worn sensors, if we can't somehow objectify their balance and show them that they're getting better, how can we expect them to fully engage? Imagine, put yourself in their shoes for a moment. I mean, I've been doing this for nearly 30 years, and I think all of you know very well, if you're given the information that you have a degenerative disease, you can feel like your world has been rocked by that.

I don't believe it is too hyperbolic to say that some individuals feel it's nearly a death sentence, and to be able to give these individuals something back, to give them some hope, to show them that they're making some measurable change, merely by reversing some of what they had not fully tapped into, some strength, some endurance, even some sensory reactivity and responsiveness because they haven't recently had balanced challenges on a regular basis, to show them they can actually make some changes at the level of the brain or elsewhere, that's what really engages the patient to try to fight the battle and to keep it going.

And that's what we've gotta love to do. So, remember now, that's actually only six of the different eight ways that I said we could have the ability to help someone with degenerative diseases make some improvements, and it relates so nicely to the seventh one here, because now what we're talking about is helping an individual at the level of psyche, the ability to know I can make a difference, and what is that, that's self efficacy. And that's what we understand from the optimal motor learning theory, that just because you have a degenerative disease, doesn't mean it doesn't apply motor learning, neuroplasticity, those things are viable in the degenerative diseases that I listed for you. And so we understand very clearly that seeing that I make some improvement has exactly what's listed in the optimal has some enhanced expectancies

that is provided, gives individuals the dopaminergic release, and if that sounds great, and sounds wonderful, and also sounds familiar to you, we certainly know that, especially for persons with Parkinson's disease and for certain subtypes of Parkinsonisms, especially when there's a stroke in the substantia nigra, very small infarct down there, that doesn't mean they have Parkinson's disease, that is actually a Parkinsonism, these individuals are not delivering, and creating. and keeping viable dopamine as their aged cohorts might, so getting an opportunity to naturally release dopamine is a win. So I think the rest of this is very straightforward for you here, but cannot be understated, very important to help to tap into that person's psychological potential, you can make improvements. Now, finally, we know that some falls, as I alluded to earlier, persons with Alzheimer's disease, are going to be two times more likely to fall than their age-matched counterparts, and that is primarily because cognition has an impact on fall risk.

Now, that can have an impact for many reasons, and I'm not gonna try to comprehensively list all of them to you, but being aware of something that is dangerous in the environment, recognizing a cue in the environment, could come from an obstacle, being more distractible, in a dual-task manner, all of those things are certainly things that increase the susceptibility of falls with regard to persons with cognitive impairment. So what we're gonna talk about here tonight is certainly that the dementias, multiple systems atrophies, some persons with Parkinson's disease, I take a moment to allude to this because, as I mentioned earlier, some of the phenotypes of Parkinson's disease will be different, and here's, yet again, another opportunity for us to look at a different phenotype where persons have some impairment in the dorsal lateral prefrontal cortex, they lose not only dopamine delivered to the basal ganglia, they lose dopamine delivered to the frontal attention centers, and they therefore are more compromised with regard to their ability to do a task. And that certainly happens in some persons with cortical lesions, and stroke as well. And now remember, some people with MS have on nearly a pure presentation of spinal cord injury presentation,

and they're going to have more spasticity and less cognitive impairment, but some of those individuals with cortical lesions and MS are going to present with some cognitive impairment that leads to their fall risk. So what do we do with regard to cognition that helps these individuals? Sometimes it's actually going to be compensatory and we give them some dual-tasking to demonstrate their abilities and help them gain some awareness with regard to how to keep themselves safe. Sometimes we're actually training caregivers to help to compensate, we'll be doing that certainly with the more impaired individuals to reduce the amount of distraction in the environment, not just the physical clutter, but the cognitive clutter, if you will. Sometimes we'll do some safety training with these people to be able to better tolerate dual-tasking so that they can prioritize their posture and not attend to other extraneous stimuli.

You all have had some persons with Parkinson's disease, where the spouse continually gives them cues to take bigger steps or to stand up straighter, and we know that when we're intervening with these individuals, if they have some cognitive impairment, that we can be essential here in helping the individual make that prioritization, make the dual task more palatable, or actually demonstrate that we need do some compensation, we've got three different windows of choice there. Additionally, it's very important that we recognize something that is becoming more and more well understood, that the opportunity to just use higher intensity exercise as a pre-rehabilitative effect on executive function is something we're just now learning how to tap into.

And that is truly to say, persons with mild cognitive impairment have been shown, very consistently, reproduced again and again in research, to be able to slow the disease progression, and in some cases, reverse some of their cognitive impairments when they are regularly engaged in higher intensity exercise. I'm not talking about reversing Alzheimer's disease because of exercise, I'm talking about slowing a regression that has been proven that's occurring with persons with mild cognitive impairment and

actually taking, just very simply, the most basic literature showing three times per week, 20 minutes per day, continuous walking at a moderate-to-high intensity can slow the progression of cognitive changes. And then as we have talked about, and we'll talk about more, dual-task training. Probably nothing increases the likelihood of a person's very ability of gait, the amount that they're walking will change within the perspective of how the left leg looks different from itself from step, to step, to step, than the influence of dual-tasking. When distracted, people increase their variability of the presentation of how they take steps. And when your variability goes up, your likelihood of falls does as well. So the attentional and procedural networks that we're gonna take a look at here, are very clear, if an individual is performing a primary task and allowed to focus singularly on that, they're going to have a given level of capacity. Now, it doesn't matter whether we're talking about the ability to do a 10-meter walk, a two-minute walk, the ability to stand and do a transfer to the right or to the left, to a bedside commode, a primary task lives by itself, and ideally, most of the time, functions at its optimal level when there are no other clouded or interfered secondary tasks.

What I'm explaining to you here is that there are times that we need to do dual-task training with our patients, as suggested in the previous slide, to load them, very similar to how you would put an ankle weight around someone, or you would put a TheraCORE around them to resist them in their effort to be able to walk, or you might increase the incline on the treadmill. I want you to consider a secondary task just like you would any one of these other features where you're trying to actually physiologically load someone, so they become more tolerant. So we add in a secondary task. And we expect, and I would please caution to you, to your patients and to your caregivers, when you're going to load with a secondary task, please announce that you are expecting a reduction in their performance. So when you've announced that expectation, they're not shocked when it happens, they're not disappointed in themselves, and cortisol doesn't raise. When they experience that reduction in performance, we can more consistently then deliver to them a more

regular exposure to dual-tasking, and through the regular tolerance and exposure of dual-tasking, individuals can tolerate distractions better than they had, if it was just their first time being distracted. So this is a habituation phenomenon, a modulation of action potential that occurs with repeated stimuli, that's exactly what habituation is. And if I'm delivering a regular dosage, not constantly, but a regular dosage, in my expression of therapy to this patient, they're going to become more tolerant of distractions.

When they become more tolerant of distractions, they will additionally have the opportunity to have improved the automaticity of the primary motor task, meaning that because the cognitive zones, the attention centers, the dorsal lateral prefrontal cortex, primarily, but not exclusively, is being occupied by some of the distractions that you're providing, the individual will, by nature, draw some of the requirements of motor function down into the basal ganglia, and that gives them the opportunity, in many conditions, and you might be thinking of some exceptions right here, and rightly so, I know we've got an intelligent audience out there, of 350 of you right now, you're thinking about this, with exception of some persons that have severe impairment in the basal ganglia, there should be some preserved capacities in the procedural memory centers, so that these individuals that are exposed to distractions have the opportunity to now improve their automaticity of that task, improve the basal ganglia representation of how I transfer, how I get out of bed, how I walk, so that the primary task additionally benefits just from presenting a distraction.

So that's something obviously I can get pretty excited about, let's go ahead and show some videotapes on that. So Kathleen is gonna pull together a video tape for you, and I'm gonna push play here and let's take a look. As she's sorting through the cards if she sees a heart, she's gonna move the ball from one side to the other, but she has to watch the treadmill because when the line goes by, one single line, she's gotta walk tightrope. There went a heart, there's another heart, she moves the ball. She's

watching for the line and she hits the tightrope walk, and then she's back to regular walk. So we have a visual distraction, two manual distractions, little bit of cognitively and arguably going on here. Yeah, so much fun to deliver that type of training for an individual that is of the personality that she wants to be challenged, she's gamified by that, she wants to see her brain be able to tolerate more and have the capabilities of pulling things together. I mean, when we're talking about an individual that has adoptive children of four and six years old, a dog that needs to be walked, and she knows that life includes a lot of multitasking, she wants it thrown at her, she wants to gamify. Remember, we're keeping this individual primed, and we're respecting her as a person. There are many individuals, now, I'm not gonna suggest that you guys go out and do this with the person that has Alzheimer's disease, but I'm going to suggest to you that the person that wants to be gamified, needs to be gamified and needs to have this capacity elevated so that she can get a release of dopamine, so that she can experience some sense of wellness and continue to thrive.

But I want you to keep in mind, and we'll go back to the PowerPoint at this point, Kathleen, thank you, that the same type of capacity can be done for a person with Alzheimer's disease, you just wouldn't do it in this manner. So I want you to think about this, if you've got a person with Alzheimer's disease, the one human characteristic thread that I want you to look for is dual task, not necessarily dual-tasking, but that is to say, balance work that is hidden in the realms of productivity. Remember, there are three major things that the human brain is gonna strive for, it's why we seek what we do as a vocation, avocation. And those three are autonomy, I wanna do this so I can have some independence, mastery, I wanna do this because I wanna be great at something, and productivity, I wanna do this because I wanna contribute back. And one of the things that remains for a person in this category that we're talking about of cognition, one of the things that remains in the people with the most severely impaired memory is that they wanna be productive. And I want you to go out there and I want you to be creative and find a way to be able to say, "Hey, can you help me do this?"

And that's where your balance task is gonna live. It's not like, "We gotta get your balance better, "because we don't want you to fall "or so that you can go home sooner," for a person that has a severe amount of dementia, they want to feel included and needed, find your balance, work and make it live there. So I will, occasionally, even then, especially in my career, I've actually pulled out a wheelbarrow for patients, had them work on helping me move things from place to place while they're working on keeping their balance, they're actually balancing the load that we've put into a wheelbarrow, maybe that's going to be a five-gallon bucket of water that's at least three gallons full, and we're gonna be working on balance, but they perceive that they're actually helping me transport this five-gallon bucket of water, and we'll move on from there.

Now, we understand, and that's exactly why we're right here in this portion of the lecture that we've gotta be able to engage patients and give them successful experiences. Dopamine is released when they're surprised with success, serotonin is released when an individual chooses to do something for their own wellness, and believe me, you are all gonna be the benefactors of oxytocin. But we're gonna talk more about this, and that means I'm doing something that's productive, I'm doing something to help someone else.

Now, granted, that should be what you guys are living every single day, that's what you are living when you're helping other individuals. But this is exactly what you're additionally living for your person with severe dementia, who feels like they're helping you out. So all these things happen with neurochemistry, and it's an appropriate slide for us to additionally address Brain-Derived Neurotrophic Factor, BDNF, Brain-Derived Neurotrophic Factor, many of you out there probably already familiar with this, glial-derived neurotrophic factor, insulin-like growth factor. Hey, when we're working on intensity and we're getting things done, and we're productive, we're actually gonna be more likely to be releasing these essential ingredients, catalyst proteins for

neuroplasticity. So let's talk about some more disease specifics and let's march right through here. We're gonna be ready to talk now, the generalities go like this, and I'm not gonna read these to you, I think you can look at those really well, this gives you another opportunity to look at the SCAs, where we're gonna make gains right there, and this is your very abbreviated summary slide right here. One of the things that I alluded to earlier that we're gonna be talking specifically about, especially in one of those kind of hidden degenerative diseases, known as Charcot-Marie-Tooth, and the forms of hereditary neuropathy, is that we can make sensory changes while we consider joint protection and strength.

All right, so let's start first with Parkinson's disease and some of the multiple systems atrophy, some of the Parkinsonisms that are coming from that. And remember, we've only got two hours tonight, where we're really trying to pour a lot of information and if you're not as familiar with the multiple systems atrophies, feel free to shoot me an email, I'm happy to guide you a little bit more with that, but we are talking about the subtypes of autonomic, of Parkinson's, and really kind of the cerebral presentations of the multiple systems atrophies, the three main MSAs.

So some of the commonalities here, and I think this will be well understood by most of you, first cited by Lori King and Faye Horak, in Physical Therapy 2009, these are some of the understood commonalities. Now, I wanna take these things from a picture's 1,000 words into really a video's a million words. So let's go ahead and show freezing of gait as a video that I wanna give you an opportunity to look at. These are some things we're experimenting with in the clinic, and that we're having some great success with. I'm going to take this individual with Parkinson's disease, and I'm gonna try to replicate his festination, and I'm gonna see if we can train him in by habituation and other considerations, so that he can break himself right out of it. And his instructions are to step on each one of those lines as they pass through. This is actually the very first time we did this with this person. He's had a good great deal of success when you

consider this is a gentleman that has fallen more than 100 times per week on many given weeks in his life. So once you start freezing, I want you to get out of it, don't worry about getting the rest of it, okay? I'm just trying to get you to get out of it. He's so tolerant and so patient. I'll pause it right there. So, Arlene, we're working at about 1.6 miles per hour there, thanks so much for your question. Kathleen, we're gonna go back to the PowerPoint at that point, I think you've seen enough of that one. Very important that we habituate, get some trainability, it's everything that we just been talking about. He needs to see himself as being a little bit successful, and we're bringing them into the clinic during an off-time for his medications, we're trying to force some of the festination and giving him the opportunity to be empowered, to be able to step right out of it. Now, we put the pillow in his hands, and subsequently we took that away, the initial thought there was to rob him from the use of his upper extremities as the primary strategy to break out, and pretty soon we didn't even need that. Let's go ahead and take a look at the next video for an entirely different presentation of the same disease, still for balance.

So here's an individual with severe dyskinesia who's working on certainly making some changes of direction and she's really concentrating hard about every attribute of her movement. And then as she advances, we are actually gonna start to pull her attention from that a little bit more. And go back to the eyes-closed effort now. That's all right, you're out walking it right now. So try with your hands down by your sides now. You can see how disconnected she is now. Can you increase her to 1.6 miles an hour? Robin, we're gonna take the speed up just a little bit. So she's working extremely hard to pull down a lot of dyskinesias while she's trying to walk in a stressful position of eyes closed. So I'll pause it there, that's great, and then we would go on and have her do a little bit of, and we can pull back into the slides again, some tightrope, tandem walk, et cetera, so really working on giving people the opportunity to over-train. If you've got a level of difficulty that you've been through at the clinic, and it is well above what the real world is ever gonna throw at you, that's to your benefit. Not only because

of your experiences, but also because it is going to reduce your stress and your literal cortisol when the world is not as challenging as the clinic was, I'm gonna take a look at Sonia's question here. Yeah, good question. We can have patients on the treadmill for 10, sometimes 15 minutes. It's not unusual for us to park up an actual stationary chair up on the treadmill, give people a break, go ahead and pop loose the harness and allow them to sit down though, too. But these individuals, when they're doing something that's so meaningful, and it's combative toward their disease, they can thrive. Now, again, I wanna give you an opportunity here just to briefly take a look at the MSAs, as I suggested I would, the MSA stand for Multiple Systems Atrophy, there are three main presentations, look at the A for Autonomic, P for Parkinsonian, C for Cerebellar, and this is where I'm suggesting our interventions, even different within the subtypes of APNC.

Now, I'll spend that amount of time on that and I wanna continue to move forward because I think we've done a great job so far of understanding where we might already be missing the target and leaving some potential on the table in terms of actually using strength dosage. Okay, so some disease specifics here that are important to understand as we move forward, ALS also has some subtypes, I've worked with a huge variety of individuals with amyotrophic lateral sclerosis, I'll hesitate to actually give you some of the dramatic stories of this.

Charcot-Marie-Tooth, primary motor and distal impairment with some sensory involvement as a function of having to spend so much cognition on movement, can actually be compromised in dual-tasking, but not centrally compromised. And then in addition, we take a look at Huntington's from a disease-specific, and we understand very similar to what we just saw with the last individual with dyskinetic Parkinson's disease, we're working on stability, we're working on having enough cognitive reserve so that they can actually place some attention on their movement when things get stressful, but also tolerate a busy world. And we really have to benefit from strength

training for them. All right, so some of the common outcome measures, this is a slide that can really stand alone, give you an opportunity to be able to go back and take a look at it, you don't need me to walk you through this one, but these are some of edge documents, if you will, that there's some overlap with that. I'm ready to move on to another one of the tests that we are certainly exploring, and I've got some great partnership throughout the United States and some of the universities that we're working with, and I wanna go ahead and show you this video on the cognitive four-square step test. So we're gonna watch another different individual with dyskinetic tendencies. The four-square step test.

- Yep.

- [Mike] Then you're gonna sit down in the chair and do the cognitive naming tasks that we talked about, that's going to actually be your water polo teams, 'cause that's a favorite topic of yours, then you'll come back and combine the two here, naming a different water polo team every time you step into a quadrant of the four-square step test. On your mark, get set, begin. Good, 6.77 seconds. Now in the same 6.77 seconds, see how many different water polo teams you can name.

- The Stanford Cardinal, the Cal Bears, the UCLA Bruins, and the USC Trojans.

- [Mike] Great, okay. Now come up and combine the two, not using any of the same water polo teams as you go.

- Okay.

- [Mike] And whenever you're ready. We'll start on your first movement, I'll watch the clock.

- Okay. Let's go with...

- [Mike] Ready?

- No.

- Okay.

- Key-de-sound pirates, the Blue Crush Bears, the TDOT Hills, Tornadoes, the Newburgh Nutjobs, the, what's that, The Madras Cops, the--

- [Mike] And you're good right there. Okay. So that took you 49, yeah, 49 seconds to do that. All right, that's gonna be part of how we structure your next home exercises.

- Okay.

- Good job. That's so challenging, but here again, we've got a winner, we've got an individual who's willing to work hard, willing to recognize, and see, and reveal some of his impairments, and actually go combat and go right at them. So this is a gentleman who hardly has any difficulty with this whatsoever right now, he's a gamer and let me tell you, he could have sat down, sat down, and named 100 different water polo teams, but the effort of trying to combine them was challenging for him. The meaningful attribute of this, combining something that gave him some autonomy, this is the conversation that he chose, this is the topic that he wanted to do, that autonomy gives him some selectivity and some meaning. And he knows if he's gonna have a walking conversation with his wife about something, he needs to be able to participate in both activities, the walk and the conversation, not altogether different than what he's doing here, it's just a with a four-square step test, we're actually putting pressure, we're putting agility to the case, and we're actually, again, increasing the clinic what he has

to do so that outside the clinic, things are much easier, he's already handled some of the more difficult attributes. So let's go back to our presentation. Chelsea, "Do we ever do them backwards to increase" see if I can see the rest of your question here, "increase difficulty?" Well, a four-square step test can be done both directions if you're actually talking about doing it backwards, but we actually have individuals do four different subtypes of distractions when we do the cognitive four-square step test. It's really for another discussion, we don't have enough time for it today, but we have them do not only subtractions, but also word-remembering, we have them also do naming items in a category, or we have them do spelling words backwards. So those are the kind of what we look at there. And we can go into further detail with that, certainly offline as well, if you wanted to email me as well.

So one of the other things that has to be a great consideration for a certainly a huge advent and what we do in rehabilitation is body-weight-supported treadmill training. What's it gives us? It gives us the opportunity to have volume, to have higher intensity, to have safer repetitions, to reduce patient fear, to challenge balance even harder. So higher intensity, not only in terms of the speed and the incline, or the ankle weights but also the higher intensity with regard to balance. As you've already seen extrapolated today, we saw an individual with dyskinetic Parkinson's disease changing directions on the treadmill. I'm not gonna have her do that on the treadmill, where the treadmill environment I find to be very conducive, because it's very unforgiving. And if I want her to do that, at that level of threat, I'm gonna want body weight support on that. It doesn't mean that it has to be any one maker, this, that or the other, that is the fabricator of the harness and the purveyor of the device, what is important then is that we're delivering dosage, we're delivering evidence, and we're delivering challenge, and we're giving hope. So we're now going to take a look at a couple of those. Certainly here in photo, we've got an individual who absolutely was just thrilled with the fact that he could run and feel like he used to during his lunch hours at work and this individual had multiple systems atrophy. And this was huge for him to be able to feel that he

could move at 3.5 to 4.0 miles an hour. Not a very fast pace, but the intensity was really, really excellent for him here, and he loved it. So here's another opportunity for high-intensity interval training, and obviously, in persons with Parkinson's disease, is an underwater treadmill. Additionally, other opportunities are available, having individuals as I've already shared with you, high intensity by changing directions, and having them do that rapidly, or even as this individual is different than what you saw earlier, turning in a consecutive or continuous circle. Now, we're gonna look at another opportunity here and I wanna go ahead and play this video so you can watch some induced pathway deviation. Close as you can, and whenever you see the purple come up, jump over.

There you go, nice job. Yeah, and so there she is, she's actually doing a great job of working hard at controlling her pathway, another dyskinetic person with Parkinson's disease and controlling where she's going to walk, just very simply modifying the task by drawing chalk on the treadmill. So we'll stop there and we'll actually go back to your PowerPoint now as well. Yeah, I think we got it pulled up, there we go. All right, thank you so much, Kathleen. Now we're gonna take a look at multi-directional gait-training, and some adaptability here. This is a very fun video and it's brief, so we'll be ready to go right back into the slides right after this. So here's a person with Parkinson's disease.

When he sees the circle, he's gotta turn a circle. He's gotta step over that line, and now he's gotta walk tightrope straight down this line, whenever he sees it come up on the treadmill. There's the circle, turn around inside the circle, get done in time to step over the line. Next time the circle comes, try to turn around. There we go. All right, we'll head back to the PowerPoint for that. And these are just some very fun ideas. I'm just showing you a very small window of some of the different conditions of balance challenge that we use for these persons. We need to keep in mind that we do strength-training inside the act of balance training for persons as well. We can do that

with repeated efforts, repeated efforts actually several repetitions a row from getting up from the floor, or hauling resistance, using what's called the 1080 motion here, we're actually having this individual working hard. She's tethered to the front of the treadmill, and we've got the treadmill belt going backwards and having her actually walk forward away from the front of the treadmill with resistance, and we've got a video on that one as well. So let's take a look at dual-task card sort. And we'll look at both of these videos back to back without a break between. You've actually already seen that, so, Kathleen, if you don't mind, I'm gonna skip past that one, I'm gonna take a look at Wesley's question as we go here. There you go, this is an opportunity for you to just take 20 seconds to watch what she's doing. So right there is the resistance cord, this is just a Rogue belt, a very strong band, I'm sure there are many other manufacturers, I'm not trying to endorse one. She is hauling and she's working on strength in balance. Now that's fabulous.

Wesley's got a great question, there is nothing that's keeping you from actually conducting that very task that you just saw in a home health setting or without a treadmill, hauling that patient back and letting them try to walk against you. I strongly encourage that to be done without a resistance cord that has handles, but make it a continuous loop so that they can feel confident that you've constantly got them. There's no issue whatsoever with regard to the one that you saw previous to that though, we also lay down a couple of strips of masking tape, create a circle on a floor, then create a straight line and then align to step over and have them change the configuration of their walking direction as they move across the hallway, or living room floor. The only thing that's stopping us is creativity there. All right, so power options. So that could be an MVP shuttle here, could be a wall push-up there, and those opportunities are certainly available for us, could be repeated sit-to-stands, none of those require a treadmill, all of those are certainly viable for all of you as well, and those types of things are really the opportunity to build power only when we're using time as a constraint. So that push-up from a wall or that stand-up is different, because those

show expressions of power rather than the stand up. Climb the stairs for strength, is different than climb the stairs with time for power, I hope you understand that that's totally different. So here's one really great consecutive series of photos here for a patient that I had the great pleasure of working with, who is actually doing a wall push-up for balance. Yes, this is still related to degenerative diseases in balance. He does the wall push-up because then when he pushes himself away, he leans back onto his heels and he has to actually be pushing and stimulating his reactive balance to keep himself from staggering backwards.

Very easy to do if you're in a hallway, turn 'em sideways in a hallway, if he staggers back too far, he can easily have some support from the other wall. Let's take a look at two other great videos in my mind. Here we've got an anteropulsive patient who has a tendency, just like you've all seen in many of your clinical expressions, to lean forward and to fall forward. So what we've got him here is up on a 15-degree treadmill incline and standing on a 20-degree incline board, and his job is to merely self-monitor, and to try to keep himself from doing what he's about ready to do, step right off of that board. So come on, Bob, hold yourself up, you can do this.

Come on, this is the type of gentleman that can benefit from this. Here's a gentleman that who would be continuously told by his wife, "Stop leaning forward, the walker is out too far in front, "you're leaning forward, take a bigger step," but instead we're giving him some controlled opportunity to work on his anteropulsion. Let's go to the next video on that if we could. And sit and keep your body as upright as you can, Larry. To me, this is another great opportunity to work on that. We're tethering him down, and I'm gonna pause it here just so you can see it, we are literally tethering him, pulling him forward, onto the treadmill, we're trying to exaggerate his tendency of leaning forward and he has to combat against the very same tendency. To me, again, another expression of taking some task specificity and combining in some intensity with balance. We'll go back to your PowerPoint at that point. Janice has a great question,

"What type of holder are you using for support?" Now I believe Janice, you must be talking about a harness, and I really want to be careful not to endorse any products, so if you'd be so kind as to email me that question, I can most certainly answer that for you. Now we want to look at the opposite patients. We want to look at a retropulsive patient, a person who tries to stand up but leans backwards. So let's watch that video now. Twice, and your eyes closed. Ready.

- [Woman] This is Jordan, he's working with us.

- Those eyes that we want. Perfect, nailed it. Here comes eyes open a second time. Good, and what I'm trying to teach him there is that he can keep himself from falling backwards. I'm putting his feet on a cushion and his toes up on an incline board. Both of those are causing him to lose his balance and to tip backwards, but by having the sheer function of having him overcome his natural tendency that we have exaggerated, he wins. Let me make that clear, we're exaggerating his natural tendency to fall backwards. I'm not compensating for it, we're exaggerating it, and then he's learning how to overcome it. Dopaminergic release, success, confidence. Let's go back to your slides. Okay, so with regard to the neurophysiology of Parkinson's disease, very important to reiterate, not just a dopaminergic loss of development from the substantia nigra, delivery to the basal ganglia, but also very important to understand the potential cognitive impairments through attention because of the loss of the dopamine loop going up to the DLPFC, the Dorsal Lateral Prefrontal Cortex, that's why we spend a lot of time taking a look at how to slow down this disease, how to protect people, and how to do a task and how to actually preemptively deliver them some of these capacities. Now, these are the rest of those growth factors that we talked about earlier, and now they're all spelled out. And in addition, from the neurochemical aspects here, of what we talked about the advent and the benefit of exercise, here we go again, or here again we go with the effects of a dopaminergic release with higher intensity. Now, multiple sclerosis, now look at this, most persons with MS decrease their physical

activity due to the worsening of symptoms, and it is now believed that the reconditioning is a viable attribute of therapy intervention for persons with MS because they have learned non-use out of fear-avoidant behavior. This is exactly what I was telling you earlier, this is left on the table for you to improve your people with multiple sclerosis, just by reversing some of the fitness-based deconditioning. So now, just like we do with Parkinson's disease, we've organized this with the same thoughtful intent, you don't need me to read these to you but I want you to know some of the common outcome measures that are suggested for, and validated for persons with MS. We gotta find potential, no one out there is ever too strong.

Remember, especially persons with MS are at a much greater fall risk when they are increasingly more fatiguable, neuroplasticity must be understood, and let me tell you again, let me reiterate this point, or actually iterate it for the very first time tonight, is that sometimes we forget to tell people with MS that we can still improve them at the level of the brain. If they think all hope is lost, and every subsequent attack on their brain is just a permanent problem that's always going to be there, then they certainly should be dashed and less hopeful.

You gotta tell 'em neuroplasticity is viable too. And we also need to help them understand that moving wrong biomechanically can actually cause pain. So we wanna try to help them be able to reestablish some of these capacities, and maybe don't sell them short so often, just like that study that I just shared with you. So let's move forward and we understand, "Hey, there's a lot on the table with regard to fitness "for most people with MS." I don't wanna generalize and say everybody, but I've never met a person with MS that's too strong, okay, and that's true for all the degenerative diseases, we can make some improvements. But one of the best things we can do with regard to balance in persons with MS is right here, somatosensory reweighting, right there. And let's talk about somatosensory reweighting a little bit so that we can understand how to get that done. We need to give these individuals an opportunity for

some brief, intense periods, not intense in terms of heart rate, not intense in terms of a massive amount of weight that is being lifted, but intense in terms of difficulty and then give 'em a break, and then take 'em back into it. Why can't we do high-intensity interval training that's balanced dosage, rest or move lighter, or move easier, balance dosage high and bring it back down again.

What I wanna suggest that we do is not just do eyes closed, because that's an easy one to be able to replicate, but the brain only recognizes the validity and the fidelity of an eyes-closed task when their eyes are closed, and then the brain goes right back to this visually dominated and dependent structure. We need to also give people the opportunity to balance when their eyes are being obstructed, or when their eyes are receiving a lie, when there's an aberration, when there's motion in the environment, or when their head is in motion, or the body is in motion, or when the accuracy is so high that the individuals need to be controlled, and agile, and precise, and not ataxic. So remember, as I suggested, intensity in this realm can mean difficulty and challenge, it doesn't have to mean heart rate and exertion. Okay, so now let's take a look at some of what we're looking at there. Another quick video and we'll be ready to fly back out into PowerPoint quickly thereafter. These are some of those visual aberrations that we can give to people. If you're too visually dependent, how about if I actually throw at you a curtain here? Use your abilities to sense what you're doing. Also, you're not gonna see what's happening, okay?

- Okay.

- Rely on your senses. Great, so let's pull back out into your PowerPoint there. That is a really one of our most fun ways of being able to help a person reduce their visual dependence by giving them a false sense through the sense of vision, and allowing the brain to say, "Hold on, let me question the eyes for just a moment, "and let me see what other senses I can pick up here." So we call that VisualLIES. There's no product to

be sold there, no financial benefit whatsoever, use it, improve it, change it, communicate with me, more than happy to see that happen for you guys because we love to do that, obviously well out of the degenerative diseases as well for persons with vestibulopathy, but really in the realms of neuropathy and MS, we love to use the VisualIES opportunity. Again, briefly I wanna go through the MSAs and lead you into a couple things there that are more specific. So here let's look at a videotape of a person, one of the most lovely individuals that I had the opportunity to work with. Okay, Lori, what we're gonna try to do now is challenge your balance while you're walking, okay? So we're going to end up having you walk at about 0.9 miles an hour, the first 20 seconds of which, we'll have you walk with your head turning side to side, the next 20 seconds with head nodding, the next 20 seconds with your feet in that lined-up tightrope position, we call it tandem walking position. Okay?

- Do I close my eyes?

- [Mike] Nope, eyes will be open. Be careful what you suggest, we might be able to hold that against you. All right, so go ahead. And your hands will be hovering once you get going on it. There we go, so she's at 0.9 miles an hour, head turned side to side, and then at the 22nd mark, you'll go to head nodding, maybe even just a little bit more full, complete motion there, all the way up, all the way down. And then at the one-minute mark, you're on to head still with tightrope walking. And you should be just about there now, that's it. Great, well, we'll stop it there and we'll go back to your PowerPoint. Now, I wanna, again, reiterate, you're only limited by creativity here. This is somebody with some pretty severe balance problems. I love the fact that I can use body weight support for her here, but keep in mind, you can additionally utilize that over level ground, try to see if you can have her walk up and down a hallway, change head side to side, head up and down, go back into tightrope, maybe in some individuals, depending on their capacities, then have them turn a 360 while they're continuing to move ahead, but in these types of conditions, we wanna hit 'em right at

what their capabilities are, give them some success, keep their balance, their sense of balance and reactive speed fresh. We're gonna move briefly into spino-cerebellar ataxias where we know the motor learning is gonna be a little bit more suppressed depending on how advanced they are, and even with regard to where they are now if they're not too advanced, we certainly wanna preemptively strike right at the areas of fitness that we can get a lot of benefit from. Get the strength up, get the rest of the fitness up, that we recognize there that I've listed. Again, consistent with how I've laid out the rest of the course, some common outcome measures for you that you can read for yourself there. And in spino-cerebellar ataxias, we certainly want to look toward the periphery for resource developments.

There are some times that we're going to wanna certainly be respectful for range of motion and other comorbidities of them as well, so we don't wanna just put it all into those categories, but we have to keep in mind, with the ballistic nature of their movement, they may end up having some difficulties that have accumulated with regard to some ankle sprains, some knee hyper extension, which would be extremely common. Some certainly fatigue syndromes and chronic pain syndromes in the low back from efforts to try to control themselves with a lot more forces than what we normally would have to use when we're up right. I do wanna take some good time to talk about something that's not often recognized in the degenerative disease class, and that would be the degenerative neuropathies. Again, the most common of which, in the degeneratives type, would be CMT. Granted, I'm well aware that there's about six other reasons why persons have neuropathy, but for right now, we're only gonna be talking about the hereditary neuropathies in CMT. What's listed for you here, I really don't have to speak additionally about. Normally we're primarily gonna be looking at reaction speed and strength, and then I also wanna again, take into consideration the same thing that we talked about with regard to multiple sclerosis. A lot of their incapacities are going to be fear-related, fear-induced and disuse-based. So now, let's

take a look at an individual that is benefiting from some lower intensity efforts here because of the buoyancy of water. Are you ready?

- I think so.

- [Mike] All right, four in a row, go. Boom, one, get past the black line. Two, land, stick the landing, there's two. Three, then get up. Good, so we'll go back to your PowerPoint there. I just wanna say, "Hey, "if we want to do some joint protection, "but we still wanna get some muscular forces "and still combining some balance, "this is another way to get that done." Now, it can happen with certainly a community pool, doesn't have to include an underwater treadmill with that as well, but keep that in mind, so we can think outside the box with that as well. Hugh, I see your question, we're definitely gonna get to that as well.

Here comes that analogy I asked you to be thinking about for yourselves, and that is neuropathy with regard to balance retraining. Can we have an individual with severe neuropathy actually improve their sense of balance and their response and the reaction speed? And I'm going to suggest to you the answer is absolutely 100% yes, and here is the analogy why. Because many of these individuals are really gonna be actually better than an individual that has had an amputation, right? Absolutely, and if you can make the analogy of a person that has had an amputation who has zero function whatsoever in their lower extremities, that can, in some fashions, even in the Paralympics, learn how to run again, what happens to allow a person that doesn't have sensation, amputation or neuropathy, to be able to learn and relearn where to pick up balance signals from? That's right, it happens centrally, it actually happens at the level of the brain. So people learn how to ignore the dysfunctional, slowed, or absence signal coming up from the lower extremities, and substitute and compensate with an impression of sensation coming from the low back, from the hips. Just like an individual with quadriplegia learns to be very sensitive to what's happened with their

upper extremities, or with their head and neck, depending on the level of quadriplegia, and then to also make all balance reactions coming from head and neck, you better believe that same viable capacity is available for your person with neuropathy and it happens because of sensory neuroplasticity at the central nervous system. So let's do a quick video here for neuropathy and balance retraining. Okay, so now you're gonna deflect the waistline backward, and allow it to sway forward, yeah? So we're actually emphasizing his use of changes at the center of mass. That's great, now allow it to sway forward. Just move the waistline, not the whole body, just the waistline. One such trouble is I can't begin.

- I'm very comfortable holding it.

- Well, try not to lean your upper body back, just push you belt away from you, there. Now go back, beautiful! Now you're learning how to pick up your balance point there. It's fine, you got that.

- Okay, I have trouble when I come back.

- [Mike] That's good, and that's what we're trying to do, is somatosensory reweighting. Hey, your most important signal is right here, your waistline, let's pick it up from there. And so we can deliver that multi-directionally, Kathleen, it's okay to go ahead and move back to the PowerPoint. But that's what we really wanna do is give him that successful experience, you can keep your balance and not everything about your balance is coming from the lower legs. So that's just a quick snapshot of that. Remember, if this individual with no sensation right here whatsoever at the lower extremities, can pull that off, then so can my patient with impaired sensation happening in the lower extremities. All right, now we wanna take some time to talk about Alzheimer's and frontotemporal dementia, knowing that these two diagnoses, by definition, are not gonna have an early and even middle-stage impact on procedural

memories. And we talked about what those were a little bit earlier on. So procedural memories are still viable and available. We need to not negate those, the presence of those, for a person with dementia. And we need to understand that how they get out of bed and how they get up to standing and how they walk, is still a very viable capacity there. And in addition, research has shown that these individuals can still make motor memory, which we should actually call procedural memories, or implicit memories, they can still make gains in that if we utilize a strategy of teaching that is going to be consistent with their ability to gain block practice exposure, and we additionally want to give them, what did we say earlier, purpose, we need to give them their balanced tasks in a purposeful condition. So extremely important that we do that, and we wanna push for procedural memories, let's take a look at some examples. We'll show you two quick back-to-back videos on this.

Look at this. He's gonna work on single extending so he can do what, he's gonna try to do it so he can tie his shoe. Try to get the other one up there so you can tie the shoe. Very severely demented patient. Okay, reach down like you're gonna tie the shoe. Okay. Now, if I would have even been more proficient and we'll skip to the next video there, I would have actually said, I might have even untied his shoes. Hey, if I wanna work on his ability to stand on one leg, and we know that's a challenging, stimulating, viable capacity, then I probably should have said, "Don't reach down like you're going to tie your shoe, "hey, let's reach down and retie your shoe," I could have even done that better. We're gonna flip to the next video then and we're gonna watch the same patient do something else that's gonna challenge his balance in a functional manner. He's simply gonna try to drink a glass of water but I'm tipping him backwards by putting him on an incline board, and for him to empty the rest of that water, what's he gotta do? He's gonna have to stand up straighter here, he's gonna have to tip his balance back just a little bit more, and he's going to have to work on a stimulating balanced task, right there. So if he can pull himself up, keep himself from losing his balance backwards, that's a win right there. And I don't have to say, "Hey, we're

working on balance," all I have to say is, "Here's a glass of water, "can you go ahead and drink that up?" just check in to see if he's thirsty. We can actually integrate real-life balance challenges if we're creative enough. Let's go back to your PowerPoint there. Okay, so keep in mind, persons with declarative memory problems, executive memory problems, dementias, can actually still learn when we're utilizing procedural memory training. And I, again, wanna make certain that that point is clear in the brief amount of time in two hours, in a degenerative disease class. I can't go into the entirety of that, but I want you to look into that, I want you to look at studies by Baddley, and I want you to look at studies that involve video gaming in persons with dementia, and I want you to study about HM, the most famous research patient ever who had intractable bilateral temporal seizures.

So he had to have a temporal lobectomy, didn't have any procedural memory whatsoever, but was still able to actually perform and learn. So there's so much to be gained from that just diving into that. Remember, procedural memories aren't just how I dress myself, this is just a short list of some of the natural tasks and capacities that should be available that are procedural memories for people. Depending on their experience and exposure with a wheelchair, you may or may not have a procedural memory setup for that. But these, this is just a short list of things that you can expect people will have stored in their brain, even when they get into advanced realms of dementia. So we'll move on from there. Certainly, as I've organized the rest of the course, take just a second to take a look at some of the more standardized capacities then, or standardized tests that we utilize for persons with dementia, with regard to functional outcome. All right, we'll go from there. I'm gonna let you watch a couple of really fun videos that we're working on right now to help persons with mild cognitive impairment to do some functional-based cognitive stimulation in combination with their balance. Let's watch two different video tapes back to back here. We'll be ready to key each one of those up.

- Box, early bird catches the stone. Empty bags can't not fill by themselves. Good things come to those who worry. Honesty is the best way to dishonesty. Ignorance is bliss .

- [Mike] Okay, I'm gonna pause right there. The goal with the Hayling sentence inhibition task is to take common idioms, leave off the way that is normally finished, and have the patient actually come up with an alternate or a substitute ending. So in this situation, for a person with mild cognitive impairment to be able to keep up with the speed on a treadmill with hands off, trying to actually inhibit the frontal lobe, we know that his walking is being challenged on a level of automaticity. So when he said ignorance is, ignorance is, hmm, not bliss, he should have come up with something like ignorance is sunshine, ignorance is fanciful, ignorance is darkness, he needs to come up with an alternate ending to that. But it's very challenging for a person with these levels of impairments to do that, we're gonna flip to the next video though. Okay, so you're gonna start in the number one. This maybe look familiar to a number of you, this is the trail-making test. So he's supposed to move from one to A, to two to B, to three to C, to four to D, et cetera, et cetera. Now, let's watch what happens with him. Gonna go right after this?

- A.

- [Mike] Where are you gonna go after that?

- [Patient] B.

- [Mike] Ah, you wanna go to the number two after the A, so it's always number, then letter, than back to number, right? So it's one A, then the number two.

- Then two, B.

- Right. And then where would you go after that?

- 3C.

- Correct. All right, I'll let you go ahead and get started now, you can begin.

- [Patient] Okay, one A, two B.

- [Mike] Okay, and I think all of you get the idea with that, he's gonna have a great deal of difficulty with it. As you may see on your screen, it's gonna take him four minutes and 38 seconds to get through this, that's a very long period of time, he's gonna require some cues with them. If any of you would like access to how we created that in our PDF version that you can just send off to a printer and print off on to a large banner, I can certainly share that with you, no problem there whatsoever, and again, no cost to it, no financial gain whatsoever. We love doing this so that we can help individuals combine in a cognitive and a motor task together. We're gonna go back to your PowerPoint at this point. While we're flying back to that, Ursula had a question, "I understand that individuals with dementia "can learn procedurally, but what about recalling?" There are some suggestions that individuals can make some gains there. They're very few and far between, it really depends on what stage of dementia that we're talking about, and there's not great evidence that there's much carry over in this. I would ask you to take a look at a study that's probably nearly 20 years old, and then some development since, look at a primary author Baddley, B-A-D-D-L-E-Y, that looks at persons with dementia learning how to face-match, so match a photo with a name for someone that is absolutely a stranger to them. And then I believe there was one more question. Tom had said, "Cardiovascular endurance training "should be performed in cumulative 10 minute," I can't see the rest of your question right there, but what I'm trying to suggest there is that, oh, yeah, "and/or performed using

perceived exertion." Okay, so when it comes to the questions at the end here, and regarding the test questions, I'll get to those for you, so we absolutely wanna cover both of those. So as we wrap up here, we've got a few more slides to go, thank you for your question, I'll definitely get to that. So keep in mind the general summary and overview here, I think these bullet points speak very nicely for themselves. We have to keep in mind to always to personalize, even beyond just the description of what should be suggested for a degenerative disease. I wanna give you a few more things to look at, resisted walking multi-directionally, which we just used with a regular universal gym set. And you could be adding on 20, 30 pounds to a patient who's actually working on strength with balance. Do keep in mind this application of walking against resistance, keep in mind that we can do some strength training in a dynamic fashion with these as well, where a lot of times we forget about doing strength training in function and with the function of balance. We talked earlier about the resource of functional strength and conveying this, and converting it into a power expression as well with time, we certainly need to look at the cardiopulmonary intervention as well, so keep in mind keeping the dosage, giving individuals that 30-minute, or that cumulative 20 minutes, but keeping in mind that the dosage must be based with their perceived exertion. For most of these, we want them to live in about a six, seven or eight in terms of the perceived exertion that they are living at, for true dosage. Every person with every degenerative disease is still a person. What their likes and dislikes are, and have been, what their avocation has been, what skills they bring to your therapy because of their vocation. And sometimes they'll still remember some of these types of capacities. Make analogies for persons in their context, in their lexicon, as an engineer, as a businessman, as someone that was a salesperson, try to tap into things that are meaningful and within their wheelhouse, in how they spoke, and things that they should be very familiar with. In addition, I just wanted to give you a couple other resources here, just as bonus, I like to think about my dosage of balance to keep it variable and fresh, so that not everybody's just working on eyes-closed, or head rotation, or standing on a cushion, these are the different contexts and the different

taxonomy that I use to be able to apply some balanced training for individuals. So obviously, they're divided into four categories, base, surface, motion and vision, and it's pretty comprehensive. In addition, I wanted to make certain that we take a few moments just to address the frail patients with degenerative diseases. And remember, patients with frailty still also need to be given that respectful opportunity to know that psychology is a big part of their improvement too, they need to see themselves improve. And sometimes we too often think that because we can't do a six-minute walk test, or because we can't do the entirety of a BESTest, that there's no good measures that are out there that are viable for a person with frailty, and nothing could be farther from the truth. There're several of the tests that I'm most in love with right now that I work on, including the minimal chair height stand test, what's the lowest surface that you can get up from without using your hands? And maybe due to your frailty, I've gotta modify that and say, "Okay, we're gonna let you use your hands, "but what's the lowest surface that you can get up from "without any physical help?" And maybe that's gonna be 26 inches. But hey, if I need to see myself improve so that I can be engaged, and actually feel like I can get better and have some intensity, then measure me now, measure me later, and show me that I've improved. I made it from 26 inches with my hands but no help, to 24 inches with no help. And then maybe I finally made 24 inches with no hands. Give me an opportunity to see that I've improved, something that isn't just coming from the therapist's mouth, with "Yay, you're doing great. "Wow, this is so good, you've improved so much," give me some measurements to show me that I've gotten better. This is just a brief list of that. It's a about psychology and rehabilitation as well. Remember, even in balance for frail persons, we need to think about building resources, strength, power, cardiovascular and muscular endurance, and the neurochemistry that I said it's available to everybody. Dopamine, success with surprise, serotonin, I'm choosing to do this for my own benefit, Alzheimer's disease, I feel purposeful, I'm helping these people out, neurochemistry. As I suggested to you, I'm going to give you certainly my direct contact information, my website, get ahold of me however you like. What I'd like to do at this point is start to

field some of your questions. And then if we could, Kathleen, I'm gonna ask us to fly all the way back up to the top and see if there's any videos that we left unplayed, 'cause I just really wanna be able to give the rest of the full experience here. Let's see here. Good, thank you so much, I'll be able to see them pretty quick. Okay, we did that, we did all of those, pathway deviation, let's look at the next series there. I think we got through all the videos. Yeah, we, as a matter of fact, did. So let's take a great opportunity to get through all of your questions. We've got 350 of you online here, so let's see what we can do. So Thomas, your question here, we'll just kind of explore this window so I can see your question a little bit better. "Should we perform in a cumulative 10-minutes set, "and/or perform using perceived exertion?" And I would actually say that, for me, both of those are appropriate than two.

So I'd have to look back at the question, hopefully, I gave you an opportunity to choose more than one. And I wanna be careful not to just go through the questions and answer them for you, because I think we did a good job during the presentation of doing that. So with that one addressed, maybe we'll go to another question here. And if we can just manage that box so I can actually click off of Thomas' and see another one, maybe we'll just bring it back down. Here we go. Okay, so Virginia, okay, looks like we've got that. Laurel, I think they'll be able to get your question for handouts addressed. And Rose, I think the moderators will help you out as well. Thomas, I'll try to go back and see here. For question number seven, "High intensity exercise "in Parkinson's disease has what effect?" and that's as far as I can read it, maybe we can slide that over so I can see the rest of his question. Or if you want to, you could type it into me or read it to me, but that's all I can see. For question number seven, "High intensity exercise "in Parkinson's disease has what effect on the?" and I just need to be able to see the rest of that to answer it for him. Okay, "High intensity exercise in Parkinson's disease "has what effect on the brain?" Oh, wow. So Parkinson's disease, just we understand that we can actually slow the disease process, we can cause dopamine to be released, we can cause brain-derived neurotrophic factor to be

released, giving us a neuroplastic experience. All of those are certainly viable, it can actually reduce the likelihood of degeneration in the substantia nigra, very specifically, and I know that I did not write this in the question, but just to give you greater edification here, it can keep the medium spiny neuron in and around the substantia nigra from breaking off at the stock, or the neck of that cell. Calista, thanks so much for typing that into me. Hassan, let's see, "Very interesting topic "and needs more time." Yeah, yeah, and that's exactly correct, yeah. So Laura, looks like we've got some handouts coming your direction. Okay, so Sandra, "Expand on the optimal," I believe that's what, yeah, "the optimal theory of motor learning."

Yeah, I would love to, I do entire full-day classes on the optimal motor learning theory. So the optimal involves three different main rail, if you will, one, giving patient autonomy, two, allowing individuals to see themselves improve, or having what we call enhanced expectancies, and then three, delivering feedback more at the goal rather than than at the body part. That is to say, rather than giving people feedback about "Stand up taller, stand up taller," we actually can give them an opportunity to beat a goal, stretch the cord, as I tie that patient down toward the front of the treadmill, rather than bark at him about the angle of his back, and then he's leaning forward too much, we can ask him just to work on the goal, stretch the cord.

And that would be a very simple application of that. For more information on the optimal motor learning theory, you may wanna look the direct source up, Gabrielle Wulf, W-U-L-F, and Rebecca Lewthwaite, but as soon as you start typing in optimal motor learning theory, or Gabrielle Wulf, you'll have much more reading than I can actually even begin to try to cover in content, for yourselves there too. And Rose has a good comment here, I can see part of it. Here, let's see here. Okay, here we go. Okay. So Calista, "According specifically "to the optimum motor learning theory, "persons with degenerative diseases "cannot be expected to improve and retain motor learning, "they can only demonstrate motor performance." Okay, that's option A. Option B,

"Balanced rehabilitation might be best carried out "in a functional task-specific setting." And then answer C, "Balance rehabilitation includes repetition, "block practice, and a functional context." And D, "Is assigned when the instructor "or therapist sees aphasia." Well, I certainly can help you out here, and thanks so much for typing that in. The optimal motor learning theory, if you're specifically just asking about that question, the correct answer certainly would be C. We need repetitions, especially in degenerative diseases, we're allowing individuals to experience some block practice, and we also wanna give them a functional context for best carry over, for optimal carry over for tasks specificity. Okay, and it looks like we've covered everything there. Okay, well, I'm not seeing any new questions come up, so Calista, maybe I'll kick it back over to you to see if I should stay on any longer, or if we've got everything covered.

- [Calista] All right. Well, we do have a couple questions in here, I think, regarding a couple more of the quiz questions. So I'm gonna pose those to you Mike and let you go over those. One of them is question nine, and it reads, "Perceived exertion is used as a measure of intensity "in Multiple Sclerosis because, "A, possible autonomic nervous system involvement, "B, patient response to exercise can be tracked more easily "from session to session using a perceived exertion scale, "C, exacerbation of MS is a frequent occurrence in therapy, and D is, "A and B are both correct."

- [Mike] Yeah, and absolutely, that is the case, it would be D, that both A and B are correct. We don't wanna feel that individuals are quite as likely, as we once thought, to exacerbate with exercise, we definitely wanna use perceived exertion for them, and one of the main reasons why we use perceived exertion is exactly what I said in the course, is that the autonomic nervous system is not necessarily reliable. So we talked about that in MS, and we also talked about it in the multiple systems atrophies, especially the subtype A. So correct answer D, skip right over C, yes to A and B.

- [Calista] All right. And I believe we had a couple still want some clarification on seven. And that's when you were discussing the high-intensity exercise in Parkinson's disease. So it says, "High-intensity exercise in Parkinson's disease, "A, may stimulate brain-derived neurotrophic factor release,

- I'm gonna say yes to that.

- "B, make, okay. "B, may cause the brain to regenerate the substantia nigra, "C, may cause the body to release carbidopa, "and D, may stimulate dopamine reabsorption "into the cerebellum."

- [Mike] Yeah, and actually the only correct answer on that very clearly exactly what we stated in the course, the only correct answer is A. So we don't worry about dopamine heading into the cerebellum, not that it never does, but it's just really not a viable part of Parkinson's disease there, you cannot regenerate the substantia nigra through high-intensity exercise, but you can reduce the speed or expedience of destruction in the substantia nigra, and then answer C, I'm not recalling exactly what it was but it was completely fallacious, and I made that one up, but answer A is the only correct answer, very clearly on that.

- [Calista] All right, let's see. We have one more, I believe, on number five. "Balanced training in degenerative diseases should be, "A, perform three to five days per week at most, "C, causing a person to need help "to prevent a fall 50% of the time, "C, including standing and feet together nudge position "and eyes closed for all, and then D, "involved dynamic balance as tolerated."

- [Mike] Yeah, and again, here, we would wanna use D, we'd wanna get some dynamic balance in there for these individuals who wanna get the function tied in, and that's what we talked about in the class, is that we wanna keep balance exercises as

functional as possible, we don't want to have everyone just doing the same balance exercise with their feet together and eyes closed in a nudge position. We additionally wanna have persons working in body-and-motion type of environment. So away from the statics, away from the cookie-cutter opportunities, and into the dynamics that give people a functional expression of balance, so I would say D is the answer there.

- [Calista] All right. And as I'm going through these, David had a question, "Subjective RPE, "or are we all one-rep-max testing the patients?"

- [Mike] Oh, yeah, that's a great point. And we talked about that when we talked about the minimal chair height stand test. So keep in mind that the minimal chair height stand test is one expression, probably the one of the easiest things that we can look at as a one-rep max, what's the lowest surface that you can get up from without using your hands? So that's a one-repetition maximum. If you wanna build from there, and again, there's only so much we can do in a two-hour course, but if you wanna build from there using that as your one-repetition maximum, the science would be that you take that as their 100%, and you give them an 80% of that height to be able to build a strengthening dosage. So, for example, let's say that an individual can actually get up from a 20-inch high surface, and that's the lowest surface that they can get up from without using their hands. Call that your one-repetition maximum. If I wanna give you a strength dosage that's built off of your one-repetition maximum, now I do that at 20% lower than, or easier than that height, which would mean I would give you four inches back because that's 20% of 20 inches, and I would do your repetitions, eight to 10 repetitions at 24 inches, with no hands. That would be one of the easiest ways for me to express that to you. Hopefully that answers that question.

- [Calista] All right. And we have a question here, "Is dual-task training counter-indicated "in Parkinson's disease patients?"

- [Mike] Hmm, absolutely not. Great question, one of the things that we talked about is using dual-task training for persons with Parkinson's disease, especially for a number of different reasons. Number one, not everybody with Parkinson's disease actually has losses in the dopaminergic pathway to the frontal lobe, the DLPFC, the Dorsal Lateral Prefrontal Cortex, so keeping in mind that a number of these individuals with Parkinson's disease have bradykinesia, have hyperphonia, have rigidity, have dyskinesia, not everyone has losses in the attention center, that's number one. Number two, a lot these individuals benefit from that type of preemptive training, which is exactly what I said in the course, let's get some delivery in before the disease gets too severe, and let's do some dual-task training with them before they've lost some of their attentional reserve or prioritization capability. So you absolutely wanna do that with persons that have Parkinson's disease.

- [Calista] All right, it looks like Dennis has a, oh, let's see. "Can we have examples for creative and modified activities "that we can apply at home care?"

- [Mike] Sure, absolutely. And I could go on and on about this, you'll just have to stop me when you've heard too many, but I love walking in a hallway with a person with Parkinson's disease and just having them take a self-selected approach at it. And I'd like to actually count the number of steps that it takes for them to get to the end of the hallway. Let's say for example, it's a 17-foot hallway and it takes them 31 steps to get down to the end of it. One of the best dynamic expressions of balance that you can work on is say, "Okay, "now let's see if we can make it to the other end, "back to where we started, "and see if you can take fewer steps." And maybe they're gonna shoot for a goal of making it in 28 steps. And then we go back again and see if they can make it in 25. Remember exactly what we're doing is we're goal-directed, so that's an external focus, we're enhance expectancies, "Let me count the number I can get "and see if I can beat the count," and then maybe we can fold an autonomy, where the patient actually tries to set a goal for themselves, that's one great way. Additionally, we can do

some timed-up-and-go type of trial testing, or shuttle testing, for a patient at home. Let's see how fast you can get from your recliner chair over to the couch, sit down at the couch, stand up from the couch, come back over the recliner chair. And let's do some some shuttle testing that you might do with an athlete, and let's actually give the patient with Parkinson's disease, with multiple systems atrophy, with multiple sclerosis, or other type of degenerative disease, an opportunity to be competitive. So we'll do some shuttle testing and work on those types of expressions. As I mentioned with Lori, who was up on the treadmill with multiple systems atrophy, we can walk down the hall and have head rotation side to side, head nodding up and down, turn around in different circles, we can do dual-tasking with a person who's wearing a purse over the shoulder, and having them walk and try to pull an item out of their purse, we can have patients do minimal chair height off of different surfaces without using their hands in their home. Those would be just, I mean, that's seven different things that I've given you right there. Hopefully that gives them a little bit more insight as well.

- [Calista] Wonderful, okay. We have a question here, "Do you have any good indicators "for moving from body-weight-support training "to without body-weight support."

- [Mike] Good indicators for that. Yeah, as a matter of fact, what I like to do when I'm about ready to make that progression, is I will begin to detach some of the harness attachments depending on whether I'm using a light gait or something else, or I will lower the tether, lower the tension that is on the body-weight support, and begin to examine to see how well an individual will do with that, and those are two of the best ways to be able to systematically progress away the actual support, while not completely taking away from the safety net before you actually give the patient an opportunity all together. Depending on cognition, skill of the patient, desire, fear, et cetera, I may actually have an individual get up on to the treadmill without the body-weight support when they've already proven to me that they have some capabilities and are not relying on the harness so that we can actually make a

translation into a gym-based program or a home-based program, and certainly we would dial down some of the parameters that we would work on when we're asking them to operate without a harness, but that should give you a pretty straightforward opportunity then, too.

- [Calista] All right, we have a question, "Exercises with Parkinson's disease patients, "should they be highly resisted exercises "or lightweight exercises?"

- [Mike] Great question. I know that the research would support both of those applications. Remember, if we're gonna use lightweight, we wanna be able to do that in a non-ballistic manner, at least, that would harm them, but it is completely indicated to back the way down and move for some power. So move quickly, and then move in an eccentric fashion more slowly. So again, move up fast, move down slow. One expression of that, when you talk about lightweight, could actually be a very easy surface to get up from. Jump up fast, sit down slowly. And the same would be true with regard to handheld weights or even ankle weights. In addition, there are times that we want to have individuals work on strength, and strength requires the higher designer forces. So probably one of the first 18 slides in the presentation, we talked about strength and the dosage requiring about 80% of the capacity for the individual. That's true still, for Parkinson's disease. It's ever more true with Parkinson's disease, because we wanna have these individuals get an opportunity to dial into some recruitment of extra forces. This is extremely helpful for persons with Parkinson's disease, to try to get some forced delivery, to break out of the bradykinetic type of presentations. So, the answer is yes to both, different expressions for both, different emphasis, one's for strength, one's for power.

- [Calista] All right, we have a few more. One of them is regarding nine. "So perceived exertion is used "as a measure of intensity in MS, "because A, possible autonomic nervous system involvement, "B, patient response to exercise can be tracked more

easily "from session to session using a perceived exertion scale, "C, exacerbation of MS is a frequent occurrence in therapy, "and D, A and B are both correct."

- [Mike] Okay, I do believe strongly that I've answered this one already once, C is an incorrect answer,

- I think so.

- [Mike] A and B are correct, which means D is the selection.

- [Calista] All right, and one more regarding the quiz. And that's on the cardiovascular endurance training in degenerative diseases. "Should we, A, perform using the Karvonen equation "with a target heart rate of 70 to 90%, "B, performed an a cumulative "10-minute setting manner for most, "C, performed using perceived exertion, and D is, "B and C are both correct."

- [Mike] Yeah, and if I heard you here correctly, you have A as being Karvonen, is that correct?

- [Calista] Correct.

- [Mike] Yeah, so the correct answer on this one is very clearly D again. So, thank you for taking the time to read those. They're a little bit harder to actually process just with everything we've got going here, but it's a clear answer of D on that one again, and thank you again.

- [Calista] All right.

- [Mike] I love the fact that we've got this many individuals that are asking all these questions and really add some efforts to really translate it into your home health setting, and to really give individuals an opportunity to translate and progress these individuals. It's such a hot topic, I really appreciate your interactions. I do have to apologize for being late to the webinar, that's completely on me and not a function of physicaltherapy.com, I wanted to take the opportunity to do that here during the question section, rather than kind of in the recorded webinar version, which I know we're still at right now, but again, thank you for your patience on that, and your persistence to stay on the course as well, I'm happy to spend more time if we need to. So again, I wanna acknowledge your efforts there, that would be a rarity, and that was completely my fault on that too. Even when I got ready to log in, I had a computer that this is the bane of all of our existence, was taking time to restart. So again, I apologize, and thanks so much for your patience on that.

- [Calista] All right, we're gonna close up with one more question and I know Mike has provided his email, so if you have any follow-up questions, Mike has graciously provided his email, so if you can follow up with him. We have a question from Maria and she says, "Can you please give a couple of examples "of visual aberration-enforced accuracy exercises?"

- [Mike] Yeah, absolutely. So we love the visual aberration, and we do it in so many different ways, by sometimes actually taking a tablet in front of a patient, or a laptop in front of a patient, and have a scrolling screen that gives persons the misperception that there's motion occurring. I love hanging a curtain in front of someone and I, a lot of times, are going to use a very ageometric floral pattern shape as you saw there, so we like to use the visual aberration there. And that can additionally be done with a more of a checkerboard pattern as well. Forced accuracy is something that we try to utilize when we're having individuals do something that you saw in the presentation when we had them walk a very tight pathway that was weaving throughout the treadmill. So that

would be one example of forced accuracy. We additionally will have patients actually step on Post-it notes, or on the chalk markers that we put on the treadmill belt, those would be some expressions of that. Please understand that both of those are completely viable in a home-health setting, or without a body-weight-supported treadmill. Putting a very tight obstacle course down would be more of that forced accuracy in terms of pathway, and then obviously, stepping on different obstacles and hitting every single one of them, using an agility ladder, many other things would be related to that. So, hopefully, that's about six or seven different opportunities for you to see both of those expressed in other manners.

- [Calista] Thank you so much, Mike, for sharing your expertise with us once again, and thank you everyone for attending today. We're gonna go ahead and close out the course for today, and hope to see you guys in the classroom real soon.