Geriatric Strengthening: Defining the Dosage and Debunking the Myth

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- [Calista] All right. Our course title again is Geriatric Strengthening: Defining the Dosage and Debunking the Myth and it is my pleasure to welcome once again Mike Studer at physicaltherapy.com. Mike is the owner and lead therapist at Northwest Rehabilitation Associates in Salem. He was Salem's first board certified clinical specialist in neurologic physical therapy and has been since 1995. He is also the only therapist in the nation to be awarded the Clinician of the Year by two different sections of the APTA, that will be the Neurology and Geriatrics Section, and 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 rehab, cognition, balance, dizziness, and Parkinson's disease. So thank you again Mike for returning to physicaltherapy.com and at this time I'm gonna turn the microphone and the classroom over to you.

- [Mike] Okay well welcome everyone to our third webinar of this week. It's been a great week and wonderful numbers of attendees and great questions from all of you, both during the presentation, as well as questions to me at my personal email afterward. So thank you so much for your energy, your efforts and really your passion for the care that we've been talking about, starting off with Monday's effort to really look at the science of stroke rehabilitation, then Tuesday balance in the degenerative diseases, and we're back here on Thursday looking at geriatric strengthening, defining the dosage and debunking the myth with a little bit of overlap that will have a common thread because science is something that is the basis of our treatment and one of the underlying principles truly will be dosage that we are talking about in all three of those today. Today we're gonna take a little bit of a different direction and look specifically at healthy aging, abnormal aging, and really take a look at adjusting the prescription of dosage specifically with regard to muscular strength, but also in the related fields of muscular power, as well as muscular endurance and really trying to engage the learner throughout our efforts to achieve their eventual outcome of greater function and

through that in today's webinar we're gonna specifically be talking about strengthening. So let's move on from there and clearly you all have signed up for a webinar that is going to be applicable, something that you can use to make change in your clinical practice. I would expect that after this course, you're going to be able: to identify the dosages of geriatric condition in the arena of muscular strength, in the arena of muscular endurance, and I want you to be able to clearly define some conditioning interventions that you can use for the geriatric patient, which for tonight's purposes we're going to define as an individual over 65 years old, a pretty common definition on that as well. What isn't quite as common of a definition is what to expect in normal aging.

There is quite a bit of advance and advancement that has taken place over the last even decade with regard to the entirety of the medical profession and how we speak about aging and what our expectations would be. It had been previously thought not too long ago, I've been practicing for nearly 30 years, that memory decline would be a normal attribute of aging. As you see up there in the rest of the bullet points on this slide, these are sentences that you probably have either heard your patients, or their loved ones and caregivers, or other medical professionals, or perhaps depending on how long you've been practicing, maybe even some things that you have iterated yourself in your career that an individual is expected to, fill in the blank, can't gain strength when they are aging, individuals can't actually gain endurance as they age. We know that this had been the prevalent mindset, but we also identify and understand that our understanding of the science of normal aging and the physiology therein has advanced.

So we wanna be able to effectively debunk these myths and we want to be able to apply the practice that keeps individuals improving significantly. So what you may see from the individual on the left is an individual that looks to be dependent on a front-wheeled walker, bent over and actually with some postural impairment. Perhaps

you might surmise some osteoporosis. You might even surmise some weakness, very specific to what we're actually talking about today, but what I would ask you to do throughout today's efforts, and then one of the main applications I believe that you can do to be more effective in your efforts to strengthen individuals, is to engage the intensity within by knowing the person you're working with. So as you see on your left, what you see could be this and what I'm asking you to do is take a little bit of your initial examination and find out about this person so that we can understand what you could hear about them. What were his vocation, advocation, roles and responsibilities that are integral to who this individual is. So you may or may not know that he has in his former vocation, "I've been a big engine mechanic." Now how are you gonna use that to your advantage?

Perhaps you're gonna talk about a strengthening exercise, and maybe even apply something that makes it seem as though he's lifting an engine out of a car, or getting underneath a car, or he's actually lifting a tire up and getting ready to move it over toward a vehicle that he's getting ready to repair. You don't actually have to carry those things out, you may even be able to imitate some of them, but you need to understand that if you don't know that this is what his vocation or even advocation has been, you will be missing out on opportunities to tap into some intensity by working through your goals into what he prefers to do and what he enjoys.

You may not have unknown that he's a former college football player, and that right next to you here you've got a functional trainer that you can actually tie a waist belt up to him and have him pull 20 pounds as he's walking with his walker and act like he's getting ready to move right through that defensive line and try to see if you can block for his running back, knowing that he was formerly a college football player on the offensive line. If you don't find out enough about him, you don't know that he enjoys golf and was competitive in that and he would love to be able to work on power, which means the speed and that he is traveling that club head through, and he's gonna be

willing to work on strength in a functional trainer, in a thera-cord, or in another manner that would involve some prescription of power and be very sport-specific, enjoyable and intense for him. If you haven't learned enough about him, you wouldn't know that he's a proud grandfather of eight and the youngest of which is 18 months old and that he would enjoy being able to sit down and lift that 18 month old onto his lap or to be able to carry that child or hold that child in his lap at the very least. And if you didn't take the time to learn about this individual, you wouldn't have understood that he has primary concerns not only about his own health, and maybe actually even more than his own health, concerns about being a burden on his wife. He's worried about how much their co-pay is, how much time it takes from her to set things up for him and to get him out of a car, or for her need to be there with him to get up out of bed or off a toilet seat, or even just to transport him. Imagine just in the five things that I've talked about right there how much of your treatment session you can use focusing on strength that's based on the individual.

You're going to be able to tap into his strength, tap into things that are meaningful for him, and really utilize and leverage the biopsychosocial aspects of care in a much better manner than had you not taken that time. So I want you to really see this slide and understand that there's a lot of material in here. So as we have our own expectations of aging and we've reset the understandings of what is obligatory and normal with aging, we try to move into the future and debunk some of the past myths that have been purveyed. Rather than reading these to you, I want to just leave these for you and understand that the primary highlights would be that even if an individual's aged and that they won't ever be as strong as they were at 19 or 23, that improvements are plausible at any age, that much of the loss is actually a use-it-or-lose-it mismatch with an atrophy of the musculature, or of a deconditioning of the reaction speeds. Those things come into play with regard to memory, and choices, and problem solving, and cognitive reaction speed. When we don't use and stimulate those capacities regularly, we would have a tendency to prune those out and lose

them. Now again I will not spend much time on this slide either. I think it's an important one for you to have if you're going to be in a position of advocacy and really by next year, in less than two months, we understand that these statistics are all true, that the amount of individuals that are requiring physical assistance to perform some ADLs or mobility-related ADLs over 65 is one in every five individual. So these are some of the conditional statistics that we must be aware of. When we're working to try to decide our programming, the advancement of our clinics, the health fairs that we are participating in, the educational lectures in the community that we are delivering, these are some salient facts that we must be aware of and things that we use as a platform to be able to educate our patients and caregivers.

So now let's continue on with what is expected and what truly is physiologically expected in aging. Now you might wanna pay some attention here. I have heard that there's an examination that you might take at the end of the course and there may be some things related here, such as the elasticity of the skin going down, such as the fact that your VO2 max is going to go down, and that happens as a function of the loss of one heartbeat per minute per year. Now that's a very rough average, but please do keep in mind, that's exactly one of the functions that really take a look at how the VO2 max goes down.

So additionally, now this isn't in pathologic conditions, we understand that there is expected to have a loss of motor units and muscle cells as we age. Keep in mind that that's gonna be a preferential loss for individuals with regard to their Type II fibers. So this is where you'll actually lose a little bit more with regard to power than endurance, but we'll lose both of them. In addition, we see that these conduction velocity, how fast I can get a message out to the nerves and how fast I can get a message back to my brain on a sensory standpoint, visual acuity, hearing, conduction, and acuity accuracy all goes down as well. Those are things that are normal and obligatory in aging. We talked about the motor units and you'll see some different nomenclature here, Type IIx,

Type IIa, Type IIb, Type II, and then Type IIa, but essentially what I want you to understand here is that the power fibers are more preferentially lost with aging and there is loss across all of them. We're talking about motor units and muscle fibers themselves, both. Now we do understand that these do not have to happen with aging and they're not a function of aging, but they're more common with aging. So these are eight of the most prevalent conditions that you will see during the aging process, but not a function of aging. It's important we take just a moment to take a look at each one of these and the fact that some of these are actually related directly to our strengthening. So the ability to be intense and to follow a sequence, or to follow a command, or stay with the repetitions in an exercise, the ability to painlessly exercise here in degenerative joint disease.

We certainly do understand the we're not going to ask, you may have a test coming up toward the end of this presentation, we're not going to ask individuals to exercise through pain, but there is plenty of research that helps us understand that individuals actually benefit from strengthening and reduce their lower extremity functional scale difficulties, so they actually improve that score, reduced some of the impairment indices as they strengthen, even with degenerative joint disease, and as well as the other forms of truly rheumatoid arthritis which we'll be talking about as well.

So two different forms of arthritis, but we understand strengthening not requiring the individual to strengthen through pain, but strength itself modified can actually and has been statistically shown to improve their pain outcomes and functional scores. Same is gonna be true with degenerative disc disease, having increased stability around the joint, and being very understanding of the directionality of their pain. The same is gonna be true with these. I'm not gonna spend too much time on those, but understand that these are actually two different things, multi-infarct dementia and more dementia that would be of Alzheimer subtype, or frontotemporal dementia, more progressive. Multi-infarct may have come on all at once, with perhaps a

thromboembolic showers, a vascular dementia, which can be progressive as well, but different from these forms down here, we understand can certainly influence our ability to get a strength dosage in. To truly debunk these considerations, you could fill in the blanks of all the rest of these. I just kinda started them off for you. I don't want you to be able to buy in and I do want you to be able to diffuse these sentences of, well, if you're over 85 years old, you cannot gain strength after this age. The same might be said of endurance and balance, and again not to waste your time on this. This is exactly what I want you to be able to debunk by the end of the course today, again the main point on those being that we're not saying an individual is going to be as strong as they were. Yes aging should rob an individual of their ability to access motor units and the strength of those fibers not only of the contractility of the fibers themselves, but also the tensile capacity at the level of the tendon, but do keep in mind that individuals can make gains. So now when we talk about how to intervene to be able to gain strength, I think it's extremely important to define the categories we're gonna look at today. Fitness is not fitness.

So there are four different peripheral categories of fitness here when we talk about the ability to exert. Now those are separate from the capacities that are skill-based, balance, which is an integration of many resources, and then also flexibility. We're gonna be talking mainly about intervening here today. We will touch a little bit on balance though as well. Now straight from the American College of Sports Medicine, this should be familiar to some of you that attended either on Monday or Tuesday night. We're actually gonna make a little bit more strength-specific advancement in today's presentation because that's a greater focus, but we know that muscular strength is something that we often miss the dosage of when we're working across all populations, but most specifically for persons that are older individuals, older than 65 years old. The most common problem is that we underdose an individual. The second most common problem is that we would begin a strengthening program without alerting the individual to the fact that muscular soreness can be, a warranted delayed

onset muscle soreness can be a warranted side effect that demonstrates we've had good dosage. When we miss those two things, either by underdosing the patient or not letting them know ahead of time to expect soreness, then we can have lost the patient and we can have, and that's a big crime to lose a patient by not letting them know, we know how to work with someone of their age, we expect that a good dosage, a good delivery of strengthening will include some soreness, that's one problem can cause us to lose a patient after one or two visits. Maybe that's just as big of a problem as the other very high crime if you will that we actually take the patient, accept their care, take their co-pay, take their time, and we underdose them. We don't provide enough stimulus to actually get them stronger.

How many times have you found yourself working with a patient and you're hoping that with a three-pound wrist weight around their arm, again right at the wrist, or maybe you take it as an ankle weight, and you have them work on walking with the ankle weight or maybe they're doing an upper body ergometer with the wrist weight or maybe they're just doing open chain lifting overhead with the three-pound wrist weight and they can achieve 20 to 25 repetitions, or in the case of walking, maybe you're actually even doing something with them that has him do two minutes worth of walking on a treadmill with ankle weights and you're hoping to increase their strength. I applaud the effort, but keep in mind that just purely straight out of science, it doesn't matter what age you are, you're not working on strengthening. You're working on muscular endurance.

We'll get to that slide in a moment, but I want to understand, if it doesn't fit within these categories, you are actually not working on muscular strength. The categories are clear. It has to be a resistance that you can only perform correctly and well for about eight to 12 repetitions without starting to compensate. We try to use the RPE scale for most individuals and give them permission to exercise in about that realm of six to eight on a scale of one to 10 where one is easy and 10 is the most they can possibly lift. You may

choose to use a visual analog scale for individuals as well. For those of you that were on Tuesday's lecture, you know that we actually made some qualifications here with regard to degenerative diseases and we understood that some of those individuals should be exercising at a slightly lower level than that, but we also understood that a lot of even the problem with persons with multiple sclerosis is that we actually did not use the RPE scale and/or that much of their losses in terms of functional fitness was self-induced due to fear of exercising. So let's apply the science, let's educate the science, and let's talk about these types of considerations with people across diagnoses, even with comorbid conditions as they age. Again an important statement here is that these follow across all populations. We are clearly not asking individuals though to exercise through pain, or even into pain to be able to be successful. We'll come back to that point in just a moment. Keep that in mind as you're answering questions about degenerative arthritis and rheumatoid arthritis as well.

One of the things that I wanna bring to you that we didn't spend much time on for earlier webinars this week is this consideration of the difference between strength and power, and there truly is a difference. I want you to take a look at some of the functions that are listed here. We understand that some of them represent both, and some of them just represent strength or just represent power. Now depending on the qualifications of what's happening in the context, we would have the opportunity to see them represent both. So for example, sit to stand itself should just require strength. However if you need to get up quickly to make it to the door, or to keep your dog from running out the door, or to answer the phone, sit to stand can indeed at that point require power. We know that power is force times velocity, so the ability to force, lift yourself out of a chair, times velocity, get it done in an expedient manner with a short capacity for time or a time restriction, equals power, F times V equals P. So you can use the same activity, but put a time demand on it and turn that from a strength to a power. Why do we need power? I want you to put that question in your mind so that we're on the same page with that. I'm gonna answer that question real soon. Now keep

in mind stair climbing again could be strength or power. If there is a speed demand to it, it will be powerful. Standing on one leg, primarily strength, power if you are being knocked by something that's moving quickly, perhaps a grandchild, or perhaps a dog that is going to jump up on you and knock you over may require some quick development of strength and some powerful efforts there too. Now a little bit more likely to be powerful as we move down in here would be reacting from a misstep and quickly putting your leg to the side, generating force in a protective manner, carrying an item while walking for the most part should be considered strength, pulling yourself up to standing if done in regular causation should be strength, if you have to do it quick and powerful, hurrying to the bathroom, the sheer notion of hurrying should indicate likely some power there, and then recovering from a strong perturbation or nudge, which is a combination of what we did here, and then potentially what we talked about there could be strength or power depending on the context.

So let's take a look at these then, strength versus power. Sit to stand repetitions, look at all of these here. Now we've added a couple of new ones here and I want to contrast those with what you see over in the right-hand. Notice the timing is going to be integral, and when we look at steps per minute over here, that's gonna be power. So you could actually have an individual work on a couple repetitions of a functional trainer, or potentially even on a universal gym machine, free weights potentially as well, but the number of repetitions per minute, when that is commanded or demanded, we are looking at power.

So I think all of those give you a better opportunity to contrast the two now. So point by point when we're certainly taking a look at now moving into the iteration of power, now this is a little bit different than our prescription of strength. We're gonna bring the repetitions down to five to eight, we're gonna bring the resistance down to 70% of your one repetition maximum. We've got over 300 people on the webinar tonight, I am certain that some of you are already thinking, wait a second. How do I test a one

repetition maximum? There's gonna be at least eight of you out there that are thinking that already. Hold that question. I'm planning to answer that. Additionally, with regard to power, we're gonna keep the prescription pretty similar here. Please understand that if you're not iterating and communicating that, it's gonna be too late. You're gonna lose that 81-year-old male that's coming back, if their daughter chose to bring them back in, if their daughter was able to talk them into it on your Wednesday session after you had an initial evaluation with them last Friday. If they're so sore that they don't even wanna come back in and you're going to tell him on Wednesday, oh, I knew you'd be sore, I expected that, you're too late. You've already lost them. They've already decided you don't know what you're talking about and that you've never worked with anybody their age and that all you're going to do is cause them to be worse. If they're not already complaining at their daughter and their doctor, you're in good luck. You have to actually deliver the educational point: expect soreness. It'll be a good thing if you see some of it.

Deliver that with enhanced expectancies. If you're all following the OPTIMAL Motor Learning Theory, you've got to be able to actually be right there a step ahead of them before they experience that. Now, again this question of how you determine their maximum, I'm gonna give you one quick glimpse on that. We're actually starting to use very frequently in our clinic the Minimal Chair Height Stand Test, which I'll reiterate again later, the Minimal Chair Height Stand Test as the one repetition functional maximum by which we can actually adjust the 70% of the maximum. We're gonna talk a little more about how to equate that a little bit later. Now it's important that we understand power is prevalent in all of our sporting lives and daily lives. We know that the ability to be the first athlete to get to a loose ball or to a rebound is going to be the most powerful athlete because it's gonna require moving body weight in an expedient period of time, getting out of the starting blocks. Hey how come I'm not in the Major Leagues and I'm actually sitting here on a stationary bike, talking to you for a webinar? Well it's because I can't swing a 34-ounce bat at 118 miles an hour. Now I was pretty

proficient at hitting when I was in high school and also my efforts to get into college baseball as well, very proficient at hitting, but you know what? I didn't have any power at all. My ability to swing that 34-ounce bat, if that's the same size that this player is using, then that's great, but if I can't swing it with speed, I don't have power. So force, swing a 34-ounce bat, velocity, swing it at 118 miles an hour, is power. The difference is getting that ball out of the infield or maybe even out of the ballpark. So we know that power is something that is trainable, something that is fitness related in sport, and we're gonna talk about that even more so in life.

Here one offensive lineman's gonna line up against the defense lineman right here and whoever's 250 pounds versus whoever's 278 pounds, it's always gonna be the heavier person wins, right? Not necessarily. So being able to move your body weight and then move somebody else's body weight, a lot of times the difference can be the amount of power you're coming at them with being able to quickly get to high force right as soon as you get off of that line. So it's the first one that can generate the greatest amount of force quickest, not the one that can generate the greatest amount of force at the end of 15, 16 seconds or so, or even if it takes you eight seconds to build up your maximal force. It may be too late.

So we certainly understand, this is gonna be true across strengthening iterations, not only in aging, but also in individuals with comorbidities of Parkinson's, cardiac, certainly arthritic, some changes, et cetera. So everybody's getting older, but everybody has room to improve, and it doesn't matter whether we're talking of Parkinson's, aging, or any of the other comorbidities. Room to improve: strength and power. Now let's take a look at some of those and we'll certainly come back to that whole notion, but I want you to take a look at some applications here and I want you to look at the photos and tell me, which one is an expression of strength and which one is an expression of power? So getting up out of a chair, walking with an assistive device, going upstairs, getting out of bed, sitting and working on a stationary bike, or standing

and working on a stationary bike, which one of those do you think is actually an expression of power? Now I'm willing to accept that there are some situations, depending on how frail the individual is, that almost every one of these could require power. Commonly walking is not, but how many of your patients actually come to you and say, "Oh, well I try to keep my strength up, "so I go for a walk at least three to four times per week." The reality is they think that's their strength dosage and we can't allow them to be able to continue that misconception. That cannot be your strength dosage. If you can walk for six minutes, you're not actually keeping your strength up while you're doing that unless the entire time you're going uphill both directions. That's purely the case, and even then, there would be some considerations for whether that's keeping up your strength or just your muscular endurance.

Hey, getting out of bed, unless you're the most frail individual, should not be an expression of strength. Also, sitting and riding a stationary bike, unless you really have that resistance up that you can actually only handle eight to 12 repetitions, should not be an expression of strength. So really what's left over right there is exactly what I left for you here, strengthening is done with climbing the stairs, with getting up to standing, and then standing and riding a bike that maybe you can only do eight to 12 repetitions or so. Remember: the defining characteristic that talks about the difference between muscular strength and muscular endurance is the amount of repetitions you can actually achieve on that.

So, Nicole, "Standing on a stationary bike," oh yeah, you answered that correctly. Absolutely, that's gonna be strength. And then David asked a question, "Reaching appropriate resistance is "a tad more difficult in home health, ideas?" Hey, David, that's a great question. I love that. Go find a surface that's difficult for them to get up from without using their hands. That is the Minimal Chair Height Stand Test. You know what, if they're frail enough that you can't find a surface that they can't get up from without their hands, then find the lowest surface that they can get up from with their hands. If

you're finding only a few different chairs or surfaces in their home, then bring with you something to elevate the floor so you can actually reduce that chair height. That's one great way. Use stairs to your advantage. Use chair heights to your advantage. Resist their effort to get up to standing using your thera-cord, using your hands. Those are three applications that I would use right there. I've got many more to talk to you about as well. So we're gonna move on from there. So the benefits of intensity and exercise, and these are things that extend well beyond even just the consideration of just aging, but fortunately for tonight's context just with an hour and a half left in the webinar, we're gonna really focus on aging and exercise or exercise and aging. So we understand that when we are more intense with the delivery of exercise, unless we get so intense that we cause breakdown at the muscular level or at the noncontractile tendon level, then we understand we have the opportunity to get more benefit with less time spent. So high intensity interval training is one thing that could be considered here.

Actually applying the dosage of strength that is in keeping with the ACSM Guidelines for strength or power gives us the opportunity to know that intensity is something that is time well spent, additionally. So that's true in terms of intensity, keeping us at dosage for strength, power, endurance and balance. We also were coming to the understanding that higher levels of intensity give us an opportunity to stimulate different aspects of the brain. We know that muscular endurance training has an opportunity to stimulate the hippocampus. We know that strength training has a greater opportunity to stimulate into the basal ganglia and we know that skill-based training has an opportunity to stimulate the attention centers. We could go on and on about that, but cognitive stimulation is certainly something that's viable, even if just an expression of brain-derived neurotrophic factor and/or dopamine because of the sheer response in the brain to higher intensity exercise. I am not going to take a long time to talk about brain-derived neurotrophic factor today. If you're interested in that, you would wanna look that up by looking at the four letter acronym for that, BDNF,

Brain-Derived Neurotrophic Factor, an expression of a protein that helps us with neuroplastic changes at the level of the brain that's released as a function of being more intense in exercise, but, hey, what about each one of the last four of these? I'm not gonna walk you through each one of these. These are absolutely true. Higher intensity and exercise stimulates immune system. Like I said I'm not gonna go through each one of these, but here we're talking about degenerative diseases and we're talking about serotonin reuptake, everything. This is very relevant across life. If you can believe it, we're now already prepared to begin discussing about the third element of fitness and that would be muscular endurance.

Hey this is one of the easiest areas right here because we end up hitting this area so well when we think we're hitting strength or power, because we're not. So pretty easy to breeze through this. You see the repetitions, you see the rate of perceived exertion on the one to 10 modified Borg scale. You additionally understand the application by sets or by days per week, and then we additionally know that you should be operating at multiple sets to be able to get the muscular endurance benefits from there. So let's take apart for just a second. Let's think about this. If I have an individual with degenerative joint disease, with osteoarthritis if you will, or an individual certainly with rheumatoid arthritis, we wanna talk about how to be able to prescribe pain and how to modify things.

So if I've got somebody that is having knee pain, then am I going to encourage them to work through that pain? Am I going to have them try to move through greater ranges or am I gonna try to be creative enough to make adjustments to the prescription of weight to surface heights so that I can compensate and actually get contraction of the muscle fibers without getting pain at the level of the joint? Absolutely. Across all three that we've talked about so far today, muscular endurance, power and strength, I can get those done in short ranges. I do not have to actually fault back into or default back into isometric strength training. I can do something with a very high sit to stand surface:

building up the chair height, putting pillows underneath an individual and having them do a few repetitions without the use of their hands from a high chair. There's no problem actually using a lift chair for something like that too as long as we're exercising in the pain-free range, and then try to change the attributes so that it can be something that delivers a strength dosage that they can only achieve, because you've taken the hands away, eight to 12 times. That certainly can be the expression in rheumatoid arthritis, can be the expression in osteoarthritis degenerative joint disease, but we need to understand that if we don't perform at or near the ACSM Guidelines we're not going to be expecting to have delivered a dosage of value to use their session.

So we wanna stay closed chain as much as possible, we wanna use pain as a guide for them and we don't wanna encourage them to push through the pain. We certainly wanna keep it consistent in exercising with them because it is absolutely proven that strength training has been shown to help knee pain in osteoarthritis as well. So very important points to make as we move throughout all three of those because we're now stepping out of the resistance elements and moving into cardiovascular.

So in cardiovascular, it's very important that we take a look and we can make adjustments. We know these ACSM Guidelines can be followed so that an individual has the capacity to do 30 minutes consecutive or three separate 10-minute segments throughout the day. That's the accumulative effects there too. One thing that I left off here that we certainly can take a look at here is again the RPE. I asked you to fill the blank in on that. Where would you prescribe the RPE for an individual to be able to get that type of if you will strengthening? Because really cardiovascular endurance comes down to dosage, strengthening and the contractility of the left ventricle is part of it for most of your patients, and really to be able to provide a prescription here, you still need to be living in that six to eight on a scale of one to 10 RPE for them as well. So Nioka asked a question that I'm going to repeat, and I'm not certain that I'm clearly

understanding. I may have to need you to rephrase that or may have to ask you to rephrase that, when you say make adjustments to work to just before pain. So if you could restate that, I'm not certain that I'm understanding completely what you're saying there. So I'm happy to come back to that when you've restated that, thank you. So we'll continue on and we look at core strengthening, something we didn't even attempt to touch base on when we came to degenerative diseases or when we came to the balance efforts earlier in the week, so core strengthening. These are kind of some of the real fundamental principles that we take a look at, the why, so the purpose behind core strengthening. Are we just doing it so that we can keep somebody from blowing a disc out? Well research has not really been supportive of the fact that it actually takes that much contractile force around the spine to actually keep yourself functional and pain-free.

Why do we do it? So that an individual can have functional and safe capacities with regard to some of these other considerations: perturbations, reactive balance strategies, carry objects, et cetera, because I think we can all agree is that no one really actually ever has too much strength, much less core strength, but how to get it done and how to adjust for persons of 80 years old or so? We know that there are some absolute phenomenal individuals that are still exercising and still performing at the State Senior Games and at the National Senior Games. We can't just say anymore that, oh well you're too old to lift this and you don't need core strength for that because you're not actually participating in crossfit. Hey, those days are gone. We've got individuals that are doing an excellent job participating at the game level, at the fitness level, in crossfit, in parkour, and we wanna be able to elevate our science and our delivery with them. So let's talk about core strengthening and how to get that done well, understanding the comorbidities that may come with some of our individuals aging, because really that makes the difference between physical therapy and in some iterations athletic training can make the difference between that and some individuals that are just coming out without a lot of experience in personal training. We're not just

trying to apply the ACSM Guidelines. We're trying to adjust them according to a person and we're trying to understand comorbid pathophysiologies so we can adjust them to conditions as well. So we know we need core strength to be able to carry objects, such as this individual is doing as part of her work, or these two individuals are doing perhaps as a function of their avocation, or their roles and responsibilities. We certainly need to be able to not only carry objects, such as here, grandchildren, or weights, but also the ability to create a force and hold the position. That's right here, working in carpentry, which many older individuals are still engaged in on an avocational basis, and that's gonna be true here with tolerating a perturbation as well. That's a pretty large dog that she's gotta deal with there. Hey, if you wanna be in the pool and catch your grandchild, you need to be able to hold yourself up there. Maybe actually the perturbation of the waves here could be another great thing that's functional and relevant for you, additionally.

Now as we talked a little bit about this, we are certainly aware of the fact that the ability to change directions quickly is going to require some power then too, and caring objects, the same, requiring some power. So core strengthening, what do we do? It's not just why we do it, but certainly how we do that too. Nioka, I look back at your comment there. Thank you so much for agreeing and supporting with what we're talking about there, appreciate your clarification. So for core strengthening, we have to understand there are some modifications that we can consider. I want you to understand I'm not trying to make a stereotypical comment here that no one over 70 should lie prone and do exercise. I don't want to ascribe that label because that's not what I believe. We take things on a person-to-person basis, but I want you to also understand I'm a very practical full-time clinician. I've worked in every single setting, bar none, all the way through each one in the continuum of care for years at a time throughout my career so I know what can and cannot be done and I'm actually let's just say old enough to qualify for the State Senior Games and National Senior Games as well. So I know a thing or two about aging. Not going to consider myself as an

expert in this in terms of knowing everything, but let's keep in mind that core strengthening in geriatrics, let's get some overarching principles and not try to say, hey that's not true because I've got these two people that can do this. There are going to be exception. So the underlying is, just like we said with arthritic changes, we need to try to exercise with pain as a guide. You know that you're gonna be more effective when you're more consistent and you're gonna be more consistent when it's most convenient, now keeping in mind that the prone position may not be the most tolerable. What I'd like to be able to do is offer you some core strengthening options that don't require than an individual get into prone to get 'em done. So these are five different applications that I would like to be able to provide to you. Now we certainly know that these can be carried out in a clinical-based manner with equipment and they additionally can be carried out with home exercise resistance.

So take a look at what you see here, knowing that we can adjust the range of motion in resisted extension and flexion. We want to keep this one especially mindful when we talk about osteoporosis and we talk about also some of the more spinal arthritic conditions, diffuse idiopathic skeletal hypertrophy with dish, as well as ankylosing spondylitis. Very important to consider those in each one of these as well.

So resisted sit to stand is one that we're gonna take a look at, applying resistance, whether that be through a functional trainer, or through the resistance of another individual, or resistance by pure chair height, or through a resistance cord. Resisted gait can be carried out multi-directionally, and similarly to everything I just said, functional trainer, resistance cord, or an individual providing resistance. We've already talk a lot about Minimal Chair Height. We'll talk a little bit more about that. Putting someone up on an unstable surface and ask them in a seated fashion to be able to keep their core steady as they are rowing a device, perhaps even just a resistance cord back toward themselves, and then also as I mentioned here some qualifications that we would make. So keep in mind that at the core, you still have to keep in mind all of

these things. The nice thing is there some beautiful combinations that can be done here such that some patients who are painful in efforts to open chain move into spinal extension can actually gain some range of motion if they're moving lightly with resistance, so that's the qualifier there. But now if we're just talking about the core, it means that we have to actually still apply these same principles of eight to 12 repetitions and 70% or five to eight repetitions with quality of movement in a pain-free range with 15 to 20 repetitions. We don't really do that much cardiovascular at the core, but I wanted to list that here to respectfully understand that the cardiovascular system to be carried out for that typical 10-minute three-set segment or for the entirety of a 30-minute application, if you don't have core endurance that happens at the muscular endurance level, you may end up regretting your efforts to engage in an aerobic sustained exercise program because tomorrow you're going to realize you didn't keep your back stable, hip stable, et cetera, while you were engaged in that. I've already spoken to the other two about that, and I think we'll move on from there.

So a couple few more highlights with regard to flexibility. I think it's important to understand this, especially when we're talking about exercising in a pain-free manner. The science right now is telling us, quote, no benefit to stretch before exercising. Certainly I like to use and I believe the research is supporting the ability to be in a sustained low-load long duration stretch to be able to drop some tension. So if you have exercised the paraspinal musculature and you're trying to get an individual to have better capacity to endure a more erect pain-free posture and we know that that is kind of the dominant muscular group that they're using to stabilize their core when they're upright in function, that they're gonna build up some tension. If they're going to build up tension, you're going to want to have a way to be able to deliver that dosage, but then also bring the tension back down. One of the best ways that you can bring that tension back down is actually to get into a low-load long-duration stretch. Now for some people, depending on their risk for osteoporosis, we might be able to use a hip-hinge motion. We might be able to use some spinal flexion. We might be able to

use some hip flexion, keeping the spine in neutral. There's many different ways to get that done and we'll talk about those, but you wanna be able to be in a position that creates a lengthening of the musculature that has built up tension, perhaps that means bring knees to chest but keeping the spine in neutral, so that the individual is not having to contract those muscles to hold this position for duration and that neuromuscular-ly they don't have to worry about steadying or balancing themselves. So using the principles of introducing flexibility after the tissues are warmed up, providing that in recovery after exercise a couple of times per day, and also considering the notion of aging with regard to osteoporotic changes is important. Now as I mentioned, we would touch briefly on balance as well.

We know that the nice thing is we can combine a lot of these capacities together. It's actually very convenient to work on strength as a dosage with balance and so we take a look at these considerations of the application. We know if there's no stimulus, there's no benefit. It doesn't matter whether the no stimulus was because it was too easy, or that the individual was not able to be successful, and so the dosage was too hard. So we recognize at a very soft and very global estimate that individuals working on balance should be successful about 30% of the time or should be successful about 70% of the time.

That is to say that we should be destabilizing them to cause them to need to respond and balance ankle strategy, hip strategy, stepping strategy at least 30% of the trials, and then we make these adjustments up or down from there in accordance with an individual's tolerance from a personality standpoint and sometimes from a psychological standpoint, that is to say more likely to be agitated, more likely to get angry with you, more likely to be depressed or pessimistic. Then we want to certainly increase our success rate, but for anyone, if you keep it too easy and pander to them, there's not going to be a stimulus or error dosage. Even if we're combining a little bit of resistance with balance in an effort to get both, we'll end up with neither. One related

chart here in my time as a part-time instructor for the CEEAA back in the 2012-13 range, I had the privilege of working with Marilyn Moffat, Karen Kemmis, and we certainly looked at this that I did not develop. I would actually defer this completely to Marilyn Moffat's development here. She allowed me to make some modifications to this, which you'll see a couple of those in bold and a few other ways, to look at the concepts of frail in this column, as well as functional in this column and fun in this column. Now certainly these cross greater parameters of fitness than just the nature of strength, which is our main topic today, but think it's important to look at things from a frail, functional and fit standpoint. I'm gonna try to share with you today some concepts for how to mobilize individuals from one column to another and I want you to clearly take a look at these so that you can say to your patient, well, we see that you're walking at 0.8 meters per second. Let me help you translate that right now.

That puts you at high-fall risk. It puts you in a category of frailty and I'd like to really address that area for you so that you can start walking quickly enough that you can choose to go out walking for a longer distance, that it doesn't feel so laborious to you and I'd like to get you out of this consideration of being frail and move you to more functional and capable.

And then when they have crossed over that mark into one meter per second and certainly having set that goal, an individual can feel prideful, can release some dopamine from having achieved a goal and perhaps can be more engaged and more likely to continue on with their fitness efforts. That's just one example of what can be done there. If we're looking at things more in the strengthening or power realm, certainly across this row in the 30-second sit to stand would be the case. Do keep in mind, propulsory forces and gait speed, especially if we were to look at a 10-meter walk when you're trying to express meters per second does require power there too. So if we have an individual that we are trying to move, as I suggested moments ago from frail to functional, you got some measures you can take a look at, some

interventions we wanna have, and some considerations there. Let's move in those realms. So I'm gonna try to actually tackle each one of those throughout the leaps. The first part will be from frail to functional, and then obviously we're gonna move from the next category from functional, that you see here, into fun. So we're gonna do these in the same organized fashion for each one of those transitions. So these are just some of my suggestions here that you would use. You'll find some great overlap with the Geriatric EDGE documents on some of these as well, but we often fall short of actually finding tests or measures that we can use for the frail population. So that's where you're gonna see me extend backwards, regressive just a little bit, into some different measures that would not be necessarily found in the Geriatric EDGE documents because we're now starting to move well into the frail area.

So one thing that would be novel to find that I'm certainly trying to get behind and make good cases for the endorsement of the Minimal Chair Height Stand Test. Now as I've expressed to you earlier, I like to use this so that an individual can be clearly shown, what is the lowest height today that you can get up from without using your hands? And then as we progress, I like people to be able to see that they're clearly getting better as they moved from let's say a 25 or 26-inch surface being the lowest surface that they can get up from, to the point that they've actually been able to achieve the effort to move from sitting to standing now from 23 inches. I've got plenty of very frail individuals that are absolutely elated to see that they've improved in that measurable regard. So that's one capacity. We actually, as I suggested earlier, utilize the Minimal Chair Height Stand Test as an attribute of a one repetition maximum off which we can express a dosage. I'll take a moment to elaborate there. We'll talk more about it later, but let's just take for consideration that the ACSM Guidelines state that an individual should be exercising at about 80% of their one repetition maximum. Now when we're working Minimal Chair Height Stand Test, I think it's pretty easy for all of you to be able to make this calculation. If you can get up from 20 inches without using your hands, then 20% off of that is actually 24 inches. 10% of 20 inches is two inches.

Another 10% of that is two more inches. So that's four inches. Four inches higher than your one repetition maximum of 20 is actually 80% of your one repetition maximum. And so yes that is actually an application that I have developed and actually espouse and is being studied at this point. We have an IRB program with patients being accepted into that study right now so that we can look at the effects of giving an 80% dosage for individuals in the test subjects versus controls that are getting other let's say customary care on an outpatient basis and let's see what happens to them. So we're enjoying looking at that. So other measures that might be appropriate for frail would be certainly looking at a 10-meter walk test, and then obviously a five-time sit to stand. Some people could use that expression of power, additionally could be taking a look at a 30-second sit to stand test. Now there are some positives and negatives for each one of those.

Very important that we understand that a five-time sit to stand test is a measure of power, taking a look at people that might take 12 seconds to get that done or so. My only bias against that is that individuals will have a little bit harder time seeing the meaningfulness out of, "Oh, wow. "That took me 14 seconds to get "five repetitions than when we started. "Now I can do that in 12 and a half seconds." That's a little bit harder to actually pull that off to be able to make that a convincing effort for people as compared to getting up from the 24 inches when they started and now down to 20 inches. They can actually see a real difference as well. So 30-second sit to stand, a little bit longer expression of an effort there too, and then that 30-second sit to stand might give you enough time to be able to see a significant difference then too. Additionally if someone is so frail that it's very hard for them to even be able to get out of bed, you might wanna do something just very simply as timing their effort to get up, and that can be an expression of their improvement. It used to take you a minute and 55 seconds to go from supine to sit, and now, because you're stronger at the core and the legs, you're able to do that in 45 seconds, which is still an inordinate amount of time, but it's showing some real life everyday improvement. And then, obviously, frail to

functional, another great test is a Timed Up and Go. You should all be familiar with that. "So can we do the walking test," this is Tabatha asking a question, excuse me, and she says, "can we do the walking test, "10-meter walk test, et cetera?" You absolutely can. If an individual's that frail, I guess I'm trying to express frailty can come in different forms, but some of the frail list of the frail patients might not even be able to walk 10 meters, but yes indeed you are absolutely technically correct that would be another way. I'm not intending to say that this is actually a completely comprehensive list. Let's see. Alina actually was asking, "I wonder if there's a standardized "functional test for wheelchair propulsion." Alina, I actually use the same myself. We would actually do either a two-minute wheel test, a 10-meter wheelchair propulsion test, but to my knowledge, there's not a standardized test for that. So we modify measures in order to make them viable for individual cases.

Now for an individual to move from frail to functional, we've gotta move through interventions as well. So we measured it, we defined it. We gave them certainly some understanding of where they are. You got to share measures with your patients. You really have to make sure that they know their scores because there's two things that have to come from measurements. You might think those things include getting paid, making authorization, advocacy, marketing back to the physician that referred to you, but to me the two things that have to come from doing measures are, number one, setting and understanding of the patient, hey this is exactly how I've decided I'm going to work with you based on the measures that I took, this is how I know what we need to work on, so we create your clinical program from this and we create your home exercise program from this. That's two major things that have to come from measures is: how I'm gonna intervene with you and how I'm gonna ask you to work on yourself. We additionally can use measures as an intervention because we use them as a psychological driver. Hey I'm gonna test you on this again in a month and I wanna see that you're significantly better. So that has to be stated there. That truly is a psychological intervention, but let's keep going because we know that that's gonna

push intensity but we'll keep moving on from there. So the interventions from frail to functional, really straightforward on point one and two, as well as point three. We try to mitigate soreness by using movement, by using a low-resistance continuous movement, maybe even an aerobic application after strengthening. That appears to be a great way to be able to reduce the amount of delayed onset muscle soreness. If you were to look at the research in all this, actually thermal modalities are the greatest in terms of reducing muscular soreness.

Cold would be the most effective means. Most typically that's done actually with submersion, could be done with some ice, could be done with cryotherapy, it's not necessarily the most accessible thing for most people, and there are certainly some considerations in applying the nitrogen-based cryotherapy for persons with fragile skin or diabetic changes as well. But just to truly understand, to reduce soreness, it comes with cryotherapy, and then there's some let's say controversy as to what would come next, a light exercise aerobic, perhaps even using a massage to mobilize vascular return, lymphatics, et cetera. Those things could be viable. Passive range of motion could be in there as well, but all of them seem to be distant second and third places and fourth in comparison to using cold.

Then obviously we also use as an intervention the consideration of measurements, and as I started the entire presentation with, personal preference considerations. Now so that means, hey, if you're gonna move from frail to functional, you better know enough about this individual to be able to tie your intervention not only to the measurements that you took, but also to who they are as a person. "I'm gonna lift my grandchild up. "I'm going to be able to carry my dog "and put my dog into the car." Certainly the way we intervene is going to be more likely to have intensity if we can actually tie it to the person. So if we're gonna rehabilitate the frail geriatric, we're gonna have to have some considerations, and I think those things are real important to understand here too. The nutritional concerns are viable, knowing that we're not attempting to be experts with

regard to nutrition, but we have to additionally consider, hey, if we're gonna be working on strengthening, we've gotta also not neglect an unstable position that we might put a person in. We have to understand that you might need to modify some of your positions that you're going to be able to do with the frail geriatric so that we don't create an osteoporotic fracture, especially for a person who's been on prolonged bed rest. If a person's not getting enough protein in, it's gonna be hard for them to actually make changes. So all those things are extremely important considerations for us to make as well. So vital signs important, especially if an individual is dehydrated. Very easy for us to be able to see that they are hypotensive and obviously passing out during exercise would not be something that would be good for our program and for the patient whatsoever. So keep these things into consideration then too. If we wanna make the next leap from functional to fit, some of the measures that I would suggest would be here. Yes you might've recognized earlier we had one comment on the 10-meter walk test and that would be appropriate here and it certainly is arguably appropriate for the frail to functional as well.

Now additionally we need to take into consideration that individuals moving from functional to fit can also apply the Minimal Chair Height Stand Test, no issue there whatsoever. In addition we use the five-time sit to stand, again my preference being 30. You will also see some applications now being more increasingly utilizing a 60-second sit to stand test in this population. That's something that I started using in back about 2002. It wasn't even actually a measure back then. I'm not suggesting that I developed it, but it was just my preference to be a deliver that, and science has come that direction at this point too. Four Square Step Test, if you're not as familiar with this abbreviation, it is the Four Square Step Test. Would be a little bit more likely to do a functional to fit, and again if you're not familiar with the abbreviations, I'll clarify these, but two or six-minute walk test. Minimal Chair Height Stand Test here, again as I mentioned could be done with or without upper extremities, but here we're moving from functional to fit, certainly more likely to use it without hands. I wanna share with

you a videotape now of how we're actually utilizing that. So just a quick videotape here we're gonna pull up and give you an opportunity, and let's see. All right. Okay, Jim, we're gonna redo your test today. And what I'd like you, sorry. I'm gonna pause this real quick. This test is actually one that we're going, I'll go ahead and show you this right now, but this one is actually the Timed Up and Go Shuttle Exam. That's totally fine to have this right here now, but the Timed Up and Go Shuttle Exam is also a test that we can use for a person moving from functional to fit. So let's go right through here, and this would be a great one to do. So this is another examination that we have that's in experimental trials right now in University in Nevada. So I'm gonna talk Jim through this right now and he's actually doing a five-time expression of the Timed Up and Go and you'll see some great applications here because it gives us more time, more repetitions to be able to actually see some sensitivity to gain. I'll let the test speak for itself from here for the next couple of minutes. To do to start with is relax against the backrest of the chair, and then when I say go I'll ask you to walk as briskly as you can over to this chair, which is three meters away, you'll sit down in this chair, and then I'll ask you to stand back from that chair and come back over and sit down in the original chair. We'll do five complete laps. You can use your hands in any fashion you like to get up or to sit down. I'd like to make certain that you make a complete effort to do the full five if you can. If you need to stop at any point along the way, that's fine as well. Move as briskly as you can safely manage though along the way. Okay, all right.

- Okay.

- [Mike] On your mark, get set, begin. Good and sit down so your back touches the backrest each time. Good, up, and back touches the backrest over here again. And now you've completed two laps when you sit down on this one with three to go, Jim. You've completed three laps with two to go. You've completed four laps. This is your last lap. And sit back down. Jim, that took you one minute and seven seconds. I'd like to ask you two questions if I could. Number one is: how tired, on a scale of zero, I have

no fatigue, to 10, I couldn't feel more fatigued than I do right now, would you rate yourself? 10 is the maximum fatigue.

- About a four.

- [Mike] About a four, second question, how confident did you feel that you wouldn't fall when doing that test? Zero is, I had no confidence. I thought for sure that I would fall. 10 is I was absolutely confident that I would not fall.

- 10.

- [Mike] Excellent, good job. Any other comments about the test or questions you have, Jim?

- None.

- [Mike] Good. Okay, great. Hopefully that is beneficial for you, understanding that that's experimental, something that we're actually trying to push the boundaries of clinical practice a little bit with right now. Timed Up and Go Shuttle Exam, look for that to come out. I've certainly got no financial interest or gain there whatsoever, but just something that just shows you an edification of what we're trying to work on. Kathleen will go back to the PowerPoint there. Please do understand that for this individual, that gives us an opportunity to look at a lot of sit to stands. Hey that's 10 repetitions total of sitting to standing and that may be at his maximum, a lot of opportunity to see some turns in there functionally as well. Kathleen and a wonderful cast of individuals that help to be in production of all of these webinars has actually pulled up the Minimal Chair Height Stand Test for us. So now we're gonna take a look at that one. Thank you again so much, and we are going to play that. Let's see if you can make it up from this height without using your hands.

- Oh, without.

- Uh-huh. Sure, yeah. Okay, there's 23 inches. Okay, sit back down. I'm gonna change the height of the surface. So you can sit down... Okay. It's gonna take some work from you. Let's see what you've got. This is a 20. Great okay sit back down and let's see if we can make it down to 19 and a half today.

- I did 19 and a half last time.

- Correct you wanna go all the way underneath it already? You wanna try with 19 and a quarter?

- Whatever .

- [Mike] All right, I'm gonna try 19 and a quarter with you. So I'm just interrupting the video for just a second. We'll go back and we'll play the rest of it. That's such a remarkable point. Patients, I don't care what age they are, I don't care how frail they are, this lady was impaired for a year and a half after a severe car accident, fractured her leg, was nonambulatory for many months, had severe neuropathy prior to the car accident. Look at how motivated she is. Oh, no, no, she knows her numbers. "We did 19 and a half inches last time." She wants to be able to beat 19 and a half inches. Folks if you don't give your patients an opportunity to use gamification as behavioral economics, you're missing out. Measures are motivation. Measures are an intervention. Let's continue on and see what else she does here. Okay, so to be clear, this will be a personal best for you. All right, I'm here for you. Give it everything you got. Okay, let's stop there and that's good. Hey, I know you wanna know the end of the story. Well that day was not gonna be her day to set a PR of 19 and a quarter inches. She had already done her two-minute walk test, Four Square Step Test and probably a few other things.

She equaled her personal best at 19 and a half. This lady eventually made it down to 19 inches and was very, very proud to do so. So we'll move on from there and thanks again Kathleen for pulling up that video. We'll go back to PowerPoint now. I'm gonna address Hitesh's question now and to reiterate that, "Any suggestion for standardized test "from chair or bedbound patient?" So I will tell you there's not a lot of great suggestions for that. Depending on the presentation of the patient that you're talking about there, you most certainly could use a Minimal Chair Height Stand Test. No problem there. If you're talking about truly a bedbound patient, again, as I addressed earlier, you could time their effort to go from supine to sit. That's one application there then as well. So you can actually just time their efforts to be able to sit without upper extremity support on a compliant surface at a bed height that maybe you've lifted up a high-low surface and they don't have their feet on the floor. That would be another suggestion. I'm not gonna try to tell you that these are standardized tests. There are certainly functional sitting test that you can look at, and there's some possibilities there too, but sometimes we just have to break it down and actually time function. Hitesh, hopefully that addresses your question. We'll go on from there. Sonia had a question, "How do you feel "about aquatic therapy being an alternate way "to strengthen with less pain?" Sonia, I am absolutely 100% an advocate of that. I also recognize that not everyone on the webinar tonight would have access to everything that I could endorse, but to me an underwater treadmill is a wonderful expression for persons with too much pain to exercise well, especially in aging to be able to paddle a little bit of jet resistance water at a slow speed in treadmill. There's a lot of great research that talks about using that for the persons with osteoarthritic hips, as well as knees. Matthew, "How far were the chairs apart?" This is the Timed Up and Go walk test on the Timed Up and Go Shuttle. So you follow that. You put them exactly three meters apart, great question. Now I should also say, Matthew, to be able to do the test correctly, you might've heard me iterate on the second repetition I needed him to get his back to touch the backrest each time. Colleen's question, "What about cumulative fatigue when finding the height?" You're exactly right, Colleen. That's something when we're developing the

test, we have to actually come up with a standardized protocol and say, okay, you get retrials at making this height. Now you need a one-minute rest break before we actually try the next height with you. I'm trying to economize the video for you a little bit there when I tape this for you. So quite honestly, we actually probably robbed her of her ability to be able to make 19 and a quarter inches just by trying to give her that effort to go maximal too many times in a row, so totally acknowledge that. Let's see. Dennis, "How often you reassess this test "throughout the course of treatment?" For this person, I did about an every other week. I would not ever test sooner than that for a one-time per week application. About every other week on that, unless I was giving them an opportunity to do something that would measurably improve their capacity at home. We could have them try to do that every seven to 10 days we could try to do a Minimal Chair Height.

The problem with trying to measure too much is that that phenomenon of measuring where you are checking the oil in your car every time you get out of the car. It's gonna be not only a waste of time part of the time, but you set yourself up for some degree of failure if you're constantly measuring, measuring, measure. Bhagat, "Do you consider painful limit "is the possible range of motion?" If you're talking about active range of motion engaged in resistance, I do consider that, but this is not a classroom for me to talk about the entirety of the use of geriatric rehabilitation.

So I'm not gonna be talking about passive range of motion when I'm defining that or active range of motion, but loaded in resistance, I'm not gonna go past pain there. Josh, "Does is matter if arms are across "the chest in the Minimal Chair Height Stand Test?" No, it does not, and as matter of fact, as we're expressing it in our research study, we're trying to give individuals the best opportunity to use their strategy for sit to stand, minus the arms. Remember: if an individual has their movement strategy and we are actually superimposing our values or beliefs on how that movement should be done, no-no, you must get up with your arms crossed at the chest, then we're actually

changing their capacity by changing their confidence and changing where they displace their center of mass by putting the hands across the chest. So we wanna make it as reality-based as possible, not try to force them into a different type of motor control strategy. Laurel, "Any suggestions for exercising "in a regular pool with minimal equipment?" Yes, find different heights. Use steps to your advantage. Actually have patients jump from one step onto another if they are at sternal or shoulder height to be able to go for some power. Those would be really good things. Have patients walk with eyes closed to work on balance, et cetera, but we again could spend more time and I know you've got my email address. I'm happy to dialogue a little bit more with you offline about that question too. I wanna take just two more questions before we go back to the presentation. So I'm gonna take Patrick, and then Wesley. Patrick your first question, "Are these test at initial eval week-to-week or," and that's as much of your question that I can see.

So the answer is yes at initial evaluation, and then we typically we're bound to test people at every month on some of these times. Now certainly we all know in outpatient rehabilitation and certainly with regard to authorization for length of stay, most the times we're bound to test them more frequently than that. So let's see, and Wesley, I'm gonna take one. "Do you think a little correction "in body mechanics could have worked to her advantage?" Absolutely. I certainly could've given her some internal cues about where to position herself in terms of leaning forward a little bit more, moving the feet back so that she can have a different tibial angle. With her lower extremity fracture, she didn't have a ton of dorsiflexion available to her as well, but there's no doubt I could actually coach this and we certainly are going to do some of that in treatment, but I'm not going to do that in testing. So we got through a lot of questions there. We'll come back to your questions a little bit more and we're going to move on in your PowerPoint now. I already should you the Timed Up and Go Shuttle Exam. And a little tongue-in-cheek, we're actually right now calling it the TUSHE, Timed Up and Go Shuttle Examination. If any of you have better let's say nomenclature

for it, we're happy to adopt some of that potentially then too. So resisted sit to stand, let's go and go into our next videotape there, and again thank you, Kathleen. So a very quick video here, one expression of that. I want you to look at the resistance canister that he's got right here. There's six different Kevlar tubes in here. Certainly if any of you are interested in looking at that device, I can talk with you offline. I'm not here to endorse any products, but this is an expression of resisted sit to stand that can be done in many ways. We certainly love the safety and security of doing it with this device though as well.

We'll go back to your PowerPoint then, and then certainly as we're intervening from functional to fit, our interventions must again behold to these guidelines. Not anything else that I need to elaborate on that for you, but again I'll just say, oops, I think I lost my pointer here. There we go. Again we wanna always try to use this consideration of tying back to measurements. I cannot say that too many times to be able to engage the individual. The measures from fit to fun in the third and final transition we'll try to make, we change up the measures just a little bit here and express out as 30 second, oh, sorry, 60-second sit to stand test for individuals as well here.

And hey, I've seen people as a matter of fact, remember I'm treating patients full time in the clinic seeing from nine to 17 patients a day sometimes. I actually earlier today I had a let's see 72-year-old gentleman get up from 13 inches and he's six foot four, and that's a long ways down. We work our patients hard. This is one strong human being here too that we've developed then too. Again no changes here from fit to fun. Our interventions must be respectful of each one of these, then I wanna actually take a little more of a turn past fun and into GeriAthletics, a term that I coined back in 2006, again no financial ties there whatsoever. Nothing to be gained financially from that, but it is actually a term that I coined back in 2006 and we take a look at the individuals that I'm steadily becoming myself to be able to continue to participate in a high level of athletics and we have to know the science so that we can apply it to them so that we

can realize that hey recovery actually takes a little bit longer as we age, that our prescription has to have consideration for the noncontractile elements of the body as we load with forces, to be able to look at the breakdown of bone in osteoporosis. And even if we've got a muscle that's ready for those repetitions and forces, do we have bones that are underlying and supporting for that as well, and then peaking for competition is extremely important when we move that individual in that realm. For me in GeriAthletes, it's very important that we conduct a Senior Athlete Fitness Examination as a general screen. I've done that a number of times volunteering at our local state games here in Oregon, most typically at the Pickleball venue, and this respectfully was developed by Rebecca Jordre at the University of South Dakota, a good colleague of mine, that I'm certain could be approachable for you if you're interested in learning more about how to conduct that test as well.

With regard to the Senior Athlete Fitness Examination, we understand that it is very comprehensive and attempts to be a screener. It's not intended to be a full documentable examination, but does a great job of looking at a lot of different parameters of fitness and considerations that could be integral in providing a prescription for an individual. We're looking at body mass, hip to waist ratios, cardiovascular. There's three different measures of flexibility, couple of balance, strength is expressed in there too along the way.

So the Senior Athlete Fitness Exam, abbreviated into the acronym of SAFE, is something that I would highly encourage you look into if your practice will move in that direction. So when we talk about GeriAthletics, we talk about senior games qualification here. Masters athletes, typically the definition will be over 40 years here, and then I think it's important to understand that there are some different sports that have different capacities with regard to aging. We know that masters swimming, that long distance triathlon, even more so than the short distance sprint triathlon, long distance triathlon, we see individuals knocking down some age records and actually

improving and setting age records as the years go by. So when we talk about, hey, 60's the new 50, that is absolutely the case. As a matter of fact a lot of the endurance sports are seeing a huge wave of individuals that are setting personal bests for themselves, as well as world all-time best. We'll be actually taking a look at a couple of those in a moment, but age records are falling and our expectations of aging into GeriAthletics is being redefined then too. Here's one individual that recently ran at 72 years old a 256 marathon. His quote is, "My ultimate goal is to win "the 120 age group in Boston," being the Boston Marathon, "some year." I have no doubt that he's got a good shot of that as well too. We're going to adjust some of our expectations with aging and we'll take a look at your next video now.

All right, well, this is my, just to give you some context here, 17-year-old dog, which is about 109 years old I think is right. He passed away just a year and nine days ago, just shy of his 17th birthday. Now, watch him here. He's gonna hop right back up on that treadmill. I want you to walk away from there, hop back on. He's back on his feet and he's putting the back on. All right thanks for that emotional foray there for just a little bit. Hey the reason why I bring this up is certainly at 109 years old, he nearly was at the shot of this video walking at 2.6 miles an hour and being absolutely blind. If he knew there was a treat and some motivation in the front of that painter's tray, he's gonna get back up on that treadmill and get after it.

So capabilities are sometimes a little bit greater than what we think. We'll go head Kathleen and advance back to the PowerPoint at this point and we'll move on from there, but that's one of my favorite GeriAthletes of all time. His name is Hunter and he's a Tibetan Terrier. So we covered that one. Now what does aging actually look like? Maybe this guy. 119, I had forgotten what the calculation is, but we're actually gonna take a look at another one. Here's Joe who has aspirations of running another marathon in May and actually completing a triathlon in April and he's gonna be doing a half marathon this upcoming January. We're gonna watch a quick video of Joe now.

Now here you're gonna see him doing what's called a performance testing and he's gonna be on an instrumented treadmill. So you see Joe here and we give the permission of the individual that's 72 years old to go head and try to achieve some of their goals and aspirations. He's got time in his life now to train for a marathon, and in his distant past he's actually done some of this. We wanna take some of the performance testing technology that's available for the professional athlete, for the collegian athlete, for the pre-collegian to high aspirational high school athlete, and that's what we're doing right here. He's on a computerized instrumented treadmill. We've got him set up with some IMUs, gyroscopes, and these body sensors that he's wearing, six of them, two at the shoes, two at the shins, one at the waist and one at the sternum, give us the opportunity to study his movement and only because we actually respectfully took the opportunity to do that, we actually found out that Joe was lifting his left hip up into 20 degrees greater flexion than he was at the right and he was gonna fatigue himself before he even got to mile 20 in the marathon because he's being inefficient.

He's moving excessively. So we addressed his range of motion at the left ankle, coached him about this. He made a change. We retested him in the instrumented gait analysis. He's no longer lifting up that high. He's no longer spending more energy than he needs to and he's ready to keep moving down the road, and we are additionally ready to keep moving. So as Kathleen's pulling back up the PowerPoint, Bhagat, I'm gonna read your question. I hope I've pronounced your name correctly. "Sit to stand resistance pulling backward, "what kind of protection to prevent "the patient from leaning to one side?" Well primarily I shot that videotape 'cause I knew what his capabilities were and so I could actually back away. Secondarily that canister is extremely powerful to keep the individual from shooting forward, but had I not had full notion that he had capabilities to do that, I would've been standing much closer to him. Stacy, "What type of standardized test do you recommend," see if I can see the rest your question, "in acute care setting or critical care setting?" So certainly in acute care,

a lot of what we actually, I mean one of your favorites, you got a high-low bed that's available to you that you can actually operate. So that's one thing. Minimal Chair Height, 10-meter walk test, two-minute walk test, even if the individual can only make 30 seconds. Great way to document that. Those are some easy ones to take a look at. You certainly can do a 30-second sit to stand with those individuals. So I would probably endorse most of those. If given an opportunity and longer time, I could certainly get many more for you, but again the expression of a functional sitting test, elevating the bed way up, getting their feet off the floor crossing the arms, maybe even do some sort of clinical test for sensory interaction and balance to have the individual try to sit with eyes closed and arms crossed across the bed. We're certainly moving past the consideration of strength, depending on how frail the individual was, but those would be some considerations I would have.

Let's see, Wesley, we already answered that question, and then Louis asked, "Have you ever use AlterG treadmills "and how do you like them if you do?" I'm neither here to endorse or to deride any equipment, so I should be very careful about doing that. I don't have enough experience with an AlterG to be able to say anything that would be of an endorsement for it. I've looked into it enough and I've chosen at this point not to spend our clinic's money on that. So I'd be more likely to actually address that question offline if you wanna send me an email, so we'll move on. What does again look like? It's continually being redefined. Here is certainly a baseball player that some of you are gonna recognize that just retired just a little bit under, what, nine months ago, actually seven months ago in April of this year.

This is Ichiro Suzuki who retired at about 46 years old and actually played later than most individuals. He wasn't the oldest position player ever to play in Major League Baseball, I think that's Julio Franco, but this guy was still performing at a high level and at one point he thought he might still actually play Major League level at age 50. So we're redefining what aging looks like there, and then we certainly understand that

when we are utilizing technology, respecting the science of aging, that we might be able to actually help people, quote, stay in the game, even if we're not talking about professional athletes a little bit longer. So we know that it takes longer to recover with aging. I talked with you little bit about mitigating recovery and how to expedite that a little bit more. Also understand that there's a certainly a much easier delivery for some of the time under tension, some of the strength gains that need to be carried out for our patients. I wanna show you another video that helps us understand how to provide eccentric control without all of those repetitions of plyometric jumps that are the reasons why some of the patients that you're working with right now are weekend warriors or aging athletes that have massive degenerative joint changes. So let's watch the next video. Here's our good friend Joe on this video.

- Stair climbing.

- [Mike] Yeah. So he's gotta actually, to set this up, he's actually controlling the platform that's moving from underneath him right now and he'll get to a point where he doesn't even have to put his hands on here. You'll actually see him momentarily, I believe still in this video, get his hands off and control that through the force of his legs. It's got a little more balance than stair climbing. There we go. So there's another expression. As Kathleen's bringing back up the PowerPoint, I'm gonna try to take Charlene's question here. "Best strengthening for rheumatoid arthritis, "water-based using 33% submersion?" You know what, Charlene, I'm gonna do my best to try to look at the evidence on that for you. I would probably go something in the neighborhood of about 60% submersion in a warmer water for persons with rheumatoid arthritis, and then also delivering some resistance of water. I prefer an underwater treadmill on that, but I don't want to endorse a certain maker of that. That certainly would be one way to go for rheumatoid arthritis. I think most research that you will see will actually continue to follow the ACSM Guidelines when you're truly talking about strength. So that type of application in the underwater treadmill to be

quite honest is cardiovascular and muscular endurance. You may be able to use some loaded squats for persons like that. I can see exactly where you're going with the 33% submersion and trying to walk in a lower height water expression, and that can certainly work. Obviously it worked well for a lot of professional athletes there. So we know some about that, but I don't think we know perfectly enough to be able to have a global statement of the best for rheumatoid arthritis. Again if you're talking about lower extremity strengthening, then we certainly know that water is probably going to be among the tops for that.

What we benefit from in water is not only the body weight, but also the use of a closed chain without being so painful, but we also actually slow down the kinematics, which is often a missing point when we talk about the prescription in that we are actually stopping the ballistic tendencies of the limb. That's an extremely important point when we talk about joint arthrokinematics and also being able to exercise pain-free is that water slows it down. So we'll go to the next one. I think it's extremely important for all of you to be able to educate and talk with your patients and their caregivers about what the expectations are and really to actually have some vicarious experiences.

So you're telling people, hey you might actually wanna go out into one of your community educational efforts, so when you're doing a health fair, and actually talk about the fact that, here's a 71-year-old lady who ran a sub 1:40 half. Hey, if you multiply that by two and add 10 minutes, which is kind of the rule for half marathon and marathon, you're actually talking about actually running a three hour and 30 minute marathon, but she's 71. She's hauling out there at a 1:40. That is, I believe, if I recall correctly, about a 740 mile, somewhere right in there. Ed Whitlock at age 85 actually completed the Toronto Marathon in three hours and 56, and then later on, that mark was actually broken by quite a bit. I'll actually share that data with you there, but that's actually the 85 year old. I should take that back. This is still the 85-year-old record. It's the 72-year-old that we should you earlier that actually ran a sub three-hour marathon,

and then Harriette Thompson here and you can read that for yourself, a nice thing there to complete a half marathon at 94 years old. So some of the other things I like to address because these are some of the common questions that we would get off of an exercise-based webinar like this is, what can I do for home programming? So I like to give you some of those things. Now these are home programs to be able to drive some intensity. Some of these are gonna be more strength-specific, but I just wanna give you a some of the basics. If any one of you wanna contact me and ask for some more home exercise ideas, I certainly can do that. I recognize we're gonna have a lot more questions to wrap up the presentation.

I wanna leave time for that, but these are some of the basic go-to's that I have. I try to personalize my home exercise programs and I certainly am a big endorser of the OPTIMAL Motor Learning Theory, authors Gabrielle Wulf, W-U-L-F, and Rebecca Lewthwaite. So if you just type in OPTIMAL Motor Learning Theory or just optimal with Gabrielle Wulf, you're gonna be able to find the 2016 article that I'm talking about. Relevance here to home exercise programming is one of the things that I really like to do is actually to give maybe one or two more home exercise programs that I really need and I ask the patient to come back and tell me which one of those they would like to strike off of their exercise program.

It doesn't really seem to be as valuable for them. They like to have control and self-efficacy. In addition I like to be able to allow patients to see, this is exactly why I've put this exercise on your list because of our findings in your testing. So because you scored this on the Minimal Chair Height, or 30-seconds sit to stand, or two-minute walk, I gave you this as a part of your exercise program. I'm gonna look at the next PowerPoint. Dennis, I'm not going to ignore your question. We're gonna get to that as we move on to the entire summary area and questions momentarily. As I started the course with the photo of an individual over on the left-hand side, and then obviously what you could have known about that individual if you took the time to interview and

investigate over here, I'm also going to close and wrap up the course in the same fashion. You might see this, but if you didn't take the time to learn about who he is, you would've missed all of this and you would've missed great opportunities to get his intensity and engagement dialed into your exercises because ultimately the best exercise is not a function of what you think is most functional and task specific. It's going to be a function of what is most salient and meaningful and motivational for this individual. So we're gonna show you a couple more videos here. Actually, you know what, we have all three of these already covered. We've done a good job of covering those. I'm gonna flip to the next slide.

I showed you that one as well, so we're good there. So I'm going to start to take your questions now. I've tried to leave enough time in the webinar to cover your questions, but I certainly wanna share with you my contact information. I have no problem fielding your questions, be those products-related, be those case-related, how can I carry this out with that patient? So shoot me an email. Visit our website if you'd like. Come visit us in Oregon. Nearly any time of year to me is actually lovely and great. So that's great as well, but contact me there.

I'm gonna start to address your questions now. As we start to wrap up, I additionally want to make certain that all of you are feeling like you've got something valuable out of today's effort, that you have something to be able to change practice and that you can have the permission to be more intense with your patients following the ACSM Guideline. So Dennis, "What is his work rest time on the react?" Oh, great question. So we started off giving Joe a 30-second expression on one side at one-minute rest, and then a 30-second on the other side. I just saw him yesterday, that's correct, yesterday, and that's two sessions ago is when he started on that. Now he's up to a minute, rest a minute, and then go another minute. Catherine, thank you so much for your comment there. I'm glad that you learned a great deal. Susan, thank you as well. We're gonna go back here. I'm not certain, one second here. Let's see, Susan, "If you have a patient

who is so sore that they do," and I see just a part of your question. Looks like I'm seeing everything, but maybe you didn't get a chance to finish that 'cause all I'm reading is, "If you have a patient who is so sore that they do am." I'm sorry I don't understand that, if you could retype that. Let's see, Charlene, "Never been to Oregon. "Daytona Beach, Florida is pretty beautiful right now. "I'll get to Oregon." Thanks, we'll be ready for you out here. Let's see, Charlene, we've covered that question. Catherine, thank you again for that. Nancy, thank you for your comments, appreciate it. Christine, appreciate it, thanks so much. Michelle, great. Oh, good, I'm glad to hear that. After 30 years of working, we delivered some new things for you there too. Sarcopenia, yeah, okay. You know what, as a matter fact, that's a great question. So sarcopenia is actually an expression of an individual that's, it's actually a weakness itself. So sarcopenia is the loss of motor fibers then too.

So that's essentially what we're looking at there. I'm sorry for actually not covering that directly, but we take a look at that. So it's really just that loss of muscle tissue. It's normal with the aging process to have sarcopenia as well. So I'll take a moment to look back to that as well. Let's see here. We've got all that. I'm just looking through your questions as well. We've got a lot of great questions coming through. I'll try to get through to everybody. So Catherine, that should answer your question there. Nancy, again, thank you, different Nancy. Margee, hopefully I'm pronouncing your name correctly. Good, thank you so much for your compliments as well. Stacy, thank you, good. Let's see. "Can you talk about one repetition "maximum a little bit more?" So really one repetition maximum is the greatest amount that an individual can lift safely, one repetition. They cannot complete a second repetition. In the most frail of individuals, getting up from a 26-inch surface with or without using their hands, might be a one repetition maximum. So we actually create a dosage off of that by reducing the difficulty by 20%, so therefore they have an 80% load. I'm gonna make it a little bit more specific. Let's say all you can lift from waist height up to shoulder height is 10 pounds. You load an individual with a grocery bag and you give them, maybe there's a

cloth grocery bag or some type of container, you put 10 pounds in there, and then you have them try to do their maximal lift. The most they can lift with two hands is actually 10 pounds. So then you wanna give 'em a prescription that is 80% of their one repetition maximum. So therefore you would take eight pounds, 80% of the 10 pounds, and you would say, okay, I want to try to do this somewhere in the neighborhood of eight to 12 times correctly biomechanically painlessly so that we can get you stronger.

And then when we come back and try to retest your one repetition maximum, since you followed the ACSM Guideline, you should fully expect that the individual actually has made measurable gains. So Stacy that's the way we do that for upper extremity or lower extremity. Now keep in mind: that could be done on a machine-based expression as well. So if an individual's maximum is let's say generating 150 watts on a fluid-based rower, on a Biodex semi-recumbent elliptical, on a new step, on a fit stepper, doesn't really matter what you're using. Whatever their maximum expression is, now you say, hey, if you can conduct that, let's call it, I don't know, 160 watts is the best you can get, now I need 80% of that.

So that means I need to subtract 32 watts off 'cause that's 20% of 160. So that will pull me down to actually 128 watts. Now we're gonna exercise at 128 watts and see if you can get eight to 10 repetitions done conducting at 128 watts. I could go on and on about that, so hopefully that helps out. Let's see. Wesley, "Great information over the past three webinars." Thank you, Wesley, I appreciate. Thanks for attending all three. Mary, oh, Mary. Hey, this could be certainly somebody else's name, but hey if you're calling in from New Jersey there and attending, I know exactly who you are. Thanks so much, appreciate it. Let's see. "You're my favorite presenter so far. "Wanna hear more from you." Thank you, Janie, appreciate that. Patrick, thank you for your comments. I appreciate that very much. "One of the gurus," okay, thank you. Let's see, and Patrick, thank you. Let's see, Matthew, appreciate it. Yes, I'm looking forward to you applying those things. Hey to all of you that are saying thank you so much, I appreciate it. You

can contact me at any point. Visit my website as well, just MikeStuder.com. Just like it sounds, MikeStuder.com. I can share with you some more information, just kinda follow along with what we're doing. Jesus, yeah, great. If pt.com is looking for more courses from me, I'm always available. I've been teaching with them for probably about the past six years. Marie, "I feel like I still don't know "the answer to this question: evidence revealed "in this course cited the best answer "from choices below for strengthening patients." I'm just gonna try to read this here. "Strengthening patients with rheumatoid arthritis is," okay, let me see here. One second. It's hard for me to actually look at these questions. Let me see if I can actually pull this one up here. Stay with me, Marie. "Evidence revealed in this course cited "the best answer from the choices below "for strengthening patients with rheumatoid arthritis is, "A land-based resistance training "set at a perceived exertion of four to six out of 10, "the mode of exercise based on patient preference. "Could be stationary bike, could be weights, "could be elliptical or other."

So that's one option. "B water aquatic-based using 33% "of body height submersion." Aha now I see you're leading the question there for the person who was asking that earlier. "C, long distance walking with assistive device as needed, "D, none of the above are indicated in RA, "and the answer is A as a matter of fact." So 33% body height, I can see where you're trying to lead that way. It would be rare for us to ever give someone one-third of their body height. It's actually very difficult to walk in one-third of your body height, extremely difficult. So we try to actually moderate out the perceived exertion four to 10, go for pain-free exercise, go for patient preference, and we try to use these three expressions. You can use a stationary bike for some that have enough pain-free motion at the knees. Most of the time you're gonna find a elliptical was gonna work better, you can use weights for them, additionally, but the best choice of the ones that you're given would be A. When we certainly take a look at this from the evidence in the literature, rheumatoid arthritis strengthening should be, A, pain free, B, patient preference, and C, utilizing some autonomy for the patient,

perceived exertion, four to six out of 10. Not overdoing it with them because we know that the noncontractile properties of rheumatoid arthritis can give them some greater amounts of destruction in what we're looking for there too. Yup, you're exactly right, Marie, thank you. So I would certainly say absolutely based on evidence that A is your answer there too, yeah, and thank you for your support on that one too. Question, I see, "question percentage mark is also confusing." Now I see percentage mark. That means you're probably using the shift key and five. So I'm assuming that's what you're talking about, Janice, is "Question percentage is also confusing." Maybe you're talking about question five. I'm not positive. In that case I'm gonna actually review question five because the numbers, sorry, the percentage sign using the shift on five is percentage.

So a blank can be an effective and reliable means in which to test muscular endurance over time with a given geriatric patient. So a 60-second sit to stand test, a one-repetition maximum arm curl, a standing broad jump, a 400-meter sprint. So if you wanna test muscular endurance, remember, the question's muscular endurance over time of a given geriatric patient, the answer here would be A because that is more than 15 rep. It's more than 12 repetitions most classically in a 60 second sit to stand test, but a one repetition maximum is not the answer because that's not muscular endurance.

That's muscular strength. Most individuals would say, for geriatrics, you're probably not gonna use a standing broad jump, and the fact that that's not endurance, that's actually power, and that 400-meter sprint probably would not be the most common application there. So I'm hoping that the clear answer is A on question five if that's what you're looking for. Yes it looks like Janice has flipped back to your question and you are talking about five. So hopefully we have answered that well. Let's see here. There was somebody that was asking about "abnormal age related changes include?" Great question. We did cover this I think pretty thoroughly towards the end and an

abnormal age-related changes that we recognize for persons is a dementia. Well you all know that's not a normal age-related change. Is it increased maximal heart rate? No, it's actually decreased maximal heart rate. Is it reduction in sarcopenia? No, it's an increase in sarcopenia in loss of muscle fibers, or is it D, none of the above? So absolutely it is none of the above on that one. Hopefully that's pretty clear for you now as well. So the answer would be D there. Oh, great, thank you, Michelle. I appreciate it. Let's see here, I've got another one. Question eight, I'm happy to go over that as well. Question number eight: safe core strengthening in geriatric fundamentals, providing dosage and limited harm should include: modified prone planks, seated activities with a spinal stability focus as we talked about a little bit in terms of changing the range of motion, recumbent or stationary cycling for safety, which actually shouldn't be much of an expression on core strength, or D, none of the above?

So I'm telling you very clearly, seated activities with a spinal stability focus, when we talked about in the class to reduce the range of motion there and providing resistance within a pain-free range, that's where I would shoot for. So I'm gonna tell you eight, the answer is B on that. Patrick, "Question number nine is confusing." One second and let's see what we get to. Cardiovascular endurance training recommendations from ACSM include: sustained activity whole body is able, 30 minutes consistent, which is ideal, or 30 minutes three times a day, which is acceptable from accumulation. Answer is D, so all of those.

You can use a sustained activity. We would like to involve more muscle groups, which is what makes it cardiovascular, heart demanding. 30 minutes consistent is ideal, but you can also express that as we saw in that slide for accumulation with cardiovascular, you can do it 10 minutes over three separate times per day. So Patrick, the answer is D there, good. Let's see, Rose, "Can you review question number seven?" and I see somebody else asking for question number 10. I'm happy to do that as well. Question seven: normal age, oh, actually we did that. So normal age-related change, I think

that's a question everybody's seen right now. Reduction in nerve conduction velocity. So that's true. Our nerves do not conduct as quickly, both in sensory and motor. Reduced skin elasticity, so you guys may remember one of the earliest slides, I said hey you wanna pay attention here 'cause this is gonna be on your questions. Reduced mitochondrial capacity, and that's true as well 'cause we talked about the energy, resources and capacities. We talked about that. So the answer is D, all of the above. I do recognize that it's hard to pick those up because I'm intentionally causing individuals to listen during the program. I'm not always spelling it all out in the handout for you there too, so. Claudia, I'm gonna look at question number 10 for you, and anybody else that needs to look at it.

Question number 10: frail geriatric reconditioning considerations include: nutrition, remember we did talk about that, enough protein intake, modified measurement to document and encourage gains. Remember we said, hey that's one thing we said every single time is that we want to be able to use measurements as an intervention so the people can see themselves make gains, especially the frail patients. Skeletal positional concerns with osteoporosis after long, prolonged bed rest. Is there bone ready to actually be stressed, even if their muscles are ready to be stressed? Is the bones 'cause remember we talked about the risk for osteoporotic fractures. So the answer there is D, all of the above, good. Let's see, "Would you clarify question number two," and there's a couple of you on that.

So I'm actually going to do that one right now, one moment. Question number two: according to the ACSM, people over 75 should perform only one set of three repetitions. Well we know that's never been the case because we're looking for eight to 12 repetitions. B exercise three times a week with 90% of their one repetition maximum. Absolutely not. We wanna use 60 to 80% of one repetition maximum. C, avoid strengthening exercises if they have osteoporosis. None of us are gonna suggest that. So the answer is D, none of the above. You would not want to only perform one

set of just three repetitions because we're not going to be able to get enough dosage. I can see why you can be allured to that. I'm intentionally being tricky there, but I want you to follow the guidelines and get eight to 12 repetitions. So you need to adjust the dosage so that they can make eight to 12. And then, William, I'm gonna take question number four on right now. Evidence in this , oh actually, you know what? I've actually gone over that one and you might've written that question after we already gone over it, the correct answer being A, land-based resistance, training a set of perceived exertion for the person with rheumatoid arthritis at four to six perceived exertion out of 10. Let's see, John, question number three, patients with moderate and severe knee DJD.

Now what's tricky about this one is I actually looked at this question while I was presenting the webinar to you guys and read this very answer, but hey I truly understand the position , excuse me, of trying to take these multiple-choice questions. I understand it's difficult. So question number three, the answer is A, continue to do resistance exercises to strengthen. Even in the case of knee DJD, they are most often successful in a closed chain fashion. We do use pain as a guide, but we don't ask them to push through pain, so that's why B is wrong, and we don't exercise for one week, and then take two full weeks off. That's why C is not the answer as well. Okay, good. Let's see, Ursula, number eight, I will go down.

I'm happy to do that. I can spend as long as we need to to cover these. I appreciate all of your energy and diligence. Safe core strengthening in geriatric fundamentals should include, the answer is B. We went over that briefly. We wouldn't necessarily want to espouse prone planks for an individual. We talked about the desire to go prone, the tolerance of going prone, and then much less of prone plank, and we talked about the fact that a recumbent or stationary cycle is not actually an expression of core strength. So we use seated activities within a reduced range of motion for spinal stability, which is what we talked about there. Good, John, thank you. Looks like we've got that.

Jesse, thank you so much for your compliments then too. Janie, no problem, my pleasure. I'm happy to help out. It's really just part of the class and part of the offering. Adam, I'm happy to review question number one momentarily. Let me just get back up to that. Strengthening without equipment for an individual who complains of knee pain. Here's another one that I actually read during the course, but you didn't know I was actually reading a question to you. For knee pain, make adjustments to surface heights, absolutely to compensate for achieve pain-free strengthening. You wanna look at that. You're gonna say all day to A. B ask the individual to work through pain for the first three weeks of training.

No that's not gonna be good for me and you heard me several times to say we don't wanna ask them to exercise through pain. Assign deep flection squats with a counter chair or table support. No so that means D is not correct either because B is not. So the correct answer is A, which you alluded to in your question as well. Monica, I'm happy to take a look at question number three. One moment. Patients with moderate and severe knee DJD is answer A. So we wanna use closed chain exercise. We wanna strengthen these individuals in a pain-free manner.

The reason why answer B is not correct because answer B tells you to push through pain in endurance training. That's not correct. Answer C is not correct because you wouldn't ask somebody to take two full weeks off of exercise. Rebecca, "The neuro class this week was extremely helpful. "Videos were wonderful. "Treatment options were innovative." Thank you so much. Vincent, "Do you have any courses related "to the business side of PT clinic management?" I'm gonna be careful about that one. I actually do consultation on the side. Feel free to contact me, but that's all I'm gonna say about that. Tammy, "I appreciate your attempt "to get people to listen carefully "to your course by not writing the answers." Thank you. Christopher, let's see, "Hey, Mike, could you review question number six?" I will do that. Okay, Catherine, really good point. "Why closed chain exercises with severe knee DJD?" You have to look up the

evidence on that as well. Closed chain exercises tend to engage the entirety of the muscular effort without actually causing, and you're correct. If you we're really loading the individual heavily with multiples of their body weight, you could have compression, but if you're not loading them either in a plyometric fashion, they're landing down, or in a fashion where they're loaded up, closed chain exercises are actually better for the individual. Now I wanna go back and review question six, which I was asked to do. Which of these below is a normal age-related change? We did this question once in review, but I'm happy to do that again. Is it dementia, no. Is it increased maximal heart rate, no 'cause it's decreased maximal heart rate. Is it a reduction in sarcopenia? No, it's an increase in sarcopenia, increase in the loss of muscle fibers. So the answer's D. None of those are correct.

The answer for number six is D. So we got that. Wow, it looks like we've addressed all the questions. If anybody else has any leftover, please don't hesitate to email me. Callista, I'll let you take back over here again. Oops, they all got cleared. Looks like we got everything. I love your points. Yeah let me just catch question nine real quick 'cause I saw somebody asking about that, and then I'll let you take back over here. Cardiovascular and nursing recommendations from ACSM, yeah. So this was answer D. We went through all of those already. It's sustained activity. Get as many muscles as possible. It's 30 minutes if you can. If you can't, you do 10 minutes three times a day. So it's all of the above. We could go on for hours. I love your energy, everybody. Thank you so much. Hey, if you wanna have me back again, suggest that to pt.com and I'm happy to do so. Callista, I'll turn it back over to you.

- [Callista] And thank you everyone for attending and hope to see you all back in the classroom real soon.