Introduction to Aquatic Therapy-Back to Basics
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- [Calista] Today's course, again, is titled Introduction to Aquatic Therapy, Back to Basics, and it is my pleasure to welcome back and to introduce Dr. Beth Scalone of physicaltherapy.com. Beth is the owner of North County Water and Sports Therapy Center in San Diego California, specializing in aquatic and orthopedic physical therapy since 1997. Beth is an orthopedic certified specialist, a certified Stott Pilates instructor and an Aquatic Therapy Rehabilitation Institute certified therapist. In 2010, Beth was honored with the Aquatic Therapy Rehabilitation Institute's Tsunami Spirit Award for her contribution to aquatic therapy education. In 2012 she was also named the aquatic therapy professional of the year, and then in 2015 the aquatic section of the APTA presented Beth with a Judy Cirillo award, in recognition of her promotion of aquatic therapy. Additional aquatic therapy certifications include master instructor for the Burdinko Method method and trainer for AquaStretch, which is a myofascial release technique performed in the water. Along with continuing to actively treat patients, Beth travels in the world, providing continuing education courses with a focus on aquatic therapy. So thank you so much for presenting for us again today, Dr. Scalone, and at this time I'm gonna turn the microphone over to you.

- [Beth] Thank you, Calista. Welcome, everybody. I hope everybody is having a great Friday, the last Friday of January, and we're headed into having the holidays here before we know it. I couldn't believe it was the end of January, so thanks for joining me. You see here on this screen my contact information, my direct emails, beth@waterpt.com, so if you have some questions, please feel free to contact me. Please do put something in the tagline, that you took this class or something. I get a lot of junk email, so if I get delete-happy and I don't see anything in that I tend to skip over it. But I am happy to try to help, and promote water therapy, so if you are brand new to water therapy, this is gonna kinda give you some basics about aquatic therapy, and if you're already part of aquatic therapy, hopefully this will fine-tune your thoughts, etc., for you to do at your job. So let's go over the learning outcomes. So after this course, the participants will be able to provide at least three medical justification statements for

the use of aquatic therapy, relating specific therapeutic benefits, with buoyancy, drag force, and hydrostatic pressure, in the patient's plan of care. Identify at least five precautions and contraindications to aquatic therapy, recognize at least three primary differences of human movement and muscle activation in water compared to land, identify at least three progressive rehabilitation exercises based on the properties of buoyancy and drag force, and list the use, benefits, and precautions of three main types of aquatic therapy equipment, including buoyancy, drag, and flotation. So hydrodynamics, basically how does the body, and how does exercise change when we're in the water, even if we're performing what looks like the same movement. So we're gonna talk about these properties. So first, buoyancy, this is the thing that we think of the most. It's usually what physicians think of, and it's basically that Archimedes principle, that you get that upward thrust that kind of unweights the joints, and this is the formal statement. It's the amount of fluid that's pushing up, based on the weight that's displaced.

So let's show the video, and this woman has significant lymphedema, so you can imagine she probably floats, but in the water a lot. So you'll see that this is, and I'm sorry it's kind of sideways , but you can see that this is much easier for her. She wouldn't be able to do this on land. She's actually using a scooter at this point, and not actually able to walk very far on land at the moment. Now, this was several months ago and I am happy to report she's now walking with walking sticks going through the pool, so she's been transitioning to land. Okay, let's go back to the slideshow. So buoyancy's one of the biggest things that helps us, and we can use it in different ways. There's an assist, or support. So when you are in the water, and you can see this woman here, she was just floating, she has neutral buoyancy, so she doesn't need a lot of flotation, but the water is supporting her now. Moving your, depending on the movement, the direction of the movement, and if you have any equipment on, will determine how much resistance or lack thereof, so for example, we have the water supports, it assists, and it resists. In the supports, you'll see that these pictures have gotten a little moved around, so let me get the cursor here, so here you can see that

the water is supporting this gentleman in a supine position, and if we had him do shoulder ab- and adduction, he would be able to reach over his head, but the water would be supporting him. In the, same thing here, if she did horizontal A-B and A-D-duction, she would be, also the water would be supporting the arms in that motion. Over here, you'll see that that's a resist, so that's the pushing down, and he's got foam dumbbells, so whenever you move a body part towards the floor of the pool, that's technically buoyancy resistance. Whenever you're moving towards the surface of the pool, then that is an assist, so it's moving up towards the surface of the water, and if it's just kind of level, or parallel to the bottom of the pool, then that's more supportive. This girl here is a complete spinal cord injury at C6, and so you can see how I can manage, although she's very tiny, but I can manage to handle her, and the water's really supporting her in that position. I don't have to work so hard, and we can get a better session with one person safely, so just realize that you can have an assist or a support or resistive exercise, and I apologize, these pictures don't match the support, assist, and resist, so don't look at that.

So body type, what's the big deal about body type? Well, we have some people that sink and some people that float, and that changes how much buoyancy support and resist, or assist, we get in a certain movement. So if you remember the woman in the first slide with buoyancy, she had a lot of lymphedema. It was very, her legs floated really easily, so the assist on her going from squatting down-up was a lot of assist. Now, you take somebody that's a lot of muscle tone, and a sinker, as I call them, you're gonna find that they don't get quite as much assist by the water. It does affect their ability to float. So think about a relative density. That's the physics behind it, and we have, it's basically the mass of the object divided by the mass of the equal volume of water, so if your relative density, and that's what RD stands for in the list here, if it's less than one , you tend to float, like a cork. Why does a cork and a rock of the same size, one floats, one sinks? It's their relative density. So higher body fat, which tends to be women and kids, we tend to float more. When you inhale, you get more volume of water in your lung, I mean, not water, more air in your lungs, and so that changes and

makes you float more, and flaccid extremities tend to float, so if you're working with patients with a CVA, that type of thing, you might have to keep an eye on that flaccid extremity, because it may not be as easily controlled. Of course, higher density, so lean muscle mass, your athletes, that kind thing, They're gonna tend to sink more. You might have to give them more flotation if you're using deep water. When you exhale, you'll tend to sink, and spastic extremities, or muscles, also tend to sink more, so something that you'll see as you do it. So the nice thing about the buoyancy, is with that it decreases the weight bearing levels, but it depends on how deep you are, so you'll notice here that the deeper you go the less weight bearing there is, and I have put it in the level of the body part, because of course four feet deep hits me differently than it does other people, so when you're thinking about that you wanna look at where does the water level hit, and it decreases. Now, the thing about this is this is at rest. It's when the person isn't really moving very fast. However, I wanna point out that when the speed increases, so if you're jogging or walking fast in the water, you have ground reaction force from the bottom of the pool still, so that weight bearing level actually goes up.

So this is really important if you've got an athlete, or somebody that is on a restrictive weight-bearing, so the doctor's giving you, hey, no more than 50% weight bearing, no more than 25% weight bearing, but you wanna get them moving a little faster, because the tissues can tolerate you just letting that weight-bearing go. You need to watch that, so you wanna remember this so that you can keep them safe. All right, now, I get a question all the time, "How does water help patients with neck pain "and upper extremity?" 'Cause, you know, especially neck. We don't, very rarely do we say, okay, dunk down, hold your breath, let's get you under water, and completely submerge the cervical spine. So I want you to try this at home. It's a little hard 'cause I can't see y'all, but what I want you to do is just let your arms hang at your side and turn your head from side to side, and kind of get a sense of if you feel tightness, restriction, what are you feeling, any pain? For those of you that are really young, you may not notice anything. If you're like me and have been in therapy for a while, you probably have

some stiffness in your neck. Then what I want you to do is if you've got arms on your chair or support the weight of your upper extremity on your desk, so that there's no pull from the arms, and you kinda un-weight those upper traps, try turning again, and hopefully you notice, you might notice a difference. So basically, buoyancy reduces that gravitational pull on the upper extremities, so it reduces the traction of the upper trap and the levator muscles, and in turn, that un-weights the facet joints, because of where they're, look at where they're attached, and that allows for increased mobility and decreased pain, so you can work on those postural control muscles and range of motion without as much pull, so that's kind of a little clinical pearl, is how does that help those with upper quadrant issues.

So buoyancy works. Just remember, it's progressive in nature. It can go from passive to resistive, and it's dependent upon the movement of the limb, and the position, and of course equipment. If you are adding anything with foam, the buoyancy piece of equipment, that is going to add resistance as you try to push that down under the water, so when we talk about equipment, you'll wanna remember, not all equipment is created equal, and as far as the amount of foam and buoyancy and density. So this is just to, reinforces what we know about buoyancy, and that would be that VMO, they did this study that looked at the activation of the VMO with a single-leg squat, and they found that it was less the deeper you went. So we know that if somebody's really weak we can utilize deeper water to start to get that muscle to be active, but allow them to be successful in the movement, and then gradually try to bring them into more shallow water, so we increase the weight-bearing and the challenges. This is just another study that also reinforces that water decompresses in the deeper we go. There's decompression in the spine. So they took normal, healthy people, they were already runners, and they had them run in three conditions on land, in shallow water, and in deep water where they were completely suspended, and they looked at their height, and before and after, so they used the how much height did they lose after the activity as the measurement of how much the spine compressed, and they found that those that ran on land and shallow-water running had a significant, statistically significant,

loss of height, compared to the deep water, so that just reinforces that. Interestingly enough, as a side note, there was a little bit of loss of height in the deep water, and the theory is you're using your paraspinals of your back, and that would create a compression force. So some of that did occur. Also, they looked at the first 15 minutes, and after 30 minutes of running, and most of the compression occurred in the first 15 minutes, so we can't even tell people, well, break it up into two 15 minutes, you won't get as much compression as far as on land.

So what are the therapeutic benefits of buoyancy? Well, we've got decreased weight bearing, and so decreased joint compression, so that leads to decreased pain. So that often will allow increased range of motion, you can do gait training without intelligent compensations in the limping. They have ease of movement, so think of the people that have a hard time moving against gravity. It's safe for balance, because we have reduced fear of falling, and the worst thing that happens is they get their hair wet, which, for some people, might be pretty bad , but we don't have to worry about trying to catch 'em, and I can handle and manage somebody that's much bigger than me, in the water, and the venous pooling on dependent limbs. It's really nice that way, but that's actually twofold. That's gonna be hydrostatic pressure, but also gravity is what pulls that down. And again, we already talked about it being progressive, and we can support and assist those weak muscles, so thinking about that. Oops. What type of patients do you think would benefit from buoyancy? So thinking about who you normally put in the water, and have you missed anybody. What kind of patients do you think, or do you use because of buoyancy, because we wanna think about that. So I usually, people think about somebody really weak, so somebody deconditioned, maybe the elderly or frail, somebody that's been hospitalized and needs to get back into a program. Obese, and deconditioned because it's so much harder to move against gravity that you get them in the pool, they can start to move their bodies. People with neurological dysfunction. The other thing is, a biggie, our bread and butter in orthopedics, is the arthritis. Patients with knee, hip, back arthritis, with the back injuries, anything that they have more pain with gravity-dependent activities, or often

you can think of them as, oh, the buoyancy may help them. So if that person comes in and says it hurts to walk, it hurts to stand, I have a hard time moving, those are the people that you're thinking huh, well maybe the pool would help you. So what are the challenges? Buoyancy is great, but it does provide some challenges to us, or for us, I guess. One, like I said, I can handle somebody bigger than me, but I'm only 5'5". If I've got a six foot four patient and I gotta get them pretty deep in the pool to submerge the body part, their back and whatever I need to help them, I'm almost under water, and I'm floating around.

So some ways we counteract that output, a weight belt on my waist, if I can still touch the bottom of the pool, and that helps ground me. My muscles have to work a little harder, but I'm not floating around so much. So sometimes that's our challenge. It may be difficult to stabilize the patient. The patient may have a hard time, so you know that the deeper you go the more that buoyancy moves you around, it's harder to balance, so sometimes it's the goldilocks principle, finding the right depth, if you have different choices. They may have less proprioceptive input, and they get different proprioceptive input is really what I should say, but buoyancy unweights that joint, so you get different, you don't get those weight-bearing mechanoreceptors feedback as much, so just thinking that they might, that might be a challenge, and I have a story of a patient who had Parkinson's, and we were walking into the pool and I thought, oh, this is perfect, he's gonna do great, and we got him to about T11, and I'll talk about that level in the water, and he just faceplanted, because he was so used to just kind of shuffling along to gravity, as soon as that upward thrust came, he couldn't control that rotation of the water as quickly, and I had to catch him and get him up and bring him back a little bit. He still did great in the pool. I was surprised at how quickly that happened, so just realize you might have to keep a close eye on people, and then of course, you got those flaccid extremities that float, so you have to keep an eye, if you're trying to work on somebody walking that's had a stroke, and that arm starts to float, their hemopalegic side might start to float behind them. You may have to do some techniques, see if they can bring their hand onto a kickboard in front of them, or add a

very small weight to that arm, to kinda keep it from floating away. So T11, what is this T11? So in this, this slide, you'll see the blue arrow is the upward thrust of buoyancy. The red arrow is the downward push of gravity. Gravity doesn't go away, because if it did all the water would float up, so when we get to the water, when it hits our body at the thoracic, the 11th thoracic spinal segment, that's the point at which most of us are now being controlled by the force of buoyancy to a greater degree than gravity, so this is where you start to have a bigger challenge in controlling your body, and your movements, or your postural control, so your balance as you get deeper in the pool.

And you'll see here, basically, that creates a rotational force, so again, the gray arrow is gravity, the darker gray arrow is buoyancy, and any object, whether it's a boat or a human being, is going to rotate until the center of gravity and the center of buoyancy is right on top of each other, so we know the center of gravity is in our pelvis, just in front of S2 a lot of times, and then our center of buoyancy tends to be mid-chest, because of our lungs, so that's one of the things that creates a strengthening of the core and the spine, because of this rotation, but also, sometimes it's a little bit challenging, patients have to learn how to control that, so just realize it, and it happens with all planes, so if the person's supine, floating, they can rotate right or left. Typically your spastic side, if it's somebody with hemophilia, they've got spasticity. That spastic side is actually gonna be more dense and sink, and their body's gonna start to drop down into the pool if they're supine, and rotate, so things to, you'll see it if you're doing it, you'll recognize that. You can also feel it on yourself. So now we're moving into drag force, and drag forces are something that are interesting, because they are based on speed. So they're the thing that help us strengthen. Now, first we have to remember that we have cohesion, adhesion, and surface tension, so cohesion is the molecules of the water like to stick to each other. So moving through the water, breaking up that water, adds resistance. Adhesion is the water molecules like to stick to your bathing suit. So every time you see you try to come out of the water, or that kinda thing, water is sticking to you and adding to the resistance, and then surface tension. The molecules on the top of the pool are actually a stronger bond, so breaking that surface

is harder, and that's why when we're doing upper extremities stuff we usually don't go out of the water, in the water, out of the water, in the water, because of that surface tension, and then suddenly you don't have resistance when you come out of the water, but it's something to think about, and it is something that if you come out of the water pretty quickly you can take up to about 50 pounds of water with you, so imagine your patient as they come out of the water. If they're trying to pull themselves up a ladder quickly, they're gonna feel that gravity return a lot faster, so when you have ramps, or just having them go a little slower can help that water drip off and not be such a dramatic change. So viscosity, that's the thickness or frictional resistance of our pool. Yes, just like honey when it's warm, water is easier to move through, so technically, if you're in warmer water, it's a little easier to move. I don't think that our human body can really tell the difference between a few degrees in the pool temperature, but technically, the warmer it is the easier it is. But this is the drag force equation, and it's just simple physics, but I want you to look at the V, which is for velocity, or the speed of the object, and the frontal area of the object, so A, and you'll notice that the A is linear, so if you double your surface area, you're going to double your resistance, but what I want you to notice is the V, the velocity, that is squared. So now, that's exponential.

So based on that equation, if you double your speed, what happens to the resistance? Because it's squared, it's exponential, and you're gonna be four times the resistance, two times two. If you triple your speed, that becomes nine times, because it's exponential. With surface area, it's linear, and so if you double the resistance, I mean if you double the surface area you double the resistance, so speed has a really big to-do here in how much resistance the patient, or the person, is experiencing. So this study looked at scaption, or shoulder elevation to 90 degrees, in the plane of the scapula, and it looked at the rotator cuff muscle activation, and they compared land to water, and what they found is if they were moving slowly in the water it was less muscle activation compared to doing it on land. However, once you started to speed up greater than 90 degrees per second, you had greater muscle activation in the pool, so

what happens is when you're moving slowly buoyancy is assisting the limb, and the muscle activation is less. If you start to move fast, drag force kicks in, kinda increases that resistance. So the moral of the story here is if you have somebody that's a rotator cuff repair, or they're in an active assistive phase of rehabilitation, where they're not supposed to have resistance, you just need to make sure they're moving slowly in the pool, because that drag force will start to play a role as they start to move faster. And 90 degrees per second isn't really that fast, so just kind of keep that in mind. Here's another study they've used, looking at the hydro-tone bell, and that's that yellow piece of equipment in the picture here, and it's drag force equipment.

These are these plastic bells that have slits in them that increase the surface area, and they found that there's a lot more force produced when it was positioned at a 45 degree angle, versus a zero degree angle, meaning 45 degrees was greater surface area than the zero degree angle, but when they slowed it way down, it was about equal, so this really reinforces how much speed plays a role, not just surface area. The hard part of getting the person to move faster, sometimes. The nice thing about the drag force with that is if the person doesn't have the strength to move faster, it's self-limiting. You know, on land, we're like do I give 'em a three pound or four pound weight? What are they ready for? And we're kinda guessing, and we often kinda guess a little lower and then move up, to see if they tolerate it. In the pool, with drag force, if they physically can't generate that tension, they won't be able to move faster, and so you're not giving them an outward force that potentially maybe could irritate things. That's one nice thing about that. Now, we have streamline and laminar flow versus turbulent flow, and this is basically, if you think about a swimmer, you think about the Olympic swimmers, how they put their hands out and make themselves really streamlined, to get through that water when they're pushing off the wall. Well, that's because it's gonna take less energy to get going and make them faster. So this picture you'll see the green subject, or object, moving through, not creating a lot of turbulence and fine, and then you've got the square big old tug boat that is creating a lot more resistance, so our profile, so to speak, makes a difference as how well. So if you think

about it, which is harder, walking forward in the water or sidestepping? Now, let's pretend, or let's assume, for me, that I am wider when I'm walking forward, and when I walk sideways, I'm a little narrower, that my profile going against the water is thinner, so sidestepping should be less resistance than walking forward, so sometimes we have to change that. We have to have them go sideways. Now, the Bernoulli Effect says that a fluid, or pressure in a fluid decreases as the speed increases, so basically, see behind this boat here, you get a low pressure, and those are something that can help pull a person through the water, so we always laugh about ducks and the ducklings, so if you think about a mother duck, her ducklings follow behind her, and why do they do that?

Well, it's easier for them to paddle through the water. She's created an eddy, a lower pressure, and then they don't have to work as hard, so you can do the same thing with your patient. You can walk in front of the patient, walk backwards. You can create a little bit of a lower pressure, if they're having a hard time walking through the water. Of course, you could make it harder. You could have them walk through the water and you could be in their eddy so they have to drag you along, but I think that assisting a patient sometimes can be, and kind of pull them along, if you've ever done the, as a kid, run around the pool and make a whirlpool and then kinda pick up your feet and float around, think about how you've got that turbulent flow moving in that, you've got that ability. So what are the benefits of viscosity? What are the therapeutic benefits? Well, they're strengthening muscles in both directions, so it's concentric-concentric most of the time, especially when using those drag-force equipment, but if I'm doing horizontal AB and Ad duction in the pool and my arms are in the water, I'm getting chest and back each time, versus a weight machine, where we're not doing that. Or when you're using free weights, that kind of thing. So that's kinda nice. It can be controlled by speed and surface area, so again, it's progressive in nature, and we have a variety of different pieces of equipment for the pool that can increase that surface area. You can decrease the movement, decrease the resistance, and decrease the load, so there's that ability to control that for those people that need to be a little more

slower progressive in nature for exercise. Slowing the movement down. We can't move quite as fast in the water, because of the viscosity, and so sometimes it smooths out your emotions and improves that quality of movement, and of course, it can increase the time-response for patient's equilibrium reaction. Now, that patient I gave the example of, with Parkinson's, his writing reactions were too slow. The water didn't slow him down enough to prevent that, but a lot of us, when we're trying to balance, if you skull, that's like flapping your arms, trying to help yourself in the pool is what we think about. That helps you in the pool, it certainly doesn't help you on land, 'cause you're just slapping at air, so thinking about those things. All right, so what are the benefits of turbulence and flow? Well, we can increase the resistance, I can create more turbulence so you have to work harder. We can have them work harder, faster. Training those speed moves, about 90 degrees per second, so realize that if you're working with athletes, that's great, you can do that, but we function at a higher speed, so it is important that we do move them to land eventually. We can use those eddies, those lower pressures, just like the mother duck and her chicks, to move through the water, and it does increase some proprioceptic feedback, so we can use it for people that have that extra sensitivity, and tactile defensiveness. We can challenge our patient's balance during stabilization exercises. So there's a lot of things that can help, and, you know, posturally, they're getting feedback from the water all around them, so even though it decreases the weight-bearing proprioceptors, you're getting other sensations and feedback.

So who benefits? We've got Parkinson's disease, cerebral palsy, it dampens some of that involuntary movement as far as allowing them to move through the water. Remember that spasticity is technically a heightened stretch reflex, and so you get that person that they go to sit to stand, and they kinda go into extensor tone, or they have more spasticity, that we move our sit to stand I believe is about 150 degrees per second, so that's pretty fast, but if we can do it in the pool and move slower, we may not trigger that tone as much, and if you added the warm water in, so another way somebody with that spasticity, it might actually help. Anybody with weakness and

muscle imbalance, because we're strengthening it, so we move through the water. Sports rehab, because we can really, those individuals can really use the drag force, get some strengthening, while we're protecting their joints, through the property of buoyancy and un-weighting them. And anybody that needs posture control and spine strength because the drag force is gonna push them around a little and they have to control that. So what are our challenges ? Well, too much turbulence. Currently I utilize a pool that I am sharing space with a health club. Now, that's, what we have is what we have available, and so the challenge to that is in the Summer, I'm in San Diego, so the pool's outdoors, and it's open all year long, but in the summer we have 200 kids in the same pool, and so our patients are challenged significantly on those days. Right now it's nice and quiet, and fortunately, we're having some warm weather so it's not too chilly, but it does make a difference.

So if you're sharing a space, or say you have somebody that's a little more frail in the pool, somebody that's doing higher level stuff, creating some turbulence, that's going to affect the person that's a little weaker. The thing that I do if I have a lot of turbulence going on in the pool, and this is just more of an aside for documentation and communication, but if you have that person that's having a hard time and you have to kinda drop down their exercise level because of the turbulence, make sure you document that, that it was really turbulent that day, because on paper it just looks like they've gone down in their flow sheet to an easier exercise, so we wanna make sure we're clear about that, and this is a shameless plug, but on physicaltherapy.com there is a documentation and reimbursement course from me about aquatic therapy, so if you want more about that look up that course. And then tactile defensiveness and vestibular, so those kids that get sensory overload real fast, you might have to limit how much pool time they have, and they may not tolerate the splashing and that kind of thing early on. Also, if you have somebody that has a vestibular issue, and it's really acute, so if they have BPDD and you just cleared them with the Dix-Hallpike and the Epley maneuvers, putting them in the pool right away is not necessarily a good idea, and especially supine and spinning them around, you definitely want to avoid that. One

of the things that has been looked at, and this is a study of, they did single-leg jumps, and these were healthy handball female college athletes, so they weren't injured, and they looked at both ground reaction forces and the concentric contraction of the quads during taking off on land, in the water, and in the water with holding these hand paddles that increased their surface area, so they were affecting drag force by increasing the surface areas of a piece of equipment, and what they found was, compared to land, so the water, both conditions, had a reduced ground reaction force, or a softer landing. However, they had a greater amount of concentric quad activation for the takeoff, and then comparing the two water situations, those with the hand paddles and greater surface area, had an even softer landing and an even greater takeoff muscle contraction, so for that it's interesting, 'cause if you have somebody that you're trying to strengthen but you're still protecting the joint, this is another example how great this is, and if you think about it, our ACL reconstruction patients, many of those people with ACL injuries also have a bone bruise.

Bone bruise takes a lot longer to heal, so here you can protect the joint, get them doing a little bit more, to strengthen, and still protecting those joints, so this is a nice little study that way. So now we're moving on to hydrostatic pressure. So this is basically the pressure that the water applies to the body. This happens whether you're moving or not, so if you're just hanging out in the pool, you're getting this effect, and it increases linearly, so you'll see the deeper you go, so in this picture the pressure at my ankles is greater than at my hips, and this is great for reducing edema, etc. You'll see that the pressure increases one milligram of mercury for each basically half inch of water. I would say, the deeper you go the greater it is, and if you're my age, you've probably seen some of those submarine films where the sub has lost control and it's plummetting to the ocean floor and they have a string run across and they can see that the hull is being compressed, but most of our patients don't feel that, and to get any more pressure you have to go deeper, so we don't, in the average physical therapy world, we don't put scuba gear on somebody and have them go any deeper, it's just they're hanging in deep water. But it does, it reduces edema, so that improves range of

motion, because get rid of that swelling, that joint can move better. It helps build up the muscles of inspiration. Just realize, the diaphram has to descend and the ribcage has to expand out during inhalation, so your diaphram has to work a little harder against that pressure, and I would say that most of us don't notice that, but we'll talk about that. Increased venous return, circulation, so that person that has some venous pooling, it also helps with that. It increases oxygen uptake in the muscles, without doing anything, so great for people with diabetes and the small vascular disease. It's partially responsible for reducing heart rate while in the water, and we'll talk a little bit about that in a minute, and no movement is necessary. Of course, you add muscle pump and stuff exercise to it, and that really helps that swelling reduction on top of that. So who benefits? Well, people with COPD, you work those muscles of inspiration and it facilitates the exhalation, and we know if we can blow more air off, typically we can get a little more air in. Already talked a little bit about diabetes.

Developmental delay, the weight of the pressure, the pressure of the water can kind of almost be like a heavy blanket. Not quite, we don't notice it as much, but that input can help. Pregnancy, that venous pooling in the lower extremities. I had a sister-in-law that was very pregnant when she visited once, and she actually put scuba gear on and hung out at the bottom of my pool at home for a while, and we kept looking down to see if she's okay, and she was happy as a clam down there, and that helped her get rid of some of the swelling. Ankle and knee injuries, so if you see those patients with ankle fractures, or, you know, the swelling is the last thing to go, and sometimes the pain is hard to get rid of. The pool can be a great place, and of course, lymphedema, and post-mastectomy. And again, a great environment for that. So why is it so important to control edema? Well, we know that with the quads, as soon as you get some swelling, the quads go down. It doesn't take very many milliliters as you see, for the VMO, and then the whole quad to kind of be inhibited, so that total knee, or that post-op knee person, again, great place for them. So the question is, how does high blood pressure affect the edema-lowering process, and this is just a food for thought, as far as especially if you're just hanging out in the pool. Well, if you think about it, the pressure

caused by the water has to be greater than the diastolic pressure, to create that pressure gradient so that you get the water out of the tissues, it goes back into the bloodstream, and normal blood pressure is 120 over 80, and at a depth of four feet there's 88.88 milligrams of pressure, so somebody that has 130 over 95, just resting in the water may not be as effective. Again, we're doing the muscle pump and it can also help, and the pressure gradient for lymphedema is substantially less, so typically we don't have to worry about that as much. So again, you've got 50 to 60 milligrams of mercury at the hand, and this was interesting, it showed a slow-paced aquatic exercise was more effective than the conventional aquatic exercise immediately after the intervention for arm volume, and lymphedema management. I will tell you that the longterm effect, no difference, but the immediate effect, so if you are focusing on lymphedema, reduction in an extremity, thinking about more of that slower-paced movement versus the conventional exercise and trying to get the heart rate up. All right, so how important is temperature.

For those of you that have ever had your pool temperature go down two degrees, you know how much the patients complain about it, and that's something, because basically the gradient in the pool, it's transferred a lot faster and more efficiently in water than it is air, so I have an 82 degree pool, and air at 82 degrees, I never get cold, but I'm gonna get cold in 82 degree water if I'm not moving, or if I'm in there too long, because basically, you're gonna, the heat will even out. So if you put an ice cube in tea, that cools the tea down and it melts the ice, so a body, a human body, is gonna cool off in that water unless they're generating more temperature, so it's pretty fast, and so those of you working in nice warm water pool, that's great. Now, that does make a difference in what we do in different temperatures. So if we're doing high-energy, vigorous exercise with our athletes and plyometrics, I want it to be a cooler side, I don't want them to overheat, 'cause they're working hard. Middle of the road, that 91 to 95 light exercise, and I would say that for aquatic therapy, I don't want it higher than the 92. 95 gets really kinda warm if somebody's moving, and if you're the therapist in that pool for more than a few hours, you do get overheated, so I would say,

thinking about it. And then of course, if you're just relaxing, it's that jacuzzi, the 95 degrees, but thermal neutral, meaning you can be in there and you don't really get cold and you don't get too hot, is 92 degrees Fahrenheit, so thinking about that. Now, we don't usually have the choice of going up or down in our pools, so if you have a warm water pool and you're seeing an athlete, just remember you gotta give 'em more breaks, have 'em drinking water, make sure they don't get overheated if you're working harder. For me, I have the cooler pool, that 82 degrees, so we see a lot of higher-level orthopedic patients, our multiple sclerosis patients are happy in the cooler water. Obese and cardiac, when we do see somebody with a neurological disfunction, where they're frail or they get cold easily, this time a year we may not be seeing them in our pool. We do have wet jackets that zip up the front, for our patients, to help them, but we may be limited in the time that they can stay in the cooler pool. So you'll see warmer water is nice for that population, and kids get cold pretty fast, so having a little warmer water can be helpful.

So therapeutic benefits to the water temperature, well, if you've had somebody that's had a heat-related illness, it helps. It keeps them from overheating with exercise. Warmer water, though, in the therapy world, actually is really nice because it allows muscle relaxation, reduced muscle spasm and pain, so you're applying the hot pack while you're working on functional movement, balance, and strengthening, and so you're getting that two-for-one kind of thing, and relaxation. All right, so there are other things that we have to think about in the world of the pool, as far as rehab. We can't always change them. We just have to be aware of them, so these are things like refraction. This is actually an intact pencil in a cup of water, and what you'll see is it looks like it's bent or broken, and that's because when the light goes through a different-density medium, it changes what we see. So in the pool, what we see isn't really where the person is. You get used to it, and you kind of have a better idea, but recognize that's there. You'll see that, and this is just the formal definition of it. It also makes extremities appear 25% larger and 25% closer to the surface than they actually are, so you kinda learn to adjust your eye, and the further that person that's immersed

is away from you, the angle change is greater and the difference between actual position and virtual position increases, so if you're on deck, managing a group of people, realize the person further away from you, that change is going to be a little bit greater. So let's look at the box, this picture here, and you'll notice that this is my big old hips and my tiny little head. I'm going with it, I'm actually the size of my head, and that this is 25% bigger, but that shows you the difference of what you see underwater versus above water. Down here, I somehow lost my forearms and hands, so again, that's just the water refraction playing a role. So let's go ahead and show the video here, and this is one of those that one of my therapists was video taping me doing this, and she's like, "Oh, I don't know "if you're gonna like this." The reason being, as I squat down, my bottom gets bigger and my chest gets bigger, and then as I come up it goes down, and this is just going a little slow, but we kinda laughed about that. I'm like, we'll I'll keep the chest increase, but I'm gonna claim that's not my actual size of my glutes. Let's just see here if it works better. You kinda get the, you'll see that happening, and it's just something you can't change, you just have to get used to. So let's go back to the, what do you call it, PowerPoint, thank you . All right.

So here's just an example of how the false bottom increases. It gets closer to, you know, it's more distorted the further away you get from the pool bottom, so again, just kind of, you can't change it, you just have to be aware of it. Reflection, so I'm in an outdoor pool, so we have a lot of glare, and-or reflection on the surface of the water sometimes, and it's hard to see. I will tell you that even indoor pools have this because of the lights above, etc. For my pool in outdoors, I wear polarized sunglasses, and that really makes a huge difference in being able to see under the water and where the patient is, so you don't have to buy the expensive Maui Jims, but the polarized sunglasses definitely do help if you are in that environment, and in an outdoor pool. All right, other things that are therapeutically wonderful about the pool. It' the virtual plinth. Have you ever had that patient that's like , I'm not comfortable laying on my back, on my side, on my stomach. I can't sit, I can't sit, well, okay, let's get you in the pool. I don't have to turn you over, and I can get easier access to all sides of the body for

some of my manual work, so it is a nice attribute there, and they're not lying with pressure. Okay, so let's talk about the physiological effects of immersion, and this is just whether you're moving or sitting still. We have an increased central blood volume, so gravity isn't pulling as much fluid into our tissues and into our extremities, so our central blood volume stays higher, and hydrostatic pressure can help a little bit with that, so what happens is, there's more blood going into our heart, and we get a little bit better stretch, or bigger stretch in the ventricles, and then that little stretch creates a more efficient, or greater, contraction of the heart. It's called Stark's law, and so basically, we now are pumping more blood per heart beat than we were, and therefore we don't have to pump our heart as many times to get the oxygenated blood to our system. So that in turn will decrease our heart rate, especially in cooler water. Once you get into that higher warmer water jacuzzi, our heart rate's gonna increase just to cool our body off, but in that cooler water, that's a decreased heart rate. It tends to be 10 to 15 beats per minute less than the same perceived exertion on land, so if you're monitoring heart rate or you're setting a target heart rate for cardiovascular conditioning, you have to keep that in mind as far as the actual number that you might be using.

Blood pressure generally decreases in warm water. It does have a lot of different factors, typically. Total work of breathing room, we talked about you had to, the diaphram had to descend and the ribcage had to expand against that hydrostatic pressure, and that increases 60%. I will say that most of us with no pathological lung disfunction, we don't even notice it. Those with significant lung volume loss, or COPD, they do report greater perceived exertion in the pool. However, a lot of the studies have shown that although they perceive that they're working harder, their saturation levels do not drop, so it's sort of a balance. If somebody's got a significant lung volume loss, you may need to limit how deep they go, you may have to get clearance from the pulmonologist, that type of thing. Blood supply to the muscles are increased, so you're just getting more blood flow in there, which is great. You get that improved removal of the byproducts of metabolic waste, so the lactic acid, etc. So it's a nice

place for recovery after somebody's done a higher level activity. Mobilizing extracellular fluid, so what happens? We have increased urine output, and part of that is because you now have an increased central blood volume, the sensors in your aorta say , "We got a lot of fluid on board. "I've got more blood here. "I better get rid of some of it," and that triggers the various different hormones that create the need to urinate . So it is true, you have to pee when you get in the pool. And for some people, that increases sodium and potassium loss, so with that older adult that has an electrolyte imbalance issue and stuff, you need to be careful with that, and again, because the central blood volume is greater, your body doesn't think you're thirsty, because you've got enough fluid on board, so we want to encourage, especially if somebody's working in a warm pool, working out, or for me in an outdoor pool, especially on a hot day, we don't feel that we're sweating, even if we are working hard, so we wanna encourage drinking water.

And then the sympathetic nervous system is partially suppressed, so this is great for our chronic pain patients, where they have that hypersensitivity, so kind of thinking about that being a nice thing that you can utilize for those. So what does all this mean clinically? As far as the heart rate, sometimes I'm gonna use rate of perceived exertion, or the Borg scale for intensity levels, just because the heart rate may be a challenge, because it's lower. Just think about how do you do that when you have somebody on a beta blocker and their heart rate doesn't go higher. You may use that rate of perceived exertion. We're gonna counsel patients to use the restroom prior to getting to the pool, and-or, and that's just to minimize how many times they say, oh, I've gotta go to the bathroom, and then there's a five minute lull in your session, but of course, have them get out whenever they need to. This happens, the need to urinate happens faster in older people and in colder water, so just recognize that. Drink fluids, even if they're not thirsty, especially after the workouts, and on hot days. Monitoring those vitals with people with cardiac compromise or other medical issues at the time, I will tell you I don't know how many of you are seeing the diagnosis of POTS, which is postural orthostatic tachycardia syndrome, and that's where the heart rate gets really

low. There are some aquatic protocols for that, but their blood pressure is really low, so sometimes we're monitoring that before and after. Somebody with renal failure, they're also, they kinda run low, meaning they're not allowed to drink a whole lot of water, because they have to go into dialysis and get the fluids off, so because of that shift in central volume we can affect how they feel, so often, I've only had one or two patients that have been in this that are getting dialysis, and we had to schedule the therapy days around dialysis when he had the most energy, because it can wipe him out, but we also did get clearance, 'cause we were seeing him referred through his orthopedist for his low back issues, but I did get clearance from his renal doctor about that shift in fluid, and we just kind of started off a little less time in the pool, and monitoring things to see how his body tolerated it, so just thinking of those kinds of things.

And then people with diabetes, especially type one, and especially those that are starting a new exercise program, we want them to be monitoring their blood sugars, because warm water, and the new exercise can have them actually using up their glucose better, and if they're still giving themselves the same amount of insulin, you don't wanna go into hypoglycemia, so that's something that having them, especially for those that are type one, they already know how to monitor that, but kind of indicating, hey, this might change things so let's keep a little closer eye on it for the next little bit, as your getting used to the program. Okay, so precautions and contraindications. So this is something that, realize that some of these are absolute, nope, you're not getting in my pool, and others are just precautions and maybe are limiting, and depending on your pool. So for example, open wounds. It's not, this is not a whirlpool soak that you're doing for a wound, so unless you can cover it with a bioocclusive dressing, and the name brand that comes to mind for me is Tegriderm, which is made by 3M, and that's a kind of a waterproof dressing, and then there are others out there, then we're probably not putting them in a chlorinated pool, especially public, although I'm not as worried about infection in my pool 'cause I know that the chemicals are controlled, but at the same time you don't want that stuff in there. You don't want that. If somebody has a soft-tissue infection, that can be spread. Granted, I will tell you that if you've got

your pool at the right chemicals, most everything dies, but thinking about that. Skin conditions, so somebody with eczema, and psoriasis, so the chemicals can be drying, so if they're coming to your pool, you may need to say okay, I need you to shower off and use your product, not the stuff that we have here, or the stuff that the club provides. Whatever works for you, right away, not leaving that on. Questionable continence, or incontinence, there are swim diapers for children. There are adult swim diapers, for that purpose, so some pools, they just say you need to wear that. Other places, it's just no, you're not in the pool if you have incontinence. I will say that if somebody has had diarrhea, that CDC actually recommends that that person doesn't get in the pool for two weeks after their last episode, and I believe that has a lot to do with the fact that if you've got kids in the pool, or people, getting water in their mouth, we don't want the E. coli exposure. We talked a little bit about renal failure as a precaution.

A seizure disorder, that's a precaution you need to be aware of, and if that person knows, that prodrome, that they might have a seizure, it's good for them to tell you, if they know it, or you're just not leaving their side. You're much more cautious about it. I have had a few patients with seizures just sort of like, "Oh, "I wanna do my own program in my own pool," and I said, "That's fine, "but you either have to go to a place "where there's a lifeguard on duty, "and you need to tell the lifeguard "that you have a known seizure disorder, "or that you bring somebody with you "that keeps an eye on you the whole time," so just being cautious. The hydrophobic patient. We gotta move a little slower. Sometimes we have, we're not gonna put them in deep water, we're right there, and that can be a challenge. You have to risk-benefit ratio, is the person, you think, really gonna benefit from the pool if they're that fearful? Can you give the time to try to get them used to the water and benefit from it. If it's marginal, then you may be choosing your therapeutic time and sessions on land, so kinda see that. Unmanaged cardiac problem, meaning if they've got unstable angina, something's going on, I don't want them in the middle of the pool where I have to drag them out, dry them off, and then use the AED, so for me, a new unmanaged cardiac problem, I'm waiting until I

have clearance for that. Just think about it, if you're not exercising the patient on land, you're not exercising them in the pool. So same thing, your blood pressure's really high, we're not pushing it. I skipped over, sorry. UTI, so a urinary tract infection, until they've been on antibiotics for a few days, we're not getting them in the pool. Febrile condition, that's a contraindication. It's, I'm not putting you in the pool to get your fever down, so just recognize we, if we're not gonna exercise you on land we're probably not gonna exercise you in the pool, so hopefully that gives you an idea of who should or should not. There are lots of areas, there are lots of places that will put patients with trachs, and G-tubes, and colostomies in the pool. There's mechanisms for that. That's typically more of a rehab hospital, because they see those patients, and so just realize those are often precautions for you have to determine if your pool's gonna accept those types of patients, or will work with those types of patients. Okay, so now moving into equipment, we have different types of equipment. We have flotation, buoyancy, resistance by drag or increased surface area, so drag force equipment, mask and snorkels, you can use if somebody's gonna go prone.

Being in San Diego, you can get a cheap mask and snorkel all year long somewhere here in town, so we don't provide them for patients. I'd prefer them to get their own, just for I don't have to worry about sanitizing the snorkel in between, and we often use the mask and snorkel if somebody's trying to get back to swimming. There's actually a swimmer's snorkel where the snorkel goes right up the middle of the forehead, so they can do freestyle without turning their heads, so some of our neck patients who wanna get back to swimming, but the rotation to turn is too much, so sometimes we use that. Shoes, shoeware is important for people that don't have sensation on the bottom of their foot, so remember, you've got a lot to watch and you don't wanna worry about their foot scuffing on something, so having shoewear. Right now I'm gonna tell you, Crocs are not shoe wear for in the pool. What they wear to the pool is different than what they're wearing in the pool sometimes. If they're doing a lot of jumping and running and plyometrics, a lot of these are the higher level athletes in which aquatic exercise is not gonna be their longterm exercise plan, so what I do with those guys if

they're not gonna go buy the expensive water shoe, we have them, I say okay, take an old pair of your sneakers and wash them in the washing machine at home and then don't wear them outside. I don't want the dirt from your yard in my pool, and then they're gonna wear 'em in the pool. They're ruined, they'll never be worn on land again, they'll get really gross, 'cause they don't dry out very far in between, but it gives them a little bit of cushion, a little bit more arch support, to do those things safely as time goes on, and then they can just toss 'em. Steps, so there are weighted steps for the pool, that type of thing, and then we can use weights, TheraBand, or Theratubing, there's specific brands of, I would say regular TheraBand, with the latex in it, it sticks, like it gets wet, and if you let it dry together it's ruined in one session, so you have to be careful. The latex-free stuff lasts a little longer, but probably looking at the tubing and the stuff that's meant for the pool will give you a, it might cost a little more upfront, but it's gonna last a lot longer. And we can do sticks and balls, PVC pipes, there's lots of things we can use.

So here's some flotation equipment. You'll see that you've got, let's see here, get my little cursor going here. You've got dumbbells, so foam dumbbells, is that's not flotation, that's going to be a buoyancy piece of equipment. We've got belts, those are flotation, and you see there's different shapes. This one's a dog bone, I mean, I'm sorry, this one's tapered, this is a dog bone, this has got some cutouts and a little bit thicker foam. We have neck collars and barbells and all sorts of things that we can utilize in the made-of-foam world. The flotation equipment, flotation equipment is equipment that you're using to help keep somebody afloat. Not necessarily life-saving device, most of them state they're not a life-saving device, but how are we doing, so the neck collars, the flotation belts here, are flotation pieces of equipment. Here, we've got cuffs on the ankle that are currently being used as flotation pieces of equipment, 'cause they're supporting the legs, and then we've got the belt supporting the person's hip in a supine position. There's another flotation piece of equipment that I don't have a picture of here, and I apologize, it's called the wet vest, and it's a type of equipment, and it's made by Hydro-Fit, so if you wanted to look it up, it's just called wet vest, and

basically it's a thing that goes over your head, it has a flotation panel on the front and back, and then there's these two straps that come around the middle and between the legs, so it's very secure. They are much more expensive than the flotation belts, and so we have one of each size, because they're really effective for the person, and that's who you use when they're very weak in the trunk, because the belt here, if you've got a lot of buoyancy back here, it's gonna push them forward, and if they don't have the strength to control that, then you're having a hard time giving them the flotation they need without them struggling.

So our spinal cord injury patients, that type of thing, we have used this wet vest. Not really practical if you're doing a group session of 50, mostly because of sizing and pricing, but very worthwhile if you see this population, and they do make a child size, so, again, I get no money from any equipment recommendations. I'm not a part of any of them. I have belts from all different companies, 'cause we have all different patient sizes and shapes and things. When we do put somebody in deeper water to float, I want you to remember that it's important the correct alignment, so here, you can see that the shoulders are just out of the water. That's the appropriate position. We don't want you floating real high, but we also don't want you over here, because first of all what I did was I just took the belt off of her, but what happened was now she's kinda drinking the pool, but now her shoulders are greater than 90 degrees of abduction, we're gonna lead to impingement of the shoulder. She comes in for a back problem, leaves with a shoulder problem, not so good for us as therapists, so remember, and everyone's different, everyone has different density. I have 60 PT students that sometimes come to my pool to get a practical exposure to the exercises, and I don't have enough flotation belts to keep these guys up, because they're all thin but sense so I'm putting two belts on them and that kind of thing, so just realize that sometimes that will be a challenge, if you see athletes you're gonna have to get some different things. That's another place where the wet vest comes in handy. If you put the wet vest on and then you put another flotation belt on top, to keep them up. So just keep in mind, we don't want to be drinking the pool, we want the shoulders just out of the

water. Okay, so buoyancy equipment. So buoyancy equipment is often foam again, but it is, we're now using that piece of equipment to use buoyancy as part of the exercise. So if you think about it, here we have a noodle, and this noodle has the upward thrust, and so it is assisting her in a quad stretch, so we're using that to help passively stretch her quads. Over here, we have the buoyancy, the flotation equipment of the belt, but we've got dumbbells and ankle cuffs for buoyancy equipment, so now she has to work harder to keep her legs down, and when she pushes her arms down she's gonna get greater resistance from that buoyancy equipment. Same thing over here, we've got the dumbbells, holding those down is the buoyancy equipment. Buoyancy cuffs, they're difference sizes. It's important to consider lever arm. Just like on land, the longer the lever the greater the force, so we can put these things closer to the joint. I can put it above the knee instead of at the ankle. It significantly increases the challenge of remaining vertical, especially when the person is suspended in deep water and doesn't have the feet, or at least one foot on the bottom of the pool, and you wanna use caution when adding, and so we're gonna show this video to explain why it's so important.

Here I am with getting a little cocky and getting a little too far in my lever arm, and can't control those buoyancy cuffs. Now, that is the last place I want my patient with stenosis, that position, for them to be in, correct? So they may not have the strength to do what I did to recover. So just think about it. Usually, we can go back to the PowerPoint, usually, what we wanna do is go and have them use them where they can put one foot down and get an idea of how much upward thrust that buoyancy cuff is before we put them in suspended water, and watch how far our angles are. Other equipment, we can use weights, and I don't use ankle weights, or weights in the pool for exercise. I don't have somebody walking around with ankle weights on their ankles. It's usually for grounding. I have, I will admit, that I do have a spinal cord patient that's completely flaccid on an extremity, or a lower extremity, I may put the weights on for them to keep their feet down, because I only got so many hands, and we're trying to work on that. The question often comes to me, well somebody has a lot of

lymphedema and they can't keep their feet down. Do you put a weight on? I say, well, I first really want them to try as hard as they can to keep their feet down, because that deep muscle activation and getting that stronger is gonna help the lymphedema. If I passively give them a weight to do it, we're not challenging it, so I usually only do it when the person I know is neurologically unable to activate those muscles, but you have to kinda figure out what you're working on, and if you're trying to work on seated cored strength, then their feet are all over the place, so you may be weighted them down. And we also use it in aqua stretch. You can use ping pong balls. This picture here, you'll see she's blowing a ping pong ball for breath control. The mask and snorkel, we talked about. You can use weighted balls that are kinda neutrally buoyant. You can also use volleyballs, and water polo balls I should say, for different things. They're kind of a buoyancy piece of equipment to push down sometimes. We also have the tubing, here.

So it's just like if you've ever, oops, if you've ever had somebody drag you around the clinic with the resistance band or tubing, same thing a pool. You're using the buoyancy to support the joints, but you're using that, you're trying to increase their challenge a little bit. Maybe they can't move fast enough, you don't have a pool long enough to get up to speed to run, or maybe they can't do the ground reaction force of running, so they can't get fast enough to walk to get more drag force. Well, throw the tubing around them. You still have that buoyancy but you're adding that resistance, and it's working similar to a land plan. So drag force equipment, well what do we have? Here's an example of refraction, and what the heck is going on with her foot, but ignore that. So we have resistance gloves, so the webbed fingers, the neoprene gloves, any of those kinds of things increases drag force. We have the plastic things. This is Hydro-Tone bells. I don't think those are made anymore, but these are called Aqualogix, and Aquastrength is another company, they're combined, that create various surface area-handled equipment, plus, it's kind of hard to see in this picture, but fins, things that go around the ankles, that add to drag force. We also have the AquaFlex paddles, so these will allow you to open and close the fin here to make it harder by increasing the

surface area, and there's different levels. So the nice thing about that is you can really document level one through five. The hard part is, because these are held in the middle, there sometimes can be some torque around the wrist. I do really like the aqua, these bells here, 'cause they're shaped, they go over your hand, so they're really nice for PNF because there's a lot less torque on the wrist from the equipment, so just realize you got a lot of options. I'm very much a proponent that if you're doing aquatic therapy, hopefully you've gotten in the pool and felt the exercises yourself, and you play around a little bit, because I'm a learner that way as well, so whenever I'm coming up with a new exercise or thinking about a new piece of equipment, I'm getting it and playing it and feeling it, and then thinking about is it drag force or buoyancy and that kinda thing, but always understand what your equipment is intended to do when you give it to a patient. You wanna know why you're providing that. Not just, oh, I bought this this latest course, and everybody loves this piece of equipment, 'cause when we get a new toy, what happens? Everybody gets it, right? And I'm guilty of it as well, so just thinking about what is the intended purpose of it.

Sometimes equipment has multiple uses, so here's an example of a kickboard, or Wonderboard. Here, she's sitting on it, so it's a flotation piece of equipment, and she has to balance. Here, it's a proprioceptive piece of equipment because we're balancing it on the head, and if it doesn't fall off that means they've kept their posture as they're walking through the water. And here, he's pushing it through the water. It's a drag force equipment in that sagittal plane of pushing forward, but he also has to push it down, and it becomes a buoyancy piece of equipment, as he uses his scapular depressors to hold it down. So you can see that a noodle is another one. It can be a flotation piece of equipment or a buoyancy piece of equipment, so they often have more than one use. So let's review the progressions for aquatic exercise. So buoyancy, what do we do? If we move towards the surface of the water, remember, that's assisted, but if we start moving towards the floor of the pool, that becomes resistance, and of course if we add foam equipment, buoyancy equipment, that will increase the resistance towards the bottom of the pool. It's also one that you can get more or less

foam, so noodles can be bigger or smaller. There's all sorts of sizes, and if you've already worked in the pool you know you have at least one of those noodles that is kinda soggy and waterlogged, it's old, and you can kinda ring it out when you get, that doesn't have as much buoyancy, so you give it to the person that is weaker. Or, you know those ones when they break? Don't throw away the broken noodles, keep a couple of short segments for those people that can't push the full-sized noodle down, so remember, those are those progressions. Drag force, drag force we increase the speed, we increase the surface area, and we can increase the turbulence. All of those can influence and progress our aquatic exercise. Lever arm, you already know this. This is your standard exercise stuff, whether it's land or pool, so going a little, you know, straightening the arm, straightening the leg, putting that equipment more distally. Different pieces of equipment, and then inertia. So our laws of, Newton's laws of physics, because a new movement could change direction, etc. We're gonna talk about that.

So think about it. Leverage, we already talked about that lever arm. Inertia, an object in motion tends to stay in motion, so if you have to stop or start, or you change direction, or new activity, that is going to be helpful. Then we have acceleration, and that's the second line. Basically, that an object, the force on an object would be equal to the mass multiplied by the acceleration, F equals MA, so if you speed up , that's a greater force. So speed is proportional, and we already demonstrated how it's exponential with the drag force, so if you want somebody to work harder, you get them to speed up because they have to use their muscles and push harder. And then we've got the third law, that when a body exerts a force on a second body, the second body simultaneously exerts a force in equal magnitude. So basically, it's the equal and opposite reaction. So the harder you push against the water, the harder the water pushes back. So just kind of remembering those laws of physics. Let's show this video, because it's just demonstrating lever arm change, so the first one should be the noodle going under my knee for a hamstring stretch. So I'm doing an active hamstring stretch. My back is against the wall, supported, and that's a shorter lever arm as far as

the amount of buoyancy that is supporting my thigh, and I'm doing more of an active, you know, just adding dorsiflexion, plantar flexion, that type of thing. Now let's go to the second video, and this is now the longer lever arm of the hamstring stretch, and it's a little more passive, and now I'm like, okay, and you'll notice the size of my noodle. I have put a noodle with a hole in it. It's not one of those white solid noodles, and I'm still getting a pretty good stretch. Here I'm doing some contract-relax, so taking the technique and I'm reaching up and away to stretch, but this is that longer lever arm, so you have to be careful in somebody that doesn't have the flexibility. We can go back to the PowerPoint, but somebody that doesn't have the flexibility that I do, if they can't control that, you do not wanna put a really heavy thick noodle on the end of their ankle and hope that they don't get a pull, so again, gotta think about those different things. Stop-start, stopping and starting, again, in the pool, you've got the Newton's laws, as well as you've got the wake behind you that kinda comes up sometimes, so we'll show this video of the kids.

This is a group of students in the pool, and I think I alluded to, have you ever run around the pool when you were a kid, and you'll see that they're running, and it's funny 'cause they're so blindly running sometimes, and you'd think that they'd know what's gonna come up, but they're just having a good time out at the pool, and then I say turn around, and they're laughing and giggle and falling over because they have forgotten, or they're just enjoying that fact and they're really feeling that. So recognize just having your patient turn around. So we can go back to the PowerPoint, yeah, perfect. Those are things that you can think of to make things harder. All right, so now let's go into walking and gait-training in the water. How is water different than the pool, in the pool compared to land? Now, it's nice because you can do functional training, progressive weight-bearing, shallow water is nice for the hydrophobic patient. It's a starting point for the non-swimmer, and for those that can't quite stabilize in deep water, this is where we can start doing some of this, and I will tell you that for post-op fusions and SI joints, we want them in the shallow water, at least with their feet touching the bottom of the pool instead of some of that deeper water. So what are the differences when

you're walking in the water? Well, we have balance reactions, of course, have to be faster and stronger on land. We better have our ankle, hip, and stepping strategies, to prevent us from falling. In the pool it slows down, we get a little bit more time. Proprioceptive feedback, the viscosity and the hydrostatic pressure and the turbulence can all provide different sensory feedback to the limb that's not on land, so we have to kinda remember that. And of course, muscle force is different due to drag forces and buoyancy, so it's not always the same. Now, when they look at, when we look at the walking in the water, it's great for gait training, but we do have to watch the person. I would encourage you to know what their gait deviations are on land, so you know what you're working on in the pool, because it will change when they get in the pool. There is a difference between cadence, step-length, and speed, when walking normal and fast on land.

So in the pool, cadence during normal and fast walking was different, but they found, initially, that there was no difference in step length with those speeds. So what does that mean? So let me put it this way. If I asked you to walk faster on land, you would automatically walk faster, and your stride length would step out. Your step length would increase. But in the pool, I can ask you to walk faster, but you would not automatically take a bigger step. Our steps tend to be smaller in the pool, because we're fighting drag forces, so you have to kinda cue that patient to take a bigger step sometimes, so we do walk faster in the pool when I ask you to walk faster in the pool, but it's not an automatic increased stride or step length. The nice thing, and you know, again, this talks about the stride length being less in water, the stride time increasing, so it takes a little longer to take that step forward, and of course, walking speed and cadence slows down in the pool. The next thing that doesn't change is the proportion of walking cycle, meaning swing and stance stays the same, to land, so we're not screwing up any kind of temporal organization of gait while working in the pool. So this is a nice thing that was found. We're still doing our equal, even though we're a little slower in the pool. If we look at muscle activation, it tends to be lower in the pool compared to land. When the person gets to select their own speed, meaning walk at

whatever comfortable speed you want to. However, if I say, okay, I'm gonna make you walk the same speed you walked on land, you'll notice that the vastus medialis, the rectus femoris, so the quads, and the biceps, and the gastroc, so the hamstrings and the gastroc, all have a higher muscle activation compared to land, so speed, again, comes into play. They do notice that older adults had greater hip flexor and extensor activity, and less ankle plantar flexion activity, compared to younger subjects. I will point out that this is very congruent with land-based locomotion, and if you know your older patients, how much they tend not to use the gastroc for push-off, and they use more hip strategy instead of ankle strategy, so something to think about when you're training that person, don't forget to strengthen those calves and work on the pushoff of the ankle. All right, so muscle activity during aquatic land exercise, in people with or without back pain.

So this they took 40 men without back pain, I mean, I'm sorry, with back pain, we call it chronic 'cause it's longer than 12 weeks, and they did some pool exercises, and compared to land exercises, and I'll say this is an awesome article. It's from Physical Therapy in 2019. It's awesome in my mind because they actually give you pictures and descriptions of the exercises that they did, both in land and pool, so if you're working with back-pain patients and you need some ideas, get this article, because it really is, it doesn't just say, oh, we worked in the pool and we worked in land, it tells you exactly what they did. But basically, they found no big difference between the two groups, so that's nice. That tells us, okay, the pool was effective, that the muscle activity was strong enough, or high enough, to elicit some strengthening in the pool as it was on land, so if they're tolerating the pool better, great. The heart rate was often higher on land, but the rate of perceived exertion varied, and remember, we talked that the heart rate is often lower in the pool, and when you look, if you look at the exercises in comparison, side to side in this article, it's very clear why one would be higher versus the other. And then pain levels were reported low. They were reported twice as often on land, but they didn't think that was really a statistical significance, worth harping on as far as the researchers in this. Muscle activation was higher on land, and 29% of the

exercises and 5% in the water. But let me show you here, these are the exercises that they did, and you'll notice, with the asterisk, I've kind of indicated one asterisk is that they had increased external oblique in the water. Two were increased rectus abdominis in the water, and three, was increased erector spinae with the water condition. So you see the asterisks, those are the exercises that actually had higher muscle activation in the pool compared to the land option, so great. What I will say is some of the exercises, for example like hip abduction and extension on land, if they're using a band for resistance, you could see why that would be higher than the pool, but I encourage you, again, this was a nice study that compared exercises, common ones we use, some of the equipment that we use, and kind of giving you an idea. If nothing else, it help you decide how to progress somebody, so for example, if somebody is doing the dumbbell hold at the side while standing march, that tells you that they're working that rectus abdominis and erector spinae a little bit more, and maybe they're ready for some higher level stuff, or transition to light land, so just something to think about. Muscle activation, and for those of you, if you part of the APTA, you should be getting Physical Therapy journal. You have access to that.

So muscle activation with walking backwards, so if I asked you to walk forward in the water and backward in the water, you're always, the backward walking, would have higher muscle activity in the paraspinals, the vastus medialis, and the anterior tib, compared to walking forward. So if you're wanting to strengthen this, and most of our back patients, we are trying to strengthen paraspinals, and most of our postural control patients, we're working on spinal extensor strength, you're wanting to make sure you have them walk backwards. All right, so that's the basics of the theory and principles, and the way I organized this was we did that, I want to answer questions, and then we're gonna go through some video examples and talk about them, but I want to kind of see, is there some questions I can clarify first. I wanted to make sure we had plenty of time for that, and then we can go into looking at those video examples, so if you have a question, type that in the chat. If not, I will keep going. Give you a few seconds. Okay, so let's start with the first video. This is supine work, so some of you may know

it as Bad Ragaz, the Bad Ragaz ring method, etc. Basically, this example is this, Chris here, is one of my therapists, and I am kind of having him supported in the pool, so he has the belt under his hips to support him, and depending on their flotation level, you may have different places, and then the ankle cuffs on his ankles to support, and then he has a neck collar on, and I am swaying him through the water, and it's a passive stretch of the trunk, so we're using drag force to get that sway. We're getting that passive stretch. I want to point out here something very important if you do this. I want you to notice his head is lined up and staying lined up with my chest, and that I am pivoting to move him. I'm talking in this video too, to him, and so I'm not paying attention completely, but it's important here. If I don't keep that, and my hands go side to side, then I don't get the same, the person sort of swings like they're in a hammock, and you don't get that drive of the drag force to stretch the trunk, so here's how we're using drag force for passive trunk. This is really nice. I can also walk backwards, and snake, what we call snaking through the water. It's great for relaxation, for stretching, for those patients with neurological disfunction, and tone, it's a nice way, if you can get 'em to relax in the warm water and you do this real slow and gentle, it helps decrease their tone before you get started. Okay, let's go to the next video.

This is now isometric trunk holds, so now I'm moving him through the water, but I'm asking him not to let his trunk side-bend, so it's hard to see here, but he's actually holding, isometrically, his trunk against the push of those drag forces. Now, if I speed up, it's gonna be a lot harder for him. This is a lot of work for me, because he's a big guy, and he's got a long lever, so just so you know, as therapists, when you're doing this type of work, it's gonna be a little bit more work on you for that, but just kind of holding that. Okay, let's go to the next video, because now it's just a demonstration of how do I take that isometric hold and do I increase the lever arm to make him have to work harder? So we're gonna put his arms over his head. Now, granted, not all of our patients have this shoulder flexibility and motion for this. I could also go to his feet and stand between his feet and move him from his ankles, so different ways to do this, and so this is a lot of work for him, to hold and keep the trunk from side-bending, and I'm

holding onto his elbows. So again, applies, and again I could go to his feet and do it, especially if I couldn't, if the shoulders couldn't go in that position I could go down to the feet and have him hold against that. Okay, let's go to the next video. All right, so here, I'm doing what we call lower-extremity noodle push-downs. It's basically hip and knee flexion with the buoyancy of the noodle pushing my leg up, and I'm pushing it down. Now what are we doing here? Well, we're working, the buoyancy is working to, I have to push down, so I have to use my quads and my glutes to push that down. I'm doing now a bicycle motion, forward and back, and so the backwards motion is actually more quad work, because the resistance is on that push-down, but as I go behind. When I go into the forward bicycle, you'll see that that becomes a hamstring work, because you're pulling that noodle underneath you and at the angle. But what else is happening here? I'm working my balance. I gotta stand on one leg and this is throwing my body around. I gotta work my core. I gotta keep my pelvis stable, so see how that forward bike kinda can work the hamstrings. You'll feel those hamstrings more, because I am pushing down another way now, more quad.

So a lot of times, depending on what you're focusing on is how this exercise is gonna be done. Of course, I would start this with a patient holding onto the side of the pool, for balance, versus here, and if I'm just focusing on hip and knee, it could be hip and knee, passive range of motion of a total knee patient, and that's what I'm focusing on. If it's my spine patient, I'm having them focus on keeping their pelvis in neutral and not letting that buoyancy throw their leg up too high and go into a posterior tilt. If I'm working on an ankle balance, I'm standing on the involved side and having them try to stay balanced, so you can see how this gets a lot of things at once and you might have to pick and choose where you focus. Okay, let's go to the next video. All right, so, I think, yeah, this is side plank, and I do have to apologize. This is my fault, there's a couple of older videos like this one that sometimes don't show up as well as my newer MP3 ones. It's my video, it's not your computer , so there's a little delay in that. But basically, this side plank here is, she's holding onto the noodle. Now, side plank on land is really hard on the shoulder. A little less so in the pool, but you'll see here, as she

is struggling, there's a lot of rotation, and to her defense there's nine lanes at her back of lap swimmers. This was a mid-lunch time, so we had lots of lap swimmers in the pool, so she had a little more turbulence to control. Now, how would I start this side plank? I would have them on the side of the pool, or on a step, a more stable situation. They still need a lot of shoulder control to do this. Now, we've added a little poolates is what we call this here, in that as she learns to stabilize the side plank, I'm having her do hip ab- and adduction with the top leg, and we're forward, hold the leg up in abduction and flex and extend the hip. So there's a lot of different, of movements that you can do, as if you were doing a side-plank on land. It just creates a lot more trunk control, and she is struggling. This is not a patient, this is actually one of my therapists when she was a student, and so she was learning how to control her body. So patients, you might have to limit how much they struggle if they're real irritable, and not let them flail about. Sometimes you just gotta let 'em find it. The water's moving them around and they just have to figure out how to move their body differently, and I promise you she actually does achieve that by the end of this video, but again, she's fighting the turbulence behind her as well. Okay, let's go onto the next video.

All right, so here's a forward plank, and this is one my favorites. You can see that this noodle's actually got a hole in it, but it's a little bigger. Now, what happened was I don't have the video of all the bloopers, but she's having a hard time stabilizing, so we moved her back to put her feet kind of against the wall of the pool, to give her a little more stability and feedback, to help keep her feet down, because this particular activity, as the noodle presses up, the buoyancy presses up, it's hard for her to stabilize, and this is a core workout. So just realize you can use different things to help stabilize. Okay, let's go to the next video. All right, so here we're gonna do a staggered stance, so I've changed my stance, which you do on land, don't forget to do it in the pool, and I'm using those Aqua Logic drag force equipment with upper extremity, so I have to challenge my balance a little because I'm doing arm work. Now remember, bilaterla armwork is definitely different than unilateral. Unilateral's gonna change and cause transverse plane stability, or lateral, in this case, also stability, 'cause I'm in that

staggered stance, so be creative with your exercises. Remember to do bilateral, unilateral, do single-single, double, whatever. Change your stance to wide, narrow, staggered, single. You can do kneeling and half-kneeling, if you have the right depth. Okay, let's go to the next slide. And here is a deep water exercise, and we've got double knee to chest. Now, he's basically trying to keep his spine in neutral and only flex at the hips, so that's kind of the key, and then I want you to notice right in here, well, here's Tory, she also has this. She's having a little bit harder time controlling the buoyancy. That's a buoyancy piece of equipment that I've given them between their knees, to control, so they have to control that upward thrust of this buoyancy piece of equipment, and stabilize. Now, Chris, he has a little bit more density, and he's also a Pilates instructor, so his connection to his core is a little bit probably faster, and then here's Tory. You can see where as she's coming up her body wants to flex forward to counteract that pressure, so I will tell you this. This was the first time they had done this. I was training them, and so gotta give 'em a little slack 'cause they were learning.

Okay, let's go to reverse jacks, which is the next video, and this is basically jumping jacks, but I call 'em reverse jacks 'cause you notice the arms go down when the legs go out. The key here is staying in the frontal plane. You want to imagine your body is between two panes of glass, and that you're not going forward and back, you kinda look straight ahead. It works the arms and the legs. It's coordination, but if you call it jumping jacks the person automatically goes into the usual, and that's okay, except then they bob up and down a little bit more, and might go under, and they might not want that, so we tend to do this. If you also notice, in this video, they're eventually going to increase speed, so that's the other thing. You start off slow, you work into a medium speed, and then ask them to speed up, and that's gonna challenge them a little bit, so not only can you change equipment with this exercise, but you can change speed. So if somebody's doing a really good job, ask them to speed up. So you'll see this here with Chris. I've asked him to speed up, and he's now moving a little bit harder and getting a little better workout, once I know he can stabilize. Okay, well let's go to the next video. Okay, so here's an underwater shot of trying to balance on single leg,

doing this windshield wiper exercise with the drag force equipment, and what I'll point out is that really works transverse plane, so at a certain point I said okay, keep one leg down, because she couldn't stabilize with the leg up, so thinking about changing that and working it, I'm like okay, now slow down, 'cause the faster you go the harder it is, so thinking about all the variables that you can do. So changing your stance is something we do on land. Don't forget you can do it in the pool as well. All right, let's go to the next video. So here's, we're gonna do a progression in the next three videos, and it starts with scissors, so this is sagittal plane hip flexion and extension, alternating obviously, so kind of a cross-country ski but without the arms, trying to keep your pelvis in neutral, starting off in a small range. This exercise, often I encourage, I cue the patient to focus on the leg and back. Notice he's sped up, but focus on the leg that's pressing back, versus the leg that goes in front often automatically will counterbalance. If you don't cue that hip extension on the back leg, what happens is they tend to keep their feet in front a little too much, so that's often a common cue, but you'll see, just working on this, we often do this one for time, for 30 seconds to a minute versus counting, but you can do whichever. If you have a back pain patient that's real sensitive to rotation, this will aggravate them if they don't maintain core stability and move just from the hips, so be picky if that's the case, if you're just trying to get some movement and some hip movement and some cardio, then you don't have to worry so much.

Okay, let's go to the next one, and this is now moving on or progressing this exercise to cross country ski level one. So cross country ski is, the hardest part of this is the coordinating the arms, but you'll notice that the dumbbells are on the surface of the water, and if you take note, her dumbbells are gonna be smaller than Chris's, when we look at another video. So just realize, now that's on the surface of the water, a little trick with the coordination for this one is if you have them start with the legs in their scissor position and the correct arm in front and back and say go, it's a lot easier for them to keep that coordination than to start from everything in neutral, so little trick there. All right, let's go to the next slide, and that's going to be the cross-country ski

level two, and that's what we call it, you can call it whatever you want. So now the dumbbells are being held down, so you gotta have that scapular depression. You can see he's kinda leaning forward a little bit. I think I try to cue him to come upright a little bit more, instead of leaning forward, but that's the hard part, so it's getting that chest up and not leaning into it so much, and again, you can do slow, fast, medium speeds, you can do short ranges, fast short ranges, or extend out and do longer rages, so again, giving you ideas on how to take an exercise that somebody already is comfortable with and how do you progress it or change it to get a little more out of it instead of coming up with six new exercises in a session, 'cause we know, patients, once they know an exercise, teaching a new one takes a little bit of time, so you can change it up a little bit, and work 'em. Okay, let's go to the next slide. And these are dips, and the key here, you can see she's having a hard time, and we have another video too coming up, but pushing down. The key here is keeping those legs vertical and keeping the feet underneath you. Now, again, density helps. Chris has very dense, muscular legs. They hang in the water a lot easier. If your legs are buoyant, you gotta work the glutes and the abs a little bit more, to keep them underneath you, so that most of our patients with back problems, I'm constantly, the first thing is trying to get them to know where their feet are and get them underneath them. And then the foam density of the dumbbells will also make a difference.

So let's go to the next slide, and you're gonna see that I have switched the dumbbells. I have given Chris the lighter ones and Tory the thicker ones, and you'll see now, Chris, he's working his core a lot more, 'cause he can't muscle through with his arms. Now, you can't see it, but that is what's happening. Now, if we go over to Tory, she now is like, whoa, this is a lot more resistance. I think I might be having a harder time keeping my feet underneath me, because I'm being pushed around by that buoyancy. She has the arm strength to do it, but then that connection to the core, so having some different sized equipment also helps for progression as far as that buoyancy goes. Okay, well let's go to the next slide, and these are kind of all over the board. It's just to give you ideas. So here I'm using the noodle behind me, and this is for walking, so I'm working

on opening up my chest and getting a stretch, and then I'm gonna walk backwards. Keep in mind, I would only do this with somebody that had this shoulder immobility, and not a restricted, or an issue in which extension could be problematic, and you'll notice that I'm actually retracting my shoulder blades, that the key with any time we put that equipment behind us, we don't want, you notice I've got that nice open collar bone. If my arm was way back here and my shoulder was forward, that wouldn't be good. So in the pool, those same alignment issues that you look at land apply. Okay, let's go to the next one. All right, so again, a little bit of a trick. It's funny, 'cause it took me I don't know how many years to figure this out, and when I did I went oh my gosh, why didn't I think of it sooner you silly. So we do the foam roller exercises all the time on land, so do scapular retraction, we might do horizontal A-B and A-D-duction on land, but here, in the pool, you can't, you notice, let's see here, I'm sitting on the noodle, like a horse, so that the noodle doesn't pop up, but that gives me a little space. It allows me to retract my shoulders and get back there more. So it's a really nice thing for your shoulder patients and neck patients to work on those muscles. If the noodle is still too squirrely for somebody, they're not strong enough, you can also take a bath blanket and roll it up, or a big thick beach towel, anchor it to the pool deck and then have it fold over down into the water, which is another trick for your, maybe your osteoporotic patients, or the ones with the really bony spines that leaning against the pool wall is a little uncomfortable for them, and they don't like that pressure, giving them a little padding is sometimes a way to help, so just a little clinical trick there.

Okay, let's go on to the next video. All right, so now we're doing more upper extremity. I'm just doing isolated protraction and retraction of the scapula, and I'm resting my arms on the pool. Now, I couldn't, I mean on the pool noodle. I could make this harder by pressing down into the water and pushing the noodle down a little bit, and holding it slightly under the water while I do those two exercises, scapular isolated, scapular protraction and retraction, and the row that I did the second half, where I kept my shoulder blades in neutral and just bent and straightened my elbows, but to make it harder, see how I pushed down? There we go, and then you get a little, so you're now

working those scapular depressives, and it doesn't take much, and if you do this you'll feel the burn. Okay, let's go to the next slide. All right, so here we have scapular elevation and depression, so now we're using the noodle. Again, this noodle is a big thick noodle, and she's controlling, eccentrically controlling that, wanting to pop up, and then using those depressors. A great way to facilitate somebody to the awareness of that, and then having her keep that down as she translates or transfers the pool noodle over to the other side, again, a little bit harder. The key here is to make sure that they don't try to cheat and side-bend their trunk to hold the limb down, so you might see that, they sort of tip into side-bending, but now she's just doing some circles, with the noodle, holding it down. Now, many of my patients couldn't control that. There's the cheat, that side-bend, unless you're trying to do side flexion of the trunk, and then it becomes the side-trunk exercise. Again, you do this, you'll feel the burn. You might have to have smaller amounts of foam. We have cut-up noodles for this purpose. We might use a smaller dumbbell, that kind of thing, 'cause that noodle is pretty heavy, as far as resistance goes, for my average patient. Okay, next slide. Okay, so just one more, and this is just taking the noodle and pressing it down. So now I'm doing basically a lat pulldown or a straight-arm lat pull-down, and again, I could focus the exercise in various ways.

So I can turn to the side and get a little challenge in my obliques. I can, I don't do it in this video, but I could bring my feet in and be more narrow, and then I could, or do it on one leg and challenge my balance. I'm making sure, you can't see from here, but I'm making sure that the patient's not arching their back, that they're using their rectus and their abdominals to stay in control. I'm making sure that their shoulder blades are staying in the appropriate position and not elevating up, so depending on what you're working on and what you're focusing on is how you're going to cue it. Okay, we can go back to the PowerPoint. Okay, so that's kind of the end of the presentation. I hope those videos were a little helpful to give you an idea, especially if you're new to it. I do encourage everybody to get in the pool and play, take that piece of equipment and feel it. Think about it. Don't forget to be picky with your exercises, and again, if you're

struggling with documentation for the pool there is a separate course for that, but one of the things I wanna encourage is if you take the therapeutic benefits of buoyancy, drag force, and hydrostatic pressure, and you remember what those are, you can word those in a way for your medical justification for the pool. Okay, so any questions? I really appreciate you guys spending some Friday time with me. Well that was a first.

- Usually I have

- I don't see any questions either.

- Lots of questions . All right, well, if you guys think of it later, you know how to contact me .

- [Calista] Yup, I'll go ahead and wrap up today, but thank you so much, Beth, for presenting for us again today.

- [Beth] You're welcome.

- [Calista] And then we officially close out today's course. Have a great day, everyone.

- [Beth] Bye, everybody.