Wheelchair Seating: Considerations For The Hands Dependent Sitter

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- [Fawn] Today's course is Wheelchair Seating: Considerations For the Hands-dependent Sitter. Our presenter today is Michelle Lange. She is an occupational therapist with over 30 years of experience and has been in private practice, Access to Independence for over 10 years. She is a well respected lecturer both nationally and internationally and has authored numerous texts, chapters and articles. She's the co-editor of "Seating and Wheeled Mobility," a clinical resource guide, Editor of "Fundamentals in Assistive Technology 4th Edition," NRRTS Continuing Education Curriculum Coordinator, and Clinical Editor of NRRTS "Directions" magazine. She is a RESNA fellow and member of the Clinician Task Force. She's a certified ATP, certified SMS and as a Senior Disability Analyst of the ABDA. Welcome, Michelle. So glad to have you back.

- [Michelle] Thank you very much, Fawn, and thanks everyone for attending this course. I really do hope that it is helpful to you and to the clients whom you serve. So today we will be discussing wheelchair seating, specifically looking at considerations when we're working with a client in a category we're going to call the hands-dependent sitter. So we're going to talk about just what that means here today. This is a CEU approved course and so we have the following learning outcomes. The participant will be able to one, define a hands-dependent sitter. Two, list three goals when positioning a hands-dependent sitter, and then finally three, list three clinical guidelines when positioning a hands-dependent sitter. So this is what we will be covering in this course. We're going to define what is this funny term, hands-dependent sitter in relation to other categories of people requiring wheelchair seating support. We're going to talk about the clinical guidelines for someone within this category. What do we need to keep in mind in terms of seating assessment and interventions? And then we're gonna wrap up with a case study that hopefully will be a good way of putting all of this information into context.

Now, this course here today is part of a series. It's a series that's designed to prepare you for the Seating and Mobility Specialist examination. This is an examination through RESNA, the SMS certification, and this is something that you might want to explore, especially if you do a lot of wheelchair seating and mobility. There is a whole process for becoming an SMS and the first course in the series actually provides an overview of that process, from why you may want to consider that particular certification, to the requirements, the prerequisites and the examination, etc. Certainly, I hope this information is helpful to you, regardless of whether you're looking at that certification, because hopefully this series of information will help you to develop more advanced seating and wheeled mobility skills, again when working with clients who need this technology.

Now when we're talking about seating and wheeled mobility, every mobility base, whether it's an adaptive stroller, a manual wheelchair, a power wheelchair, a power operated vehicle, also called a scooter every mobility base includes some form of seating. You need to sit down when you're using them. The primary supports include everywhere pretty much of bearing weight. And that's the seat, the back, the armrests if they're present and foot rest. From there, the seating interventions that we use are gonna vary quite a bit, because it's going to depend on many, many individual factors age, diagnosis, prognosis, postural needs, pressure, risk, all sorts of things. One way of categorizing the people that we work with who require wheelchair seating is by their postural needs. And we can divide this into people who can sit without the support of their hands, the hands-free sitter, the hands-dependent sitter, and that's what we're gonna focus on today. Someone who needs the support of their hands in order to stay upright. And then finally the prop sitter.

So let's define each of these and then we'll move into the hands-dependent sitter today in this course. So the hands-free sitter is a person who can take their hands off

of the surface they're sitting on. So like this woman here is sitting on a mat table. And rather than having to have her hands on that mat surface, she can place them in her lap and she's not falling over. Her position may not be ideal, but she can stay relatively upright. In general, the hands-free sitter with their hands off that surface, can shift their weight somewhat to the side and return to midline without, again, falling over. So this woman should be able to lean a little bit to the side without putting that hand out, steady yourself and still recover independently. This requires good trunk control. The hands-dependent sitter, again, who we're talking about today, needs their hands on the surface they're sitting on in order to stay upright. That might be one or both hands, and if the hands are lifted, the trunk is going to collapse. Now, this is a common developmental stage for infants. So before kids can independently sit upright, it's very common, that they will have their hands out on the floor, and if they lift a hand to reach a toy, for example, they fall over. Fairly soon after that stage, show that child gains enough sitting balance and trunk control that they can reach out with a hand and eventually both hands to grasp things, to rotate their trunk, to lean to the side and are able to stay upright. Before a period of time, everyone goes through a hands-dependent sitter stage. Some of our clients continue to need more support. And then finally, we have the prop sitter. And in the case of a prop sitter, this person cannot maintain independent sitting, even if they can place their hands on the surface. They need a great deal of external support instead. So this young man has a lot of flexion in his arms, he really can't get his arms down to the surface anyway. But even if he did, he just requires a great deal of partial support. He is in that prop sitter category.

So what are our goals when we are working with the hands-dependent sitter? Well, we wanna provide adequate proximal support close into the body to allow for distal control. This is really big. It's all about stability. So for example, you might be sitting in front of your computer, watching this course right now. You are able most likely to keep your trunk upright, you are able to balance your flexors and extensors, you have an intrinsic amount of stability to maintain upright. Now, sure, sometimes we get tired,

you might have your arms on the desk in front of you and you're leaning on those to get some support. But you can readily lift away from there and keep yourself upright. If you need to reach out and grab that mouse or type on the keyboard, you can because you have the proximal stability to allow you to disassociate your arm to use it in an isolated way and promote that more distal away from the body control, like fine motor control.

So for people who are hands-dependent sitters, we need to give them enough proximal support, close in their body to compensate for their lack of intrinsic stability. We bring in extrinsic stability, the seating system. So they can disassociate their extremities, arm and the leg or a head so that they can move and have that more refined distal control. This is a great deal of what we do with the hands-dependent sitter. We hope that by doing that we're optimizing function for this person. We can't be functional if we have our hands supporting us the whole time. We need to free up those hands for the person to be functional with them. If this person still doesn't have strong hand, or upper extremity control, we're freeing up other parts of the body for function. We wanna prevent development of a symmetrical postures. Someone who lacks intrinsic core stability tends to collapse at the trunk. And that can quickly lead to a more permanent asymmetry of the spine for example of the pelvis. We wanna prevent that if we can. If it's already present, we need to deal with that within the seating system. And then while we're looking at stability, while we're looking at function, while we're trying to maintain alignment, we also have to make sure we're being mindful of pressure, that there's not too much pressure in certain areas for this person, because these are also clients who are often at risk for developing pressure injuries.

So again, the hands-dependent sitter, with the hands lifted, the trunk will collapse. The client can typically sit hands-free, if they have enough support, posterior and lateral to the pelvis, as well as posterior to the lumbar thoracic area. So what does that mean?

This person maybe on the mat table has to have their hands down on the surface of the mat. But if we give them enough support, behind into the sides of the pelvis, just like if we're grabbing onto their pelvis with our hands, and usually posterior to that lower back area, this person can often sit with very little other support. So this young man here is actually just in a little activity chair. He cannot sit independently on his own, on the floor or on a mat. But in this little activity chair, he's got some nice strong support behind his pelvis with the back of this adapted sitting system. He has a little lateral pelvis support here. He also has some lateral trunk support. And with all of this he can sit up very readily, free up his hands and he's reaching out to a tablet for communication.

So what's some things we need to keep in mind in terms of assessment? Well, we need to observe the client's current seated position. And then we need to move into the Mat Exam. And there's a number of things we're going to keep in mind, including the amount of support this person requires to stay upright, their available range, sitting balance, muscle strength and sensory status, particularly sensation that's gonna directly relate to pressure risk. So let's look at all of these in a little more detail. First, we need to observe how is the client seated right now. You know, for me, it's really tempting when someone comes to see me and perhaps I'm less than impressed with their current seating or positioning within their seating system. I wanna get my hand on them, I want to pull their bottom back, make sure their pelvis is in alignment, all of that. But what I try to do is before I adjust anything, I wanna look at how is this person already positioned. I need note that, I need to look at the position of the pelvis, spine, extremities, the head, write all that down, I might grab some photos as well, so I know this is where we're starting. Those photos can then help me determine have we improved this person's posture? Those photos can also be educational.

This young woman here, I took some pictures of her from the front and the side before we made any changes. And then I showed her those photos. And it was interesting.

She told me that nobody had ever showed her picture of her posture before. And so after we made some changes, I was able to show her those pictures, and she could appreciate the difference between the two. And that was very helpful to her. So this can also be helpful for education. I do include photos often in my documentation as well, I'm educating the funding source at that stage to show them this is my clients current posture, and this is what we're trying to accomplish and why. So no matter what level of partial support is needed, it's important to look at how the client is positioned in their current system. And then again, note those findings.

This person here, I am using this picture for this illustration here, but she actually is a prop sitter. She can sometimes sit hands-free actually, sometimes hands-dependent but mostly is a prop sitter. It depends on her movement. She has cerebral palsy and apoptosis and her movements when they are relatively quiet, sometimes she can sit completely independent on a toilet, for example, but other times needs a lot of support, especially when she's really trying to use her body, in this case, use it to control her power chair with her joystick. You can see here she has this arm tucked underneath in between her legs. This leg is wrapped around the bottom of the right leg. What she trying to do? If we look at the left arm, it's kinda wrapped around her armrest a little bit. She's hanging on. She's trying to find stability that she lacks. And so a great deal of what we did in her seating system was to find that stability for her, so she didn't feel obligated to hang on. She instead was freed up to be functional.

We then move into the Mat Examination. Now in this series of webinars, we have a webinar dedicated completely to the Mat Assess, and I would encourage you to check that one out. But we're going to briefly talk about the Mat Examination when it comes to the hands-dependent sitter. So we're going to place the client sitting on the edge of the mat table like we've done with this young man here. If he lifts one or two of his hands, he is going to collapse. That collapse can be posterior, where the back of the pelvis rocks into a posterior tilt and the spine becomes flex or kyphotic. So we can see

that collapse into a kyphosis and posterior pelvic tilt. We also might see collapse laterally, where one side of the spine become shorter. And we might see along with that some pelvic obliquity, where one side of the pelvis is higher than the other. Then we placed the client supine on the back on the mat table. And it's important to determine in the hands-dependent sitter, how much available hip flexion we have, because this is going to determine the seat to back angle of the wheelchair frame and seating system. Very, very important. This is reviewed in more detail in that Mat assessment course, we actually have some videos showing how to determine available hip flexions. So again, I would refer you to that particular course.

You know, I'm gonna go back here for just a second. So it's important to look carefully at these pictures. This young man here, it's a little hard to tell with just a picture, but he has a tendency where both his legs wanna go to one side a little bit, called a windswept tendency. His pelvis is actually just a little bleak. He's little high on the left, and he is rotated forward just a little bit on the right. This leg, his left leg is a little more abducted and externally rotated. This leg is a little more adducted and internally rotated. So those are tendencies, we have to determine, can I correct those tendencies? In his case, we could. We could correct all of these back to a neutral range.

All right, so range of motion. So again, in supine, we have to determine how much available hip flexion the client has. We have to check the hamstring range with the hips flexed as well. So the first thing we do, and again, this is reviewed in more detail in the mat assessment course, is we bring the legs upward into flection. If I start flexing these hips and the pelvis starts rotating back into a posterior tilt, I know I've reached the end range in terms of hip flexion. So it might look like, "Wow, "I can really flex those hips a long ways." But if I'm losing a position of the pelvis, I really can't. So I flex those hips until the pelvis starts moving back off a little from there, and that's my available hip flexion. To check the hamstring range, we keep those hips flexed at about 90 degrees,

if the client has that degree of range. Most hands-dependent sitters will have that much range of motion. Then we're going to slowly extend at the knee to determine how much hamstring range I have. That's going to determine the angle of the knee in sitting. And as a result, the angle of the footrest hanger. So we need to know how much of fluxion do we have, that's going to determine the seat to back angle of the wheelchair seating system? And then how far can I extend that knee before I start moving the pelvis as well? So the hamstring is one of those muscles that drives me crazy. It's a two joint muscle, it crosses the knee joint and the hip joint. And if it's tight, and I try to move this hip into more flexion, I'm going to rock the pelvis into a posterior tilt. Also, if the hamstring is tight as I try to extend the knee, I'm going to pull the pelvis forward, because the pelvis is attached to that tight hamstring. So important to look at both of those ranges on mat table.

Also on the mat table, I have to look at sitting balance. The hands-dependent sitter will lose their sitting balance if the hands are not supporting the body. So I have to decide how much support the client needs and where and at what angles to optimize their trunk and head control as well as trunk and head balance. So as I am on that mat table, behind the client, as they're sitting on the edge of that mat table, I'm gonna place my hands where I believe this client needs support and see if they can now lift those hands off of the seating surface. In this case the mat surface. I have to see which angle their thigh to trunk angle needs to be. At what angle I see the most trunk and head balance. Muscle strength. Part of the reason this client may have trouble maintaining sitting balance is because perhaps this person is having difficulty balancing their muscle groups, those flexors and extensors and the trunk to maintain upright sitting without help.

This could be for two different reasons and people with abnormal muscle tone, balancing those muscle groups that co-contraction can be very difficult because one muscle group tends to dominate the other in people with increased muscle tone, or

there may be fluctuations in muscle tone. Other clients may have difficulty balancing these muscle groups because of paralysis of the muscles or weakness of the muscles. And that's where muscle strength comes in. So we then need to make sure the seating system has enough postural support that the client can maintain that posture over time and during functional activities. This is very key. It might be that this client looks great during the actual assessment. And you think, "Wow, this is it. "This is the seating system that's required." But our clients have to be able to maintain their postures over hours of time frequently. And so we wanna make sure there's adequate support, not just for the short haul, not just for that sprint, but for the marathon, when the client becomes fatigued later on in the day, that they still have adequate support. We also have to make sure that they have adequate support for those functional activities. So a client might look great within their seating system, again, if they're just hanging out, and I'm snapping pictures, but I will often ask clients I work with while we're simulating seating options, to attempt certain functional activities. Because that same client who perhaps can sit upright for a short period of time if I asked them to, may either collapse over time or during attempts at functional activity, whether it's brushing their teeth, or trying to control a piece of assistive technology.

Sensory status, also very important. The hands-dependent sitter is less likely to be able to perform an adequate weight shift compared to the hands-free sitter. The hands-free sitter generally has more mobility, they may be able to weight shift from side to side or even use their arms to assist in a weight shift. So it's important that we consider the seating materials we're using and the weight shift strategies that we're using so that this client has a minimized or reduced pressure injury risk. The same clients depending on their diagnosis may be more likely to have muscle atrophy and bony prominences. This means that they are at increased pressure risk. So perhaps for this client with a with paraplegia, spinal cord injury, they may have hands-dependent sitting balance, they may not require a lot of support, but this client may have a high pressure risk because they may not be able to sense discomfort, numbness in the glutes because of

their paralysis, because of the spinal cord injury. And also, this client may be more limited in some of their weight shifting abilities. So we need to keep all that in mind, we recommend the best materials. And we're looking at weight shift strategies.

Functional activities, again, we wanna make sure this person has adequate partial support for their functional activities, that can include self propelling. Some of these clients in this category of seating, may be able to self propel, we'll make sure this client if they are eating orally or are still able to do so that that's optimized, and that they can reach. So not only can I be functional, but I can reach away from center, meaning maybe I have to lean a little bit forward or to the side and come back without losing my sitting balance. So this client, again, may not need much support unless they're doing those activities. This young man here looks like he can sit up without very much support, but when he tries to start reaching out for certain objects, his trunk quickly collapsed. And so we needed to add in some more postural support for him. We needed to discuss this as a team because some of the people on the team were concerned that we were overprescribing, that we were providing more support than this person really needed. But to be functional, he did require a little more anterior and lateral trunk support for certain activities.

So, interventions. To prevent collapse of the client into that posterior pelvic tilt and kyphosis, we often need a lot of support behind the pelvis, and often lateral to the pelvis. Again, really just like if you were sitting behind this client, on that mat table, and you had your hands on their pelvis. You're gonna give them enough support that they can move back and forth without postural collapse. So that means we need to look at a cushion that has significant posterior pelvic support and or strong contact with the back at the level of the pelvis. So this particular cushion here it happens to be a Ride designs cushion has a unique shape. It has these components in the back called cantles. And those cantles provide significant posterior support to the pelvis so that the pelvis is less likely to rock back into a posterior tilt. Many people who are

hands-dependent sitters end up with a back that may start rather high up, behind them, because they may not need a lot of support from a back behind them. That back if they don't have a lot of support posterior to the pelvis needs to come way, way down and provide that contact so that this client is less likely to collapse into this posture. All right, let's talk about some geometry here. In case you have kids at home that say, "I don't need to learn about math," you can tell them you did so today. Angles are very, very important when we're looking at wheelchair seating. And particularly for the hands-dependent sitter, we need to look at the angle between the pelvis and the lower back and the angle of the thigh to the trunk.

Now a long time ago, I used to, well, actually not even that long ago, I mostly focused on the angle of the back to the seat. The seat to the back angle, or perhaps the clients trunk to thigh. So let's take a step back for a second. In a wheelchair, we have the back canes to the wheelchair and the seat rail. And so sometimes that's referred to as the seat to back angle. But depending on the materials of the seating system, we also need to look at the angle of the seating surface to the back of the seating system, also called the seat to back angle. But that angle could be very different than the angle of the back cane to the seat rail, because of the contours of the seating system. Most important, I need to look at the actual trunk of the client to their thighs because again, that might be much different than the actual seat rail to back cane angle is going to determine the angle of these wheelchair frame components. But it's important I look at each of those individually. Make sure the client has adequate range of motion for the posture that we have selected.

Now with these hand-dependent sitters, it's important to look very specifically the angle of the pelvis to the lower back. So let's look at our second picture. In this picture, we have a closed seat to back angle, we're at about 90 degrees. But this upper back is heading further back. What's up with that? Well, the reason is sometimes in order to promote stability and function, we need to provide very significant support to the back,

the posterior of the pelvis, so we might close that up a little bit, but allow some extension of the upper back. So now our entire seat to back angle becomes more open. But in essence, we have a 90 degree angle, at the pelvis to thigh but a more open trunk to thigh measurement. So I hope that makes sense. This is an example of the back that's reflecting that shape. This is called the Tarta Back. And you can see that there's a curve to it, which is really nice because that's similar to the curve that we might be promoting in our client's spine. So by having a tighter angle here behind the pelvis, we're providing more posterior support for the client at the pelvis. But we're promoting a little extension beyond that, because if we kept the client at a more closed trunk to thigh angle, many of these clients are gonna collapse forward. We have to allow some room for extension, but we might need to maintain a good, more close contact with the pelvis. So angles are very, very important. And something we need to keep in mind with everyone using wheelchair seating. These are some specific things that are important to keep in mind with the hands-dependent sitter.

Another important angle is the tilt of the frame itself. We can change the orientation in space or the seat slope of the wheelchair and seating system. By doing so we can decrease some of the negative impact of gravity and fatigue. Gravity is not always our friend, neither is getting good and tired. So, sitting at my desk, I can certainly sit nice and upright, make my grandma proud. But gravity is constantly pulling down on me and before I know it, I'm not exhibiting the best posture I can and I need to remind myself to sit up tall again. Fatigue doesn't help. The more I get tired throughout my day, the more likely my posture is to collapse. Well, it's that much worse for the clients that we are working with. So we need to keep in mind what can we do within the seating system including the orientation space or seat slope to help decrease the impact of gravity and fatigue? So here's a couple things we can do. We can lower the seat height in the rear, and that can have a positive impact on sitting balance and stability. It's not usually a huge change about an inch, but this can make a big difference. It depends on the client. So here we have a rather typical setup. We have a

seat rail parallel to the floor. If we go here to the right, you can see that the rear of the seat is a little lower than the front, this is sometimes called a dump and this can help increase hip stability. Now the client has to have adequate hip flexion in order to assume this posture, otherwise, we're going to drive the pelvis into a posterior pelvic tilt. So this is not always necessary, but something we can keep in mind. Some of our clients instead will benefit from tilt in space, where the angle between the seat and the back remain the same. But we have tilted that entire seating system a little bit to help compensate for fatigue, to help nullify some of that impact of gravity. Wouldn't it be great if we had an anti-grav seat? I would recommend that seat.

Other things to keep in mind are lateral support. We have to determine the right amount of lateral thoracic support, so that this person can be functioning. Well, they can let go. They don't have to hang on with their hands to stay upright. But we also don't want that getting in the way. So we've got a lot of backs on the market. We have a lot of different categories of sitting systems. But this particular ADI back is an off the shelf back. It has a bit of a curve to it, to encourage this person to stay in midline. But we can also add a separate lateral support to provide more targeted support to the lateral trunk area, so this person can free up their arms and be functional. We don't want this pad to be any bigger than it has to be. And sometimes the entire shell of this back comes forward quite a bit called the deep back, that can help someone stay in the middle a little more, but sometimes it gets in the way of function. So we have to find that balance for that individual.

Pelvic obliquity. Fortunately I am opposed to pelvic obliquity. Pelvic obliquity is when one side of the pelvis is higher than the other. And this can be a big problem, because now we have more pressure under one ischial tuberosities as compared to the other. Many clients who get a pressure injury under one buttock, have this pelvic obliquity. So it's much more common to see an injury on one side than both and it's because again of these obliquities. So even if we provide posterior and lateral support to the pelvis,

the pelvis can still collapse into an oblique position. And if we have a bony asymmetry, then this person's at higher risk for developing pressure issues. So there's a couple things we can do. If this person has a ability for us to reduce this obliquity to a neutral position, it's still reducible or flexible. We can use an obliquity pad to fill in this space. So let's look at this picture here. This person has a pelvic obliquity, the left side's higher than the right. But here underneath we've added in an additional pad. We don't want this pad to be in between that bony prominence and our nice, wonderful materials in this cushion. Needs to be underneath and it's raising this up to level out the pelvis. So this person has a tendency to fall into obliquity, we're going to fill in that space to level out the pelvis. Another option is to use an off-loading cushion. This is a another Ride designs cushion, it's called AccuSoft Cushion. And it has a very deep well here. Well, really nobody shaped this way where there ITs would actually contact down in this big hole. It's designed to off load those ischial tuberosities completely and instead shift the weight over to the trochanters. And that's the reason for the shape here. So by raising, by offloading those ITs that are now hovering over that well, sometimes this can accommodate that obliquity or correct reducible obliquity.

Many hands-dependent sitters have tight hamstrings. My hamstrings are tighter than I would like them to be as well. But we know that those tight hamstrings can pull the pelvis into a posterior tilt. So this young man is trying to long sit, he just doesn't have the hamstring range. And it's pulled his pelvis in a posterior tilt and of course we see this trunk reflection as well as a result. So what do we do? Well, again that hamstring is a two joint muscle. It crosses the hips and it crosses the knee joint. So what do we do? If the hamstring is tight, one of the things we can do is close the knee angle. Should we pull those feet back, creating more flexion, relaxing the hamstring, and then we're less likely to see that posterior pelvic tilt as we close this up. Depending on how much we close this, we can have two different issues. We can have caster interference which can be a challenge where a foot plates are hitting the casters. We can work with the supplier to look at various strategies to avoid this. But one of the things from a seating

standpoint we might have to do is bevel the front of the seat where we kind of cut it back a little bit at this angle. Because otherwise as we bring the feet back, the calves might end up being compressed against the front of the cushion. We don't want that to happen, should we bevel the front of that to alleviate that pressure when we have to close the knees. Again, hamstrings two joint muscle. So in addition, or instead of closing the knee angle, we can open the seat angle. This places the client's body mass behind their center of gravity. Now that can promote instability and it causes some clients to slide. So this is something that we have to keep in mind. One thing we can do to help compensate for that is we can combine this open seat to back angle with a little bit of an anterior tilt, not very much or our clients are gonna slide forward again about 10 degrees. So we've dropped the front of the seat in relation to the back of seat just a little bit. So now we still have an open seat to back angle, but it helps the client not be as in stable and helps prevent some of that sliding. Again, main goal is to accommodate those tight hip hamstrings.

What about those clients with those tight hip flexors? We talked about this earlier on the mat assessment. This is something we need to check for. In these cases, if we pull the thighs downward, we might pull the pelvis into an anterior tilt And if that's the case, then we need to compensate in the seating system by wedging the forward portion of the seat so the pelvis is in neutral. So we have to raise the front of the seat in relation to the back, that dump like we talked about before. But instead of trying to promote stability, like we were doing before, we're accommodating for these tight hip flexors, where if the client isn't a little more closed in their hip flexion, their pelvis will rotate forward into an anterior tilt. So we can wedge underneath here to match the angle we've identified on the mat table so that we're not pulling someone into an anterior tilt. It is important to make sure we haven't put too much pressure on those ischial tuberosities, so is ITs, when we use this angle. We can allow the client to lean forward also when there is tight hip flexors, and that can off-load the ITs, when this person can lean forward. We can also use a belly binder, might be a little hard in this picture to see

but this guy here, this gentleman is wearing a belly binder to help minimize that tendency towards an anterior tilt. These belly binders tend to catch the lower edge of the rib cage, the upper portion of the pelvis that reduces that lordotic tendency of the spine that accompanies an anterior pelvic tilt. Now we know that seating impacts the ability of this person to be mobile.

So it's very important to check that if we've made changes to the seating system, for our hands-dependent sitter that this only has a positive impact on their ability to self propel, to do weight shifts, to do transfers or other functional activities like this gentleman is using his communication device directly with his hands. If we see that there's been a negative impact, we need to address that, we need to re-look at what we're doing with seating, we also may need to get in there and make some adjustments to the frame itself, so that we are continuing to optimize this person's seating and also functional mobility.

All right. We're gonna spend the balance of this course on a case study. We're hopefully we pull together some of this information. Now of course, every client is unique. A lot of what we've discussed here will apply in pieces to particular clients, we're not going to generally see a client that struggles with an anterior tilt to their pelvis as well as a posterior tilt. It's gonna be one or the other. But let's look at this young man here, Paul. Paul is six years old. He has cerebral palsy. He is a twin and he was born early at 28 weeks. And as is more prevalent in preemies developed cerebral palsy. So actually seated or lying on the mat behind Paul is his brother. He's a little hard to see here. His brother actually is a prop sitter, but Paul is a hands-dependent sitter. So let's take a look at Paul from a medical stand point. Overall he has increased tone in his body, though not as much in his trunk or his neck, and that's very common in people with cerebral palsy. He has some difficulty regulating his body temperature. He gets cold easily and as a result that impacts his muscle tone and is functioning a bit. He is continent, he is able to indicate a need to use the bathroom and successfully use

a toilet. He has a slight adaptations to the toilet for bowel and bladder. But despite being continent, he still is having accidents about once a day. Why is that important? Well, because when we're looking at a seating system, we need to keep in mind materials. We need to make sure that his upholstery and the materials underneath are not getting urine or fecal matter on them that can be an issue with odor definitely, but also just germs and it can impact the performance of those materials. That foam can readily degrade. He is verbal, so he's able to have a conversation with us and he uses a G-tube for medications and additional fluids. He can take some of his food and liquids by mouth. Paul has had a couple surgeries, he had that G-tube placed a while ago. He also has had a dorsal rhizotomy, the attempt to the dorsal rhizotomy was to mostly impact the tone in his lower extremities. I think there's a lot of work that's being done to try to help him to emulate in the future with either a walker or gate trainer. And that was the purpose of that dorsal rhizotomy. One of the challenges of working with children in seating is as they get older, these children will often undergo certain surgical interventions, either orthopedic surgeries, or perhaps tone management. And those can impact the seating requirements for that individual. How much partial support they need, and so his needs could change over time. When Paul was younger, he was a prop sitter. He is now a hands-dependent sitter. As he gets older, he may become a hands-free sitter. It's hard to say, it depends how he continues to progress. It also depends on these various medical interventions.

From a gross motor standpoint, Paul is able to stand pivot transfer with assistance, which is great. He can actually sit independently, but only in a W-sit hand. That's the therapy, so we don't want him in that position. It's really not a good position for those hips. So we want to help him sit more appropriately. He can sit in a more standard posture but does require again, his hands to hold them upright if he is sitting on the edge of that mat table or seated in a wheelchair seating system. He can do some limited bunny hopping from that W-sit position, but he's not up and successfully using a gait trainer walker at this time. In terms of equipment, Paul has a car seat, even

though he's six years old. Up until a certain weight, kids should be in a standard car seat and then in a booster seat. So he is sitting within that now, he is not needing to stay within his wheelchair seating system. In the car, he does fine in a standard car seat. He does have a manual wheelchair, it's called the Zippy Zone. And he's able to self propel this, he can get his hands on those wheels and push forward. It's a very lightweight chair to help with his self propulsion. He also spends time in a standard tandem stroller. Again, although he is six, mom is dealing with twins and depending on where they're going out in the community, there are times where she still places them both in this tandem stroller, it's just easier for her to manage them. He does have a stander that he spends time in so he gets that good weight bearing and that's important for development of his hips, development of that socket there to have that weight bearing and work on his legs. It also helps his range of motion. It's very important that he spent some prolonged time with a good stretch to those muscles in the legs because he spent so much time in a flex position within his wheelchair. He is starting to use a gait trainer in therapy. I do not believe he has one of his own at this time. And he and his brother each have a bath seat as well to provide a little more support in the tub. Otherwise he'd be W-sitting in the bottom of the tub. At school, he sometimes uses an adaptive seat so he will transfer out of his wheelchair and sit in that for some activities. He certainly could perform those activities within his wheelchair seat as well. He wears ankle foot orthoses. And finally, he has glasses for his vision. His vision is well corrected with those.

So we got Paul out onto the mat table to see what we could find. His range of motion is well within limits for what would be required to sit within a wheelchair. Part of that is because he's still young. We wanna make sure that we keep in mind that Paul is getting older, that we can do we can do now within a sitting system to ensure that he loses as little range as possible as he gets older. He does have a tendency towards strong hip adduction and internal rotation and his hamstrings are getting tight, again, within range for seating but another important reason for him to use that standard.

Now when we place Paul on mat table, you can see that here he's actually lifting his hands off the surface. So we might think "Wow, is he a hands-free sitter?" But when he lifts his hands he quickly collapses and needs to get one of those hands out again. So he does need to get those hands back down to support him. So we would say he's a hands-dependent sitter. So he's mostly dependent upon those external supports to maintain a seated posture, not only to maintain a seated posture, but to maintain a good seated posture. Here his pelvis actually is in a pretty good spots, it's not always that upright, but he's falling back into a flex trunk and as a result has some neck hyper extension. Again, he can sit on the edge of that mat table for periods of time if he uses his hands and he can let go just momentarily without falling over. Again, placing him in that hands-dependent category.

So what are Paul's postural support needs? With significant contact, lots of support at the upper pelvis and the lower back, he can maintain an upright posture. Otherwise, he collapses into that posterior pelvic tilt. With that significant pelvic support, he can move his trunk back and forth without losing his posture, without falling over, without collapsing into kyphosis or posterior pelvic tilt. So this is really important for him. And with significant pelvic support as well as lower back support, we see improved trunk and head balance, decreased active extension and increase function. Why? That significant pelvic and lower back support is providing stability that he does not have inherently on his own. And so by providing that stability, he's able to display better trunk and head balance. He has better control. He has less active extension because for a lot of these clients that extension is, I'm trying to shoot off my tone in effort to stabilize. So by increasing my tone, I can activate muscle groups to try to keep me upright. If I have enough extrinsic support from the seating system, my muscle tone might relax, all of that extra stability and the ability to work outside of my increased muscle tone increases function.

So what did we recommend? Well, actually, in Paul's case, and this is less typical for a hands-dependent sitter, we recommended a custom molded seating system. Wait a minute, Paul's only six years old. It has a three year warranty for growth. This is a particularly unique seating system and that it's only available in the Denver area this time. It's from Aspen Seating and it's called the Aspen Seating Orthosis, and this is another young girl who is showing that Aspen Seating Orthosis. The reason we recommended this is it provided very intimate contact, very good, precise, comprehensive contact with the posterior pelvis and lower back where he required that degree of contact. And when we tried other seats and backs, we couldn't get as much intimate contact with that area to give him the support that he needed. So even though this is a molded seating system, it actually is less aggressive. He has less seating opponents around his body than he would if we didn't use this system, because it provides so much support posterior to the pelvis and lower back that he doesn't have to have that degree of support elsewhere on his body. It also provided some trunk support to minimize his risk of spinal curvature development. He's symmetrical now, we wanna keep him there. But it's still allowed him to move his trunk around for functional activities, including self propulsion. And this particular orthotic style molded seating system is actually very lightweight. And so we didn't wanna add to weight when we're trying to optimize self propulsion. So as a result of these interventions, we saw overall decreased active extension, reduced hip adduction and internal rotation. A lot of this was due to reduction in extension. These are both components of extension, but also to the shape of the seating surface. And he had sufficient postural support and stability to optimize his function. And hey, ultimately that's our main goal.

I have some references here for you. I hope they're helpful to you. There is a new book on the market, all about "Seating and Wheeled Mobility." And we have a chapter in there from Sharon Sutherland, that really goes into even more detail about dependent or hands-dependent sitters. I want to encourage you if you have any questions to feel free to reach out to me via email, there's also some helpful resources on my website

and you can always contact occupationaltherapy.com. I would also encourage you to check out the other webinars. They are available on occupationaltherapy.com, including the ones in this series. Thank you very much for attending this course. I know everyone's really busy and I do appreciate you taking the time to learn more and be of better service to the clients that you serve. And again, just make sure you have my contact information.

- [Fawn] Thank you Michelle for a great talk today. I appreciate all the information as I'm sure participants do as well. Again, here's our contact information, feel free to reach out to her if you have any further questions. I hope everyone has a great rest of the day. You join us again on continuedandoccupationaltherapy.com. Thank you.