Digital Diets and the Impact of Screen Time on Development
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- [Fawn] Today's course is Digital Diets and the Impact of Screen Time on Development. Our presenter today is Angie Neal. Angie is a Speech-Language Pathologist from Greenville, South Carolina. She has worked in Outpatient Pediatrics in school settings but her passion is helping students succeed in an academic setting. Mrs. Neal frequently presents across the United States and uses her animated presentation style to share practical strategies that can be quickly utilized. Welcome, Angie, so happy to have you.

- [Angie] All right, I'm happy to be here, so, here we go. I'm gonna begin with a question. So, my first question is, how many of you have noticed an increase in referrals or concerns, especially for your K-4 and K-5 kiddos, over roughly the past five years. As OTs, you've likely noticed more referrals for fine motor skills or, for example, they have great finger pointing skills but no tripod graphs. Well, I have, and it's not because there are more kids who struggle with speaking clearly, but the concerns from the teachers are due to students who are struggling with academic readiness, primarily in the ability to interact appropriately, follow teacher directions, and the ability to appropriately control their emotion. Now, I've done the same workshop for speech language pathologists, for school psychologists, as well as nationwide conferences for pediatricians and developmental pediatricians in other related fields. And they are seeing the same concerns. Matter of fact, every time I do this workshop live, I get a lot of head nodding throughout the workshop. And at the end of one I did with developmental pediatricians, I received the biggest compliment I think I've ever received. And it was a developmental pediatrician that came up to me afterwards and said, wow, that really made me think. And if nothing else, that is what I hope to do today. Just to get ya thinking about this and thinking about how exposure to excessive amounts of stimulation through technology can have a negative impact on the skill development necessary for academic readiness.

So again, my name is Angie Neal, and I am a school based Speech-Language Pathologist, and I'm extremely honored and excited to have been invited to share this with occupational therapists, 'cause y'all are my people, in a school setting, OTs are my go to. Y'all are the only other people who really have the perspective of how we straddle both the educational and medical settings, and how that impacts our perspective across many different areas. Now, I am including my email on here, maybe at the end, but I'm including my email, my personal email on here, in case you'd like to reach out with any additional questions at any time. Or if you are interested in having me come to speak with your group somewhere, after all of this craziness is over. So, here we go, we're gonna start with a few disclosures. So, I am an author with TeachersPayTeachers who receives royalties. The handout that I'm giving you today is basically a parent friendly version of everything I'm talking about in this workshop, and it was two pages, and it's also information about how to go on a digital diet, which I'll explain, with some activities they can do. So, if you're looking to share this with others who have not taken this course, I would ask you to please refer them to my TPT page and then they can download it from there. But I'm also getting a stipend for doing this workshop, and I'm a member of ASHA. Now, as a quick note, please go ahead and type questions that you have at any time. Now, I am not gonna read them or answer them until they get to, until we get to the end, so that I can get through all of the content, but go ahead and type away.

Here's our learning objectives. We're gonna describe the negative impact of excessive screen time and how it relates to how kids were relate to the world socially, we're gonna review key data and emerging research on the topic, and we're gonna talk about strategies to share with families, that's the most important thing. Now, as I begin talking about the current research and the impact of technology on development, there's one thing I really want you to keep in mind. Human Development is cumulative. In other words, each step builds upon the next. And so, when one step is delayed or disturbed, there's a snowball effect on the development of other skills.

So, we're gonna start with a few key statistics. So, in 2011, 38% of children, age eight and under used tablets and smartphones, that was 2011. In 2013, it was up to 72%. We're now in 2020. Do you think that number is higher or lower? My guess is much, much higher. Now, in 2018, one-in-four children under the age of six had a smartphone. My question is, what is a five year old doing with a 400 or $700 smartphone? Also, about a third of all screen time used by children is on a mobile device, meaning it is used, not in a fixed location, but across many locations, and this is more important than you might think when it comes to building language and learning how to interact with the world around you. And the use of mobile devices and children has risen from five minutes a day in 2011, to 48 minutes a day in 2017. Again, do you think that number is higher or lower now, in 2020? Now, where things get really precarious is in the studies and the notes that we're finding in children age two and under, almost 40% of children under the age of two use mobile media, and that's a 2017 data.

Recent studies are revealing that kids and babies, under the age of two, are spending more than double the time in front of screens than they did in 1990's, but here's the kicker with this, especially for that age group, it's not until around the age of 18 months that a baby's brain has even developed to the point where the symbols on a screen even begin to represent their equivalent in the real world. Also, between birth and age three, all learning takes place in a social context, through relationships, and the younger they are the truer this is. And children under the age of two are wired to learn and remember things through experiences and through imitation, but what they found is that children watching screens imitate 50% less actions than those children who engage in live three-dimensional interactions. Meaning it's actually easier to learn from humans, than it is to learn from screens. In addition, children 12 months and younger, they're not even able to follow the changing scenes on a screen, or the program's dialogue, because they haven't even learned the words and context and syntax yet.

So, the question we have to ask is, what is keeping them engaged? Well, it's the exciting colors, the quick scene changes, all the music and sounds and beeps, and the over exaggerated character.

Just as an example, Baby Einstein, all right, I'm not gonna say my kids didn't watch Baby Einstein, but I'm sharing this with you so that you understand what is going on in it. So, Baby Einstein. There was a video called, "A Day at the Farm." In the "Day at the Farm," there are seven scene changes in one 20 second section. One more time, seven scene changes in just one 20 second section. So there's roughly one scene change every three seconds. So what's actually keeping them engaged isn't what they're seeing, it's the constant stimulation. And then, when they go to an actual farm, it's actually quite boring for them because there's no sheep popping up out of the corner, and the cow space isn't super exaggerated from being in a super close up focus, and you actually have to walk from here to way over there to see the horse. And chances are that horse isn't doing a beautiful slow motion run, it's probably just sitting there eating. In other words, it's conditioning the mind to a reality that doesn't exist. And as a result, for every 30 minutes of screen time, there is a 49% increased risk of expressive speech delay.

And this statistic comes from a 2017 study out of Canada by Dr. Catherine Birken, and this is the first study that reports a link between handheld devices and expressive language delays. And now there are over 200 peer reviewed studies that point to screen time correlating to increased ADHD, addiction to screens, increased aggression, depression, anxiety, and even psychosis. And the National Institute of Health is actually doing a current study, it's a $300 billion study using functional MRIs to examine the changes in brain structure among children who use smartphones and other screen devices. And what they're finding in the first batch, the first batch of results shows that kids who spend more than two hours a day on screens scored lower on language and thinking tests, kids who spend seven hours per day on electronic

devices show premature thinning of the cortex. So, what is the recommended amount of time per day that kids should be spending on technology? Well, we're gonna look to the American Academy of Pediatrics, and they recommend less than two hours per day for children aged five to 18, no more than one hour a day for children aged two to five, and none for children younger than 18 months. Now again, keep in mind, this is per day, and consider how quickly this adds up. If the child is at school, and they have 30 minutes of circle time on a promethium board, or they have 30 minutes of iPad centers or Chromebook time, and even if their driving to school and they're watching videos on the back headrest, 30 minutes to school, 30 minutes from school. Well, that's two hours right there.

Now, as we're recording this workshop today, I have been working from home for a few weeks due to COVID-19. So, trust me when I say the timing of this workshop on screen time is not lost on me. Now, while we are using for screens for interactive and educational purposes, it's a necessity at that time, but what I'm talking about today is not that. I'm not talking about interactive, active use of screens. It's the mindless entertainment type of screen time for children and adults. And let's take a look at this from a child's perspective. Oops, all right, so this is a picture from a kindergartner. It's actually the picture from a friend of mine and she posted it on Facebook because it was a wake up call for her. If you'll notice in the little red circles, her child sees the phone as an extension of their person, as a part of both the mom and dad. So again, that was a huge wake up call for her. And when I do in person workshops and have more time, there's a video on YouTube that I really like to show because it's especially eye opening and you can look it up later if you want. It's called, Cute Baby Crying for Phone, and it has a baby sitting on like a little activity mat, looking at, and holding the phone, and smiling, just strumming his fingers across the screen, but when the phone is taken away, the baby cries. But it is not at all a typical cry. And it is not at all the typical kind of body movements that you see in a crying infant. It's spastic and dramatic. Then they give them the phone back and it stops, instantly, and the baby

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smiles, strums the phone again, and they repeat this whole sequence again, and it's actually really hard to watch.

Now, next we're gonna talk about a few other things. So, while correlation is not causation, it does lead me to now talk about a frightening trend. And that trend is the increase in incidence and prevalence of autism. So, what we've seen is a huge increase in the incidence and prevalence of autism, classifications in both the school setting and the medical setting. So, nationally, one of 59 children had a diagnosis of autism spectrum disorder in 2018, and the year 2000, it was one in 150. Now, since I turned in this PowerPoint to be approved for today's workshop. So, as of today, March, or I guess it's April now, 2020, the CDC is now reporting that number is now one in 54. So, it's even more. We've gone from one in 59 in 2014, to one and 54 in 2020. Now, in the school setting, in the 2000-2001 school year, the number of children, three to 21, who were getting special education for autism was 93,000, but in 2015 it was 617,000.

Now, this leads me to talk about this. I'm not at all here to say that technology causes autism. What I want to get you to become curious about is what happens when there's disproportion exposure during critical periods of development that can negatively impact the development of areas, of the areas, that we look for when determining the presence or absence of autism. Such as, social communication, including social reciprocity, social emotional skills, including Theory of Mind, and the behaviors that are related to emotional regulation and self regulation. So, I want you to consider this. What happens when children are having less social interaction opportunities, and when there are obstacles being put in the way of healthy brain development? Including obstacles to social communication, social emotional skills, and emotional and self regulation skills. What happens is it looks very much like a child who struggles socially, and then presents very similarly as a child on the spectrum. But thinking about the three prongs for autism, I want you to think about the statement regarding atypical

restricted repetitive patterns of interest in behavior, including sensory sensitivities. And I say this and point this out because atypical, that's the word I want you to hone in on, an eight year old boy who's really into Minecraft isn't necessarily atypical. An eight year old boy who's really into manhole covers or garbage trucks, that is atypical. So, while they may seem really interested in video games, we have to tease out whether or not it's atypical interest, versus an actual addiction. Yes, addiction. Which I'm gonna talk more about later. And when it comes to developing this ability to engage in socially inappropriate interactions, it's really a chicken and the eggs kind of a thing. When children don't get practice with social interaction with peers, they aren't getting opportunities to exercise their emotional regulation with peers, and the peers are the ones who provide them with feedback to know whether these behaviors were appropriate or not. And the less they regulate these emotions, because they lack the practice, the more they stand out to the peers, and the more they have difficulties in establishing relationships with peers.

Now, what's interesting to note, as well, is countries that have not experienced a digital revolution, have not, they have not seen this increase in autism, meaning the exponential rise in autism affects children in rich countries. And it's only happening, only, in rich countries. Many countries where families have access to five to 10 screens within one household, between your TVs, smartphones, laptops, iPads, video games, and screens built in a car. And it's also, we don't want to just pin this on the kids, it's also the impact of parents, attending to screens instead of interacting with the child. Like I showed you in the picture earlier. Think about all of the opportunities or missed opportunities from language, for conversation, for play, for development, as you ride down the road, as you sit at the dinner table, as you walk through the grocery store, as you wait in line at Disney. Wishful thinking there. As you watch the car go through the carwash. Those are some of the more common times that we now see kids and parents on their devices. And when parents are distracted by their phone, it impacts the development of joint attention with the child and their emotional connectedness, as

well as conversational ability, which we know is critically important to language development, and we're gonna talk about that later.

Now, parents will say, but they're playing educational games. So, that's okay, right? Let's explore that. So, there's certainly something to be said for that, okay? And again, that statement is often made by parents, though it is, the problem is when they're letting the phone read books, or the iPad read books, and again there's something to be said for that. But the research is showing us that children aged three to five, whose parents read, quote-unquote, read to them through electronic books, they had lower reading comprehension, compared to physical books because of all of the bells and whistles from electronic books that distract them from a focus on the actual story. So, for example, if they're reading Curious George, digitally, every time you push the man with the yellow hat, he takes his hat on and off. Every time you push Curious George, he goes up and down the tree. So they're distracted from the accumulated meaning of the story, and too, keep in mind, with young children, young children learn meaning, word meaning, through social interaction with real objects, and sharing a book with a child is significantly different than having a book read to them. Because sharing, this is important, sharing is the only setting where parents typically talk about things outside of the everyday routine. In other words, it's a chance to talk about space, talk about Africa, and dragons, and castles, and so on. Because books are not constrained to the here and now.

So, subsequently, this contributes to the knowledge gap in exposure to concepts that are outside of our everyday routines, which impacts vocabulary. Now, there are more than 700,000 educational apps out there. There's probably more than that by now. And 80%, or more of them are targeted specifically towards young children. Now many claim to help children learn to read, but most don't. They may teach a child how to recognize letters, but that doesn't mean they can blend sounds to form words. They may teach your child to count to 10, but that doesn't mean they can show you a group

of 10 blocks. In short, the apps are just glorified flashcards, they don't add depth of knowledge, and they don't help generalize knowledge, which is necessary to build a strong foundation for learning. Because when it comes to teaching children, nothing is more important, nothing is more valuable, and nothing is more effective than human interaction.

And let's take a moment to think about the people who invented all of the tech. Most of those tech executives in Silicon Valley don't even allow their children near certain devices, there's actually a private school in the Bay Area. I can't think of the name of it at the moment. Where 75% of the parents are tech executives, and they don't allow, that school doesn't allow any tech in the school, none. No iPads, no promethium boards, no whiteboards, no Chromebooks. And Steve Jobs is famous for saying that his own children aren't allowed to use iPads. Silicon Valley nannies actually have to sign no technology agreements, meaning they won't be on a device and they want to allow the children on a device while they're in their care. And think about the video game and app designers, they don't only hire video game designers, they also hire neuro-biologists and neuro-scientists who hook people up to electrodes and other sensors, while they're testing the app. And if it doesn't produce the blood pressure rise increase, the skin response, and other biological responses that they're looking for within a few minutes of playing it, they go back and they tweak it until it does. And using hyperstimulating digital content to engage students, creates a vicious and addictive cycle. The more the child is stimulated, the more that child needs to keep getting stimulated in order to hold their attention. And the big question we have to ask is, is there any evidence that supports that these educational apps actually produce better educational outcomes. Do they do what they say they purport to do?

Now, let's talk more specifically about the parts of the brain that are negatively impacted by excessive screen time during critical periods of development. So, you can start to communicate this with parents. So, first we're gonna talk about dopamine.

Now, dopamine plays a major role in reward motivated behavior, and it serves a survival function. So for example, eating, after some effort and delay, making the food, buying the food, shopping for the food, cooking the food, eventually, there's the reward of the food. So, this reward serves a survival function. It's a reward that incentivizes us to have biological functions such as eating. However, technology, games, apps, they provide a shortcut to this rewards process, and it floods the brain with dopamine, and it is not serving any biological function. And consider how many dopamine hits kids are getting per game, or per swipe, and multiply that by the length of time they're on a device per day. The impact is a flood of dopamine that little bodies haven't adapted to. And again dopamine being what it is, it makes us crave more and more, not dissimilar to any other kind of addiction. And evolutionarily speaking, we haven't adapted to what to do with all of this dopamine.

Now, when a child gets used to this immediate stimuli response, they start to prefer these type of interactions. In other words, they start to prefer immediate gratification and response over real work, excuse me, real world connections. Now, as I do workshops all over the United States, I hear again, and again, and again from therapists, who are working with nonverbal or limited verbal students. And the first thing they have to do, before beginning work on assistive technology or augmentative communication, the first thing they have to do is put that child through a four to six week detox from technology, so that they can have the child start to interact with the technology as a tool and not as a toy. We also have whole generations that are being trained to have shorter attention spans than books require. Now, books take cognitive patience, learning to read takes perseverance, apps don't. When the app gets too hard, they just turn it off or change the game. And a 2013 study from the University of Oregon found that attention span persistence didn't just impact reading and learning, learning to read and reading development, but it also predicts their math and reading scores, at the age of 21.

Now, let's talk about frontal lobe development, the frontal lobes are considered our emotional control center, like the Disney Pixar movie "Inside Out," anger, fear, disgust, joy, sadness, all my favorites. And it's home to our personality, and frontal lobe damage results in a lot of difficulty in a lot of different areas, but I'm gonna highlight just a few. The first one is memory. Memory for what has occurred in the past. What are those teachable moments that remind us not to do the same thing again that got us in trouble last time. It also impacts initiation, slowing down enough to initiate and use conversational filters, and to use appropriate conversational approaches, as opposed to just jumping in and insisting on playing my game, my way. Also, impulse control, we may want to blurt out anything and everything, but impulse control and restraint is what keeps those things in check and helps us to interact socially and appropriately. Also, social behavior, consider that in order to recognize a social cue, a nonverbal social cue, and in order to respond to it, it requires us to have the ability to even attend to it long enough to notice and process what the signals were.

Now, executive function is also part of frontal lobe development as well, and how is executive function important to social skills and communication? Well, let me ask you this. Have you ever had to carry on a conversation with someone you don't like, about a topic you don't particularly want to talk about or care about? In order to do a task, they want you to do, that you don't want to do? And yes, you still have to smile and nod. While the whole time you're talking and you're planning what to say in order to get out of there as fast as you can, and you're inhibiting that eye roll, and that head shaking that you really, really want to do. That is executive function. And development in the frontal lobe takes off between six and 12 months when babies become more mobile, and verbal, and when they start to interact with the world and the people around them. And it matures in spurts with new functions being added until the frontal lobe reaches full maturity around the late 20's. But what happens when we give kids nearly unlimited access to devices and they haven't fully developed the frontal lobe? This is where we need to really give the term addiction some consideration, but first

let's define, what is addiction? Addiction is something you enjoy in the short term that undermines your wellbeing in the long term, but that you do in a compulsive way anyway.

Now, what is similar about addiction to screens, to addiction to anything else, is the parts of the brain that are involved. The dopamine, the adrenaline, and so on, which makes us crave more and more but the difference between addiction in children, versus adults, is that children haven't developed the frontal lobe, or fully developed part of the frontal lobe, which is the part of the brain we use for impulse control and decision making. In other words, they haven't developed the part of the brain that tells us, whoa, we need to put on the brakes here, this isn't good for me, this is keeping me from doing things that I should be doing instead. There's a double whammy. This type of hyperstimulation actually stunts the growth of the frontal cortex, as we're seeing from the NIH study. So, continual hyperstimulation creates more of a dopamine response to crave it, and less of the good decision making abilities to step away from it.

Now, before we start talking about the next area and go on to the next slide, I have a question for you. Ever had any runners in your school? All right, so now we're gonna talk about the HPA, the hypothalamic pituitary adrenal axis, and this is related to fight or flight. That adrenal response, and that adrenaline rush we feel. Our blood pressure goes up, our pupils constrict, our palms get sweaty. This fight or flight adrenaline rush is typical and it's necessary, but it is supposed to be short term. It's supposed to be a short term function of our bodies. So, for example, a dog chases you, your heart races, your adrenaline surges, and then you calm down as soon as the threat goes away. However, when kids are engaged in similar adrenaline, dopamine enhancing activities for hours, there's a consequence to that. It leads to aggression, impulsivity, hyper vigilance, and hyperactivity. So when they become faced with a tragedy, such as not being first in line, or they have to use a blue game piece, or they're not winning at

whatever game. There's an immediate physical reaction. Pushing, jumping, screaming, crying, running, otherwise known or what we would otherwise call, fight or flight. Now, keep in mind, again, learning to read, learning to do math, doing everything in school requires a certain amount of patience, practice, and perseverance, two things that are not full of bells and whistles, and you don't get a reward, every time you get a word correct or math fact correct. Again, reading is an amazing collaboration between the visual, auditory, linguistic, and prefrontal cortex, and pretty much every lobe of the cerebrum is involved. But kids, those kids who are in fight or flight mode, who struggle with self regulation, who are in a state that craves hyper arousal, those characteristics are more than unhelpful when it comes to learning to read.

Now, I've actually been doing some studies on this at Seattle Children's, kind of a, what do mice look like on technology, study. And this 2012 study looked at the impact of over stimulation, similar to technology, during the early developmental period. What they did is they had mice in at 10 days of life, they exposed them to six hours of exposure to lights and sounds which would mimic the same lights and sounds that would mimic what technology looks like to children. They did this for 42 days, which is essentially the entire childhood of the mouse, and then they tested 'em 10 days later. What they found was there was a significant increase in hyperactivity, as well as risk taking, and the control group of mice spent 75% more time on novel objects, meaning learning, whereas the mouse on technology, that mouse struggled to even distinguish a new object, out of a choice of two.

Now, let's talk about myelin. Now, myelin, all right, here we go. A newborns brain is 33 grams, in the first two years of life it triples in size, and this is unparalleled growth to any other time. That's why they sleep all the time. So, by the age of three, the brain is about 85% complete. We are born with a lifetime of brain cells, also known as neurons, but that's not what grows. It's the connections, the synapses, that account for this group. So, we start with 2,500 synapses at birth, and it increases to 15,000 synapses

by the age of three. Now, over time, these connections, these synapses, become more pruned and more refined, which makes what we do faster and more efficient. The synapses though, are formed based on early experiences, meaningful experiences, not just repetitive experiences, like we see on apps. And actually scientists discovered that it takes approximately 400 repetitions to create a new synapse in the brain, unless it's done through play. In which case, it only takes between 10 and 20 repetitions. So, myelin is what allows the synapses to become faster and more efficient, myelin is a fatty coating that forms a sheath around the synapse. So, similar to like, just like a plastic coating on a power cord, forms of protective coating around the myriad of cords within the power cord, the myelin sheath performs a similar function.

However, the brain cells that produce the cholesterol for myelination are very easily damaged by things like head trauma, stress, toxins, certain drugs, and the wrong kind, as well as the wrong amount of stimulation. Now, when I explain this to parents, I usually use this example. So myelin is kind of like a sled on a snowy hill. The first time we try to learn something or try to go down the hill, it's slow and effortful as we make our way through the snow. But with every subsequent trip down the hill, we have created these grooves in the snow, which makes it easier and faster every time we go down the hill. So, when infants, or young children are exposed to complexities of language, those neuropathways for language, and any other thing we're trying to learn, they myelinate. They make those tracks in the snow. And it makes everything that we do faster to learn and easier to learn, and almost effortless to learn. But again, myelin is very easily damaged. So, when we are providing too much stimulation, or the wrong kind of stimulation, the ability to, quote-unquote, grow a brain in such a way that it makes it easy and efficient to do things, it makes it very difficult. It makes it difficult to learn new things or engage in play with other people. So, this overstimulation stops the synapses from growing and stops creating that special covering that makes learning easy and makes it easy to learn and use what we actually already know.

So, speaking of play, play seems like the last thing we need to be thinking about in terms of academic readiness, until you have children who can't play or they aren't on the same level of play as the other kids in the classroom. So, kids learn through play, they learn how to interact in groups, they learn how to lead, how to share, how to problem solve, and how to resolve conflicts. Now, Gayler and Evans, found that the level of involvement in pretend play by preschoolers with their parents, was positively linked with their capacity for emotional regulation, which we're gonna talk about more in a minute. But that's because of the guidance and the coaching that parents offered during play. Now, the problem is compared with a virtual reality, play with another two year old or another four year old, it's actually kind of boring and frustrating. 'Cause you have to share your stuff. You have to take turns with someone who also wants to be the fireman, and you also have friends who don't want to do everything you want to do in the exact moment that you want to do it. So, seriously, how can Candyland compete with that?

I've seen this a lot in K-4 and K-5. Kids just starting school, they don't even have the basic play skills, and this is for both my students who come in with complex developmental diagnoses and those who do not. But for one, here's an example of one, who does have a diagnosis of autism. So, a little girl that came to our school, she just moved, recently moved from out of state, and pretty much she lives, her grandmother is her primary caregiver, she readily admitted, she didn't know what to do with her so she stayed on the iPad all day when she was at home. So again, she was in second grade. As a second grader, I had to start my therapy by working up from the most basic level of play, onlooker play, before I could get her to even engage in or benefit from my actual therapy targets. Now, what's interesting and sad, is how much progress she made while she was in school, and what happens, the slide backwards when she's gone for a long break, which makes me very worried about her right now.

So, Theory of Mind is what we're gonna talk about next. Now, Theory of Mind is understanding that other people have perspectives that are different from my own. And it is a primary area of difficulty for children who are on the autism spectrum. But, here we go. The development of Theory of Mind is negatively impacted when they don't have the opportunity to develop these skills through interacting with actual people, by looking at facial expression, interpreting body language, and so on. Because you cannot develop Theory of Mind, the ability to think about what other people are thinking, with a screen. I'll say it again, cannot develop Theory of Mind with a screen. Now deficits in Theory of Mind result in difficulties, such as understanding that different people or places have different expectations, understanding nonverbal language, such as facial expressions and gestures, even being unaware that their behavior affects how others think and feel, and also the inability to identify future self, and how I act in this moment can have an impact on things that happen later. Because they can't see themselves as a future self or as another self. And Theory of Mind development begins early in infants, like three to 18 months, when they're following directions, when they follow a point or a gesture, attending to facial features following line of regard. And all of that, again, is based on interaction with people. So, and there's several different layers I'm gonna go over really quickly.

So, the layers of Theory of Mind are the development of Theory of Mind, starts with pre-first order. That develops around the age of three. That's where they think about themselves, how I feel, what I think, and they use simple emotions, such as happy, mad, sad, as well as thirsty, hungry, dirty, sleepy. And you have first order, first order develops around the age of four to five years. That's where I think about what another person is thinking, including characters from a book. And you have second order, that develops around the age of six to eight. That's where I think about what another person is thinking about a different person, as well as, now they can develop more advanced emotional concepts. Like proud, jealous, worried, they also start to learn that

you can feel one way at first, and that emotion can change. Keep that in mind as we talk about emotional regulation.

This second order is also where they start to be able to lie, or detect a lie in someone else. I love to tell the story about a little first grade friend that I have. We had a fire alarm go off and our dismissal is at 2:45. So, at 2:20, the fire alarm went off, which, if you're in a school you would never, ever, ever have a fire drill at 2:20. So, everybody filed outside, fire trucks came, everybody was looking around. What's going on? About that time I see my little friend come running out, "I did it, I pulled the fire alarm! I was just curious." So, he is an example of, he didn't have second order Theory of Mind because he could not lie. And so that's actually a question I always ask in my evaluation, whether or not the student tells lies because it reveals a lot about Theory of Mind.

And then we have third order. And this is where they begin to understand figurative language, okay, where words say one thing but they mean another. It's also where metacognition comes in and they're able to start to monitor their own comprehension in conversation. It's also where they start to understand sarcasm, okay, and again, as it relates to emotional regulation, this is where they start to be able to hide emotion. In other words, I'm not gonna cry even though you said something I don't like, or I'm not going to hit you even though you made me mad. So again, this leads us to talk about emotional regulation. So, emotional regulation is the ability to move appropriately across various emotional states, and self regulation is what provides us the capacity to do that. So, emotional regulation supports positive interaction with peers because to have a friend, a friend has to see you as stable. And when you are emotionally stable, friends want to spend time with you, which builds your opportunities for social interactions. Now, I have a little buddy that I work with, who is a constant roller coaster of emotion. Just as an example, once within a 10 minute span of time, he went in full on flight, ran out of the room, ran out of the building, and we saw aggression, anger,

regret, emotional, like real significant emotional lability, tears, crying, and then back immediately to happy compliance. Within 10 minutes, all of that happened. Now, think about that for a minute. How I'm ready to learn, follow directions, do multiplication, and read stories about Abraham Lincoln, would you be if you were feeling aggressive, angry, tearful, or even that same roller coaster within 10 minutes, probably not very likely at all.

But going back to the digital piece, digital interactions don't teach kids how to self regulate. They don't teach them how to calm, they don't teach them how to persevere, or pay attention to things that aren't full of bells and whistles. And actually, I'm gonna mention the Developmental Peds Conference again because I had several pediatricians tell me, who were not in agreement, that what they're now seeing at well baby appointments, is that when children are getting their shots it is not at all uncommon that after the shot, instead of the parent holding, and calming, and singing, or talking, or soothing the child, they're giving them the phone instead. So, self regulation and the ability to learn how to calm, it's not learned through distraction, it's learned through interaction, through that modeling. Screen time is also predictable and within their control at a time when kids need to be learning how to be, deal with situations that are out of control, because trust me, in K-4 and K-5, it is no longer their world, it is Miss. Patterson's world and they have to figure out how to live in it.

About the age of two, most toddlers have learned some self regulation skills, such as being able to wait a short period of time for something they want, paying attention when someone is talking to them, or even persevering through something that is new and challenging, but not if they spent their childhood just swiping right when things get too hard. Now, I shouldn't have to mention the negative impact on emotional regulation as it relates to sleep. When kids stay up for hours and hours, unregulated the amount of time they're in front of the screen. Because when we don't have adequate sleep, we are all a little less in control of ourselves and our emotions, right? Now, what is one of

the primary emotions our little friends feel? Anxiety, now why is that? We'll pull this all together. When you have deficits in Theory of Mind, you can't think about your future self, and that's what anxiety is. What might happen in the future. Depression is the opposite. Depression is worrying about what's already happened, or already happened in the past. So, the opposite of anxiety isn't, I'll say it again. The opposite of anxiety is not calm, it's trust. And often we just tell kids calm down, but never in the history of the world, has anyone just automatically been like, oh, you say, calm down, okay, we're good. All right, I'm good, okay, moving on. No, instead, what we need to do to reduce anxiety is build trust in the people, the environment, and the routines around them, and take them through baby steps in order to build that trust. And how do we build trust? Through communication and experiences with people, which leads us to talk about my bread and butter, the speech and language piece.

So, the Hart and Risley study was the one that led to the description of the 30 Million Word Gap for children of low socio economic status, but we're seeing similar results now, but it's not due to socio economic status, it's coming from being part of a low level language environment. And conversations between children and parents are the most influential contributors to vocabulary before school entry. And this has a profound implication long term because the amount of talk that kids hear through the age of three predicts their language skills and school test scores, at the age of nine and 10. Children also don't learn words by having each one explicitly taught, they learn them indirectly through daily conversation, by being read to, or by reading on their own once they get a little further down, it's a really big deal further down in upper elementary. So, there's a negative impact when these activities don't take place at critical stages of development. Now, remember, we're born wired to learn from interacting with people through that beautiful dance of facial expressions, and tone of voice, and body language, and lots, and lots, and lots, of words, and the impact of length, a language rich environment, or not, has been well documented. So, when kids haven't engaged in conversation, is often the result is, they don't alert to when they hear words they don't

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know or aren't familiar with, and they aren't listening as carefully when they are read to, and later on they aren't even good readers on their own. They also struggle with complex grammar and sentence structure, like we read in books. So, it's important to consider exposure to interactions with actual humans during your assessments.

So, a few of my favorite questions that I like to ask in assessment is, are these. One, is the child breaking social rules or expectations they don't like, don't agree with, or can't stop themselves from breaking, or are they breaking social rules and expectations they don't know? And this is a big one because most of our buddies on the spectrum tend to be ardent rule followers, meaning once they learn the social rule, not only would they not commit that same mistake again, but they'll police everyone else and report anyone who does break that rule. So, if they continue to break the rule or expectation, it's not likely due to a lack of knowledge, but something else. The second question I like to ask is, what is the pervasiveness of the difficulties? Are the behaviors specific to certain topics, certain subjects, certain times of day, certain settings, certain people, certain locations? Because social communication difficulties are not limited to school, or to the art room, or the gym, or discussions on math as opposed to social studies, social communication deficits are because there's a lack of knowledge, social knowledge, no matter the context, place, or topic.

The third question I like to ask is, once they break a social rule or expectation, or what, excuse me, when they learn a social rule or expectation, do they continue to break it? Again, if so, why? Fourth question is, what opportunities has the child to be exposed to or learn these social rules or expectations? And the fifth one being, are the behaviors we're seeing cruel in nature? Because people on the spectrum are not cruel and there's no intent to harm behind their behaviors. Actually people on the spectrum are capable of great depths of empathy, they just struggle with perspective taking because of the deficits in Theory of Mind, as well as the nonverbal skills necessary to recognize when someone is struggling. In addition to the verbal skills of knowing how to respond.

So, I want you to consider this, again, talking about behaviors that are cruel in nature, empathy, prevents you from hurting another person. So, therefore an absence of empathy makes hurting another person possible. Now, empathy is feeling with people. Empathy drives a connection with people. A lack of connection in empathy impacts trust. There's that word again. And we often think of growing into adulthood, as becoming independent and autonomous, but in fact, it's more related to become someone that other people can depend on, such as trusting that you're gonna show up to your job and do the job you're being paid to in an efficient and effective manner. The way to develop that dependability is to develop trust. The way we develop trust is in spending small moments with other people, talking to them, sharing stories, demonstrating care for them.

And here's an interesting fact about empathy to keep in mind. A magical tool was developed in the year 1440. And it was the impetus for a major shift in violence, at that time, because it increased our empathy for other people, our ability to feel with other people. It was Gutenberg's Printing Press. That was invented in 1440. And so with the mass production of books came widespread literacy and the ability to inhabit the mind of people, unlike ourselves. And while this may sound trite, it was actually a seismic innovation for people in the pre-industrial age who didn't see, didn't hear, or didn't interact with people outside of their own village. And reading can be a simulation of various social experiences, you might otherwise never be exposed to. And the same social cognitive processes we employed here in real world social comprehension are found similarly in reading. Repeated simulation of this kind leads to a honing of these social empathic processes, which in turn can be applied to other contexts, outside of reading. In addition, readers of fiction learn social information from books by acquiring knowledge about human psychology. And interestingly, readers of fiction tend to have better abilities of empathy and Theory of Mind, but that's not what most of our buddies on the spectrum like to read, is it?

Now, I dare say, empathy was not demonstrated, and here's an example, September 2019 in New York, where there was a 16 year old boy who was stabbed and 50 to 70 other teenagers filmed him dying instead of helping and comforting him. They were more concerned with being the first to post it and document. And I don't think there's a better example of the impact on technology and empathy than that. Now, we spoke earlier about reading comprehension and what that means, so we're led to believe that technology is necessary for learning, but somehow we've survived a millennia without it. The Pyramids of Giza were built, we have maps of the galaxy, modern day airplanes, we sent a man to the moon, all without the help of smart gadgets. Yes, these things make our tasks easier and faster, we have to first teach kids the basic underlying principles. Am I saying Chromebooks are bad? No, I am saying we must teach the basic skills to mastery first.

Now, many of us read digitally all the time if you have a Kindle. But remember, we're reading as mature proficient readers, not novice readers. Also mature readers have developed deep comprehension strategies and they, even myself included, I learned to, when I go, oh, wait, I just skimmed that, I need to go back. I think there's something important there. But novice readers haven't developed these skills at all. And consider the purpose of reading in school, compared to reading for pleasure on your Kindle, you're not browsing a social studies book, you're actually trying to gain knowledge from the text, and we do physical things to the book. We highlight, we flag, we make notes in the margins, we dog-ear certain pages to bring our attention to certain facts, but for children in third grade and up, the research is showing us that there's a negative impact on sequencing details, taking the time to understand plot, and even making inferences.

So, as we start to wrap up, we're gonna talk about red flags. So, there's a reason to be concerned when children are not able to balance screen time with time spent with

actual human interactions. There's a reason to be concerned when they demonstrate extreme irritability or aggression when the screens are removed. There's also a reason to be concerned when they view the world through the lens of a specific game, or app, or video, or they tend to rush through things, any required task, in order to return to a digital world, or when they need technology to calm down. Yet, how many times are we giving iPad time as a reward or is it a distraction? There's also a concern when they're consistently requesting technology over other free time and play activities. So, again, when this occurs, there's a need to reset this hyper aroused nervous system, and they need a four to six week time spent without any screens. Now, when I talk to parents, I tell them, that with the exception of books, which are free from the library, they have everything they need to raise a happy, healthy child. So, reading to your child, getting outside, playing, those all cost nothing, they're technology free, and fun, and easy, and that is what a digital diet is.

So, let's talk about that. A digital diet is meant simply to imply that what we put in our brain contributes to healthy brain development, and what it needs to develop appropriate skills. And make no mistake, most of what is on screens is nothing more than mental junk food. So, I like to ask parents if they would give their two year old a steady diet of Oreos and Cheetos? Of course not. Yet, when children stay engaged for long periods of time each day on passive digital activities, that's the equivalent of mental junk food, which also is bad for their development. So, to start, we need parents to truly understand why this is important. And we've discussed that at length already. Your handout, again, is a parent friendly version of all of this. But we also need to talk to parents about the important concepts, such as technology is and should be a tool, not a toy, and screens are not meant to be free babysitting. It's not free, actually, at all, the payment is just waiting around the corner. 'Cause we're gonna pay for it in the impact to their brain development, their social development, and their academic readiness. We also need to talk about what. What is the expectation? And that is where we need to go back to the AAP guidelines. We also need to talk about creating

tech free times and locations. My favorites are in the car, at the dinner table, before bed. Those are some of those sacred times because those are two of the best times to engage in conversation, and before bed because of the impact on sleep.

I also like to recommend that they use apps that monitor or restrict the amount of screen time. There's apps like Forest, and Moment, and Freedom, there's a bunch of 'em out there. I also recommend, go in and change the phone settings to grayscale, not color, grayscale. And then the whole second page of the handout is all replacement activities, which is also known as the things we used to do before we had technology. Read books, have a game night, have playdates, even with your, just your parents. Again, going back to our COVID-19 times. And in these playdates, work on compromise, complementing, and basic social manners. Also, portraying and practice delayed gratification, be able to delay gratification is a huge, huge help for them. And we are seeing this again, and again, and again, where children have difficulty with that. So, teach them to do monotonous mundane chores, like fold the laundry, clean their room, hang up clothes, set the table, unpack groceries, empty the dishwasher, put toys in the box, make their bed, all of those things, and get them engaged in activities. Golf, especially adaptive golf, is one of my personal favorites, not because I'm good at it, but because there's so much that's around, the rules, and the social politeness that you have to have.

The next one is talk more, tell your stories. Stories are how we connect and make connections with other people. I like to recommend to parents, that they get a sticky note, and on that sticky note in the car, at the dinner table, right these two words, I remember. So they remember to go back and say, I remember when this happened to me. Now, the next slide is a list of the many references that I used in their teeny tiny print 'cause there's a bunch of them, but if I had to recommend one, I would recommend Dr. Mary Ellen Wolfe's book, "Reader, Come Home," especially if you're

interested in the literacy connection. And we're at the end, and I did include my email at the very end, it is WordNerdSpeech@gmail.com.

So, I am at the point where we are ready to take some questions. So, oh, so I see a question about, including the use of large screen TV?

The whole thing you have to really consider when you're talking about screen time, is it needs to be engaged and interactive. So for example, when, let's give the example of a preschool special ed classroom, and they're using the promethium board to show a video. Let's say, it's about letters and sounds, or numbers, or colors. If they are not interacting with the kids while they're watching it, or then transferring that and generalizing what they just saw in the video to an actual application of that knowledge, that's a problem. It needs to be interactive and engaged. All right, I'm looking for another question. Okay. Online human interaction through live video conferencing. Yes, with kids, so, that's where you're able to FaceTime, or Zoom, or Skype. Yes, you should completely engage in doing that, talk to grandparents from all around the world. Again, that's engaged and that's interactive. So, that's a good thing. And I am not aware of a limit on how much they should be able to interact online that way.

The next question is about Theory of Mind, if I would review the different orders, which I'm happy to.

So, pre-first order starts very, very young. And Theory of Mind is a big one. When you do a lot of the research, especially, on autism, Theory of Mind is a big one. So, pre-first order is around age three to eight, pre-first order develops around the age of three, that's thinking about myself, how I feel, that's where I do therapy that focuses on identifying the emotion in themselves. Happy, mad, sad, thirsty, hungry, dirty, sleepy. First order should be around four to five years, that's where I started thinking about what another person is thinking, that also includes your characters from a book.

Second order is around age six to eight, what I think another person is thinking about a different person. That's where you get into those more advanced emotional concepts. That's where emotion can start to change. That's where lying becomes possible. My story about the fire alarm. Third order is age eight to 10, and this is where they understand figurative language and they start to be able to monitor, self monitor themselves, and hide emotions. I'm not gonna hit you even though you made me really mad.

So, here's another question. Are highly interactive apps part of screen time limits? Is this more of a judgment call?

I think that's a great question, especially from an OT perspective. So, the example given here is drawing apps. I would say, you have to, sort of, consider when they're drawing, are they drawing just with the pointer finger or is it better for them to be drawing on paper using a tripod grasp or something else. Again, my thinking is you want to start as you need to go on. So, and that's where I'd go with that.

Is it okay to let a 21 month old earn four to five minutes screening for using the potty?

My opinion is that there are other things you can use as a reward for going potty. My personal children earned a Skittle, or something like that. I would not recommend it. I'm just a little hesitant on that. How much time is recommended to play outside to balance the screen time? I would say you need more time and it doesn't even have to be outside, inside, outside, upside down, I'm okay with. When it comes to the recommended amount of time, I would stick to what's recommended by the American Academy of Pediatrics, anything after that is fair game.

What about shows like Sesame Street, which my child is watching.

Oh my gosh, I love Sesame Street. Sesame Street has some amazing things, especially for self regulation with Cookie Monster, right now. And I get the work from home, like I said, it is not lost on me at all that we are in crisis teaching mode right now. So, Sesame Street, I think is wonderful. Again, I would keep that balance. Is it appropriate for a child to be watching Sesame Street for three or four hours a day, probably not. But, and again too, generalize what they're learning from that. So, if the number of the day is three, incorporate it into an activity where you, they have to count three in order to get three goldfish crackers, and then you don't give 'em more, you only give 'em more when they count three more.

Do I consider video games or apps which require some form of participation, interactive?

No, so, I'll give you an a good example of that. So, what is the World of Warcraft. I can't think of the name of it. That's certainly interactive, but it's certainly not something that is helping to foster social engagement, even if they're on the headphones with another child, that's not something that is fostering good social communication. Any resources or activities to develop Theory of Mind? That is probably a longer discussion than we can get into and we're already five minutes over. I tell you what, if you email me, I'll give you some more information on that.

In your research, have you seen specific video games or applications being associated with specific characteristics?

No, I haven't seen specific ones, as it relates to ADHD and sensory seeking behavior. It's really more related to what happens when they're using video games and certain applications, what is the change in the brain, which is what we just talked about. But that's a great question.

Opinion on computer education programs for screen time, like Jumpstart's math, reading, and life skills, would this be more of the?

Yes, that's more of the interactive screen time, that is, again, leading to generalization of that critical knowledge that we need.

How did you address this with your student whose grandmother didn't know what else and how else to entertain the child?

Oh, that was a hard one. And I tell you what it took, and this is what I have found in years and years of being in a school setting. The first thing I have to do to make a change like that, is I have to develop trust with that parent or grandparent. So, what it took was showing what we're working on, talking about what we're working on, showing her the difference that it made, showing what difference it made when she came back to school after a long break, and then she fully realized, ohh. I had another similar situation where I said, just work with me on this. Okay, just take the screen time away for just a week or two weeks. Get, you know, I'll reward him at the school, you know, we'll keep a calendar. Every day that he hasn't had it he can bring the calendar back, every day he hasn't had technology, I'll give him a reward. And what the parent then saw was a change in behavior, a change in attitude, a change in language, a change in their progress towards their speech, a change and progress towards their reading development.

Any particular studies? That's one you have to email me for. And I'm gettin' the nod that it's time to write up, wrap up, and I think we are going to have to finish there. But thank you so much. I was so happy to share this with you. And feel free to email me anytime. Thank you so much.

- [Fawn] Thank you so much, Angie, for a great talk today, and thanks for the audience having such great questions. I hope everyone has a great rest of the day. You join us again on Continued and OccupationalTherapy.com. Thanks, everyone.