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Relationships between Language and Executive  
Functions: Planning and Regulating  
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- [Host] Once again, welcome to our webinar today. Part two in a two part series. Today's event is Relationships between Language and Executive Functions: Planning and Regulating. Our presenter today is Jill Fahy and she is an associate professor in the department of communication disorders and sciences at Eastern Illinois University where she teaches graduate courses in acquired language disorders, cognitive communication and executive function disorders, diagnostic principles and also an undergraduate course in neurology. Ms. Fahy's clinical work focuses on the assessment and treatment of developmental and acquired executive dysfunction in school-age children and young adults seeking diagnostic insight and recommendations for home, academic, social and vocational needs. Ms. Fahy is a nationally known speaker on the evaluation and treatment of executive dysfunction and the role of language in executive functions and she's the author of numerous books, articles and materials on this topic. So Jill, we're very pleased to have you back here for part two. I'm going to turn over the floor to you.

- [Jill] Okay, thank you so much and thank you for giving me the opportunity to talk on this conversational topic of executive functions and what kind of relationships there may be between those particular skills and language. Both of which are really complex constructs and so it's somewhat difficult to nail down that relationship in one answer. Our goal for today though, is to identify the kinds of features of executive function deficits that we might see in children who have language impairment. And then also to be able to describe the role of language as a tool for reasoning, planning and predicting so that you can engage language, actually deploy language as a tool when we use that in situations that require both our executive functions and our language. And then I want to try to discuss some therapeutic methods that can be used for language and also EFs. But we want to try to elicit complex syntax that will promote the development of strategic planning hypotheses for problem solving that can be strategic and not trial and error. And also how to use language for self-regulation. So

briefly I want to just to establish a foundation of what are those executive functions. And as I said just a second ago, there are multiple components to the world of executive functions. This makes it somewhat messy trying to even do research to figure out how or if EFs impact language or vice versa. Because there are so many of these discreet, separate, cognitive and executive skills. At a foundational level, we can see what we really need to pay attention to are attentional abilities. And attention is a complex system. It develops over a number of years. They're are sustained. Can you direct your attention over a period of time?

Can you selectively attend? Can you, for example, sustain attention over a period of time, while also tuning out distraction or other competing stimuli? Then you need to be able to develop the ability to deliberately shift your attention between tasks that require your effort. And finally, you need to be able to engage divided attention that is deliberately focused, willfully and cognitively sustained over whatever period of time is necessary. So attention in and of itself, can truly undermine how well we might be able to use language or how well we might be able to use other EF skills. In addition to attention and separate from that, is working memory. And so working memory is that ability to hold information, both verbal information and nonverbal information in a very brief temporary short-term memory capacity. You're only holding so much in working memory long enough to process it, attach meaning and comprehend it.

Or you hold information in working memory long enough to manipulate those details in some fashion, manipulate an idea, transfer that knowledge to a written note or some other form of output or you retain something in working memory long enough to go execute that task. So working memory is one of the EFs. In addition, the ability to inhibit. Inhibitory control is its own separate different EF skill. Can you delay a response? Can you suppress a response? Can you inhibit and resist yourself from being distracted? Can you resist competing or stimuli that are vying for your attention? Can you inhibit verbal responses, motoric responses? Can you inhibit general broad

behaviors in order to give you an opportunity to begin to consider a strategic response or more contextually appropriate response? In addition, there is the ability to either determine a strategic goal or to recognize some kind of implied expectation in the environment. So what is it that this social environment needs me to be able to do right now? What is it the teacher is expecting me to do? How am I expected to perform in this situation or internally to have that dialogue and decide how shall I proceed? So developing some kind of focus for behavior. In addition, there is fluency. Basically simply means, can I generate ideas? Can I generate words to build those ideas from? Could I generate different ways to use materials? Could I generate a wealth of options for how to get myself out of this problem? If I only had three things and I was stuck in the woods, can I figure out how to hunt or find food or do something? I know that's an extreme example, but fluency of ideas literally is your brain's ability to generate opportunity and option and idea and alternative options.

I mean if you keep running into plan C has fallen apart, plan D doesn't work, we are almost out of options and yet somehow still I have to generate an opportunity. Strategic planning. Planning is its own EF skill and it develops over time from random trial and error to the point where it becomes more strategic and more predicted. That is in terms of predicting the outcome of a plan and eventually what we want out of a fully mature planning ability is to anticipate outcomes, be able to articulate whether or not my approach is strategic, will result in my initial goal or not. I need to be strategic and organized so that I can hypothesize, predict, determine and then prioritize. I'm gonna do this first and then that and I have a reasonable ability to say the outcome will be this. Strategic planning is what pulls us out of random guessing and trial and error. In addition, there is the need to be able to initiate and then maintain initiation over time or persist. So I might have a reasonable attention and working memory. I may have a goal in mind and I may even have some ideas and a somewhat strategic plan, but if I cannot motorically initiate and overcome a variable such as fatigue or anxiety or the feelings of being overwhelmed with the largeness of a project, overwhelmed with all of the moving

parts, if I'm unable to initiate, then the rest of it will collapse. And then also we have to be able to shift and adapt. So flexibility, cognitive flexibility. Can I adapt a different way of using materials? Can I generate an alternative approach if the first one fails? Can I stop doing something when I recognize that it's not being useful and adapt accordingly? Or can I adapt when the environment or the expectations change? And then overarching is the ability to have accurate self-awareness, self-appraisal and self-monitoring. So can I maintain attention to what I am doing over time in order to monitor the quality of my efforts or monitor the quality of my plans?

Do I have accurate appraisal and awareness? And these two become problematic often in people who have social cognitive deficits. May continue to have inaccurate self-awareness and self-appraisal. So each of these, all of these different components are defined and identified and described differently and have their own sets of assessment tools. And it would be difficult to say I'll evaluate EFs as a cluster. You can do that and observe where and how things fall apart. But you can also parse each of these out as separate but very related constructs. So how do we use our EF skills and why do they matter? In the end if we are able to develop all of those separate components, if they can all come online as they do in different times and continue to mature, given environmental opportunities to practice given relatively all other developmental variables intact, then the end goal is that we should be able to self-regulate and self-monitor and not be in need of somebody else standing over us saying, don't forget to.

Make sure you. No, not that. They mean this, not that. Did you find this? Did you check this? Don't forget. So the end goal is to be very deliberate and relevant and planful, so that we control our own responses and our emotions. We can control and regulate actions. We need to be able to deliberately adapt and shift because things rarely always go as planned. So we have to overcome rigidity and avoid being stuck in a perseverative, unuseful behavior. EF skills truly come online when we're faced with

something that's either highly complex and out of our ordinary or for a task that is highly novel and unusual, something that we may not have encountered before, something that we don't necessarily have a plan for. We also need to use EF skills to be contextually aware and timely. So can I read the room? Can I recognize this situation? Can I take whatever plan I may have had in mind and realize that, that is not going to be contextually appropriate or timely at this matter? So I have to be able to adapt and notice and monitor my efforts for whether I'm being relevant and accurate. Monitor the quality of my homework or the work that I do at a job so that I'm not unintentionally inaccurate or incomplete or dangerous even. I need to be able to apply EFs to estimate how much time something will truly take and monitor the passage of time so that I can break large things down into manageable components and avoid feeling overwhelmed or anxious. And so essentially how well your executive function system develops, provides you with the opportunity to set realistic goals for yourself in life, whatever they may be, and then to hopefully be able to achieve those goals with minimal unintended problems that we may have inadvertently created for ourselves.

We need to be able to manage conflict, frustration, regulate social behaviors. We need our executive functions to apply within academic demands and vocational needs. Be able to persist despite whatever levels of intrusion there may be or unexpected changes. Executive functions are not the same as our IQ. And I see a lot of actually a high IQ people, students, clients, referrals for assessment who may not have well developed executive functions and this can be a confusing, frustrating situation. So they're not necessarily at all tied to one's IQ. And we are talking about a 20 to 25 year developmental time span. And each of these distinct EFs which can be modeled and identified and measured and evaluated, they each emerge on their own and yet they overlap and they're integrated. And we move through, if we think about the first five years, mostly the goal for development of these skills is focused on developing sustained attention and simple inhibitory control. If we can get those things on board, the ability to shift between simple things that we're observing, focus attention with our

caregiver or play mate or with objects, but strategic planning is fairly minimal. If we move into early childhood, the goal here, if typical development is taking place, we begin to see a shift to internal monitoring where I begin to regulate my behavior somewhat and yet I still need a significant amount of environmental support and structure and we can begin to see changes in attention and planning becomes more strategic. In the adolescent years, there's a continued internalization of self-appraisal, self-monitoring. It's not fully mature yet, but if we were to evaluate inhibition for example, and shifting purely on just some lab-based tasks of executive functions, adolescents can often perform very much like adults in a controlled test environment, but they don't yet demonstrate the consistency of being able to apply these skills in the real world.

They don't yet have enough refined neural networks and the ability to practice. And in the later teen years, we are really becoming more dependent upon needing to have well developed abstract language and social acuity and reasoning. We bring to bear all of those skills, our language tools and our social tools. We employ those through our executive function system and actually vice versa. So, many different things can interfere with those developmental variables and the list is almost endless. Not only are there developmental risks, but I should mention obviously, acquired trauma can interfere with all of these particular structures coming online. But comorbid health disorders, acquired and progressive genetic syndromes, developmental trauma, we are starting to see a lot of referrals in our clinic for children who are being diagnosed with developmental trauma, birth related trauma, language and learning disorders, social communication disorders.

So more specifically we see so many clients here in this particular clinic who are coming in with an array of different diagnoses. They may have some primary disorders of autism or social pragmatic communication disorder or language impairment. They often present with additional learning disabilities dyslexia, dyscalculia, agraphia, ADHD,

anxiety, depression, OCD, TBI. So, there are many different things and each one of those diagnoses comes with its own package of some kind of executive function problem in addition to that diagnosis. So when people come here and when I say here at this university where I happen to teach we have a clinic and we see people from all over this state and the region and sometimes from multiple states away. And so often people will have that initial question, does my child have a problem within his or her executive functions? Just the answer is yes, I can read your chart and know. The more complicated question is are we looking at a relationship between language or is it a social pragmatic problem. What should we do in therapy? I mean, that's basically the question. What are we gonna do about this? That's also a messy answer. So I will try to move through some of these relationships. What I really want to say is there is no one answer, there is no one answer yet that will explain what exactly is the relationship between executive functions and language. What I can tell you is that we use some of our language tools when we employ executive functions to solve problems.

We also use some of our executive functions, they are employed when we begin to either process, interpret and comprehend language. And we use our executive functions when we begin to organize and formulate and express language, both oral and written. So there's a bi-directional relationship between these two areas. But the question that I've been asked is, is just one cause a better or worse outcome in the other. At the present moment the best answer is that there's a parallel concurrent relationship between the development of executive functions and language. It does not appear at this point in time that deficits in executive functions cause language impairment, nor do deficits in language cause executive dysfunction. And I'll talk more about that in just a little bit. There's also a bi-directional relationship between social competence and executive functions. So we need accurate ability to interpret social situations so that our executive functions could adapt or shift behavior. We need accurate social reads on what people think or feel or want or expect of us, so that we can use our EFs to generate a strategic and relevant response or inhibit a response



because now might not be the right time. And we also need our executive functions to backtrack and regulate how we respond. Executive functions are clearly used in tasks such as listening, speaking, reading, and writing. And so how, well from a language perspective, how well are we able to comprehend what somebody is saying? Certainly depends upon a certain amount of attentional control and the ability to retain information in working memory. Can we inhibit distractions and selectively attend to the information we need? Can we inhibit or shift away from our initial understanding and update or produce a different understanding of what we just read if we have new information or conflicting information.

We need and use our executive functions to help us formulate a thought, a statement to produce some sort of oral expression that is planful and relevant to the situation. We also seem to be using inhibitory control to help with strategic planning in syntax, for example. Clearly there are also many ways that executive functions are brought to bear for reading comprehension and written expression. Again, being able to demonstrate attention to task persistence with the task, update information as we read new parts of the text, shift to understanding an alternative meaning or using context to derive a different meaning requires the ability to shift. And then of course to generate written language requires any number of our EF skills.

So what about? Different studies have looked and seem to have some agreement that inhibition, working memory or updating information in our working memory and attentional systems, these three areas, there seems to be a wealth of information that would agree, we use inhibition as we are planning syntactic output. We use inhibition as we are attempting to comprehend, especially, when there might be an ambiguous meaning or conflicting meaning, so we have to inhibit. Updating information in working memory is also a critical component of language processing if we're going to understand semantic information generate semantic understanding for auditory and reading comprehension tasks and also updating working memory for syntax. These are

all found to be heavily related and correlated to inhibition, working memory and attention. So what about, Then this particular study, there are many studies, this particular one was attempting to ask a longitudinal question. Are there relationships that might emerge and change between language skills and executive function skills? And so, 240 children in this particular study. And they brought in kids that they felt were at risk for reading disabilities. They either had a family history of dyslexia or their early childhood teachers were identifying them as being at risk in some fashion for their language.

And so they saw these children over a period of three years and at these three intervals repeated these language measures. So did a lot of intensive look at vocabulary, sentence structure, comprehension and use. And then spent a lot of time doing an extensive executive function battery. And I want to point out not just looking at verbal executive functions, but paying attention to nonverbal. So it would make a lot of sense, it's not that far out of reach to think that verbal working memory is related to language or verbal inhibition. But what they found is that there's a lot of relationship between not only verbal executive functions but also nonverbal. And the other main conclusion is that over these three years, the two seems to develop concurrently. And this was for kids who, and I wanted to also say of all those 240 children, about a third of them were typical language development, a third of them were at risk for dyslexia, and a third had concerns for language. So in all three groups they found stability between the relationships.

Couldn't find any way to say that language deficits cause executive function problems and couldn't find any way to say that executive function problems cause language. But they did see that perhaps processing speed might be an overlapping feature. What about children ages eight to 11 looking at that? This particular group looked at kids who had typical language and again, they spend a lot of time doing extensive language measures to really dig into all the different components there and looking at nonverbal

executive function measures to dig into those components there. And they found significant relationships between nonverbal inhibition, was able to predict how well children did on syntax recognition, some relationships between nonverbal working memory and some receptive language tasks. And so trying to understand maybe children with typical language are really relying not just on their verbal inhibitory skills or verbal attention or verbal working memory, but really nonverbal. What's kind of emerging is this idea that language and executive functions are intrinsically related with a back and forth use and application between language skills and executive function skills. I know the therapist in me is crazy about this because what I really want to know at the end of the day is what do I do in therapy? And I guess just to jump ahead, you can look through all these studies and I think what we're coming up with in terms of an answer is that we have to do a little bit of both. It's a mistake to think that I could go in and do EF therapy and somehow cause change in language if I only did EF therapy. And it's also a mistake to think if I only do language therapy, I can somehow cause change in EFs.

You need to do both and I wanna talk about that, in the rest of this conversation today. Adolescents, relationships between language and EF in adolescents. There are fewer studies that look at that and many of them are using parent or teacher or self-reported ratings and looking at kids who have specific language impairment and they're presenting in their adolescent years as having less well developed executive function skills. And of course there's academic demands increase and kids are expected to have adolescent language and have very advanced higher level language to reason, to abstract ideas, to deduce things, or differentiate. They're beginning to show up and have gaps in their ability to perform at the expected level. Honestly, most of the referrals that I tend to get are maybe early childhood where parents are clearly noticing a problem, but teachers have not necessarily felt that it was a significant concern yet because there's so much structure still in the younger school years. By the time kids hit junior high and high school, things sometimes have gone off the rails for both

language, real subtle problems in language, but they begin to become more apparent and especially as classrooms expect more of you and there are less supports and structures. Kids who have specific language impairment. So how might we try to summarize this? If we know that there are bi-directional relationships between language and EFs, if people in research seem to agree that we employ some EFs in language and as I'll talk about in a little bit, we employ some features of language for certain EFs. This is all fine and well and good. Kids who have a language disability then are now presenting with a double whammy. They have a language impairment, and they also have deficits in their executive functions.

So they are faced with a double set of challenging circumstances. Not necessarily able to use language as a tool to predict or reason or anticipate or plan and not necessarily able to use their executive function skills to inhibit or control behavior, to update information in working memory, to shift between tasks and in both cases are demonstrating deficits in processing speed. And this is just a small sampling of the different studies. There are hundreds of them at this point emerging. But kids who have a language impairment are also performing less well and in cases having deficits in executive functions and attention, verbal and nonverbal, not just verbal attention, but across the entire domain. Attention, working memory, fluency of ideas, planning, inhibitory control, shifting and updating of information and cognitive flexibility.

So think about if I can't generate syntax to explain myself and I can't inhibit my initial response and I can't organize the words and marshal them into some kind of statement, I am going to be, I see kids who are frustrated, who act out with behaviors as opposed to being able to use words, who can't use language or semantics to explain, predict, reason, organize themselves. And it isn't just that adolescents are being observed with more EF deficits than typical. There are also studies that are looking at preschoolers. As early as in preschool, kids with a language impairment can be observed to have more difficulty with their executive functions. There are even a

couple of studies that kind of stumbled into this other group called low-level language kids where in these cases the researchers were originally trying to figure out and recruit kids with a language impairment and then evaluate their executive functions and then try to describe what the problem was. And they ended up with kids who were referred by teachers for communication problems, but they didn't exactly meet criteria for being diagnosed with a language disorder. But their language was clearly not the same as kids who had typical language. And it turns out that even those kids sort of on the border at risk for maybe having a language disorder at some point, but not yet diagnosable they also have executive function profiles similar to kids who are actually diagnosed with a language problem. How do we use language when we internalize it? What is the point of inner speech and what can it do for us? At one level, language needs to give us the ability to be planful and deliberate. Vygotski has a model that I think works very well and talks about the development of inner speech, that is, moves from being a description of a problem at earlier ages, where we're simply requesting some kind of external help or making a comment about the existence of a problem.

We then move into reflective language, which also corresponds to early planning and strategic development. At this point though, kids are doing a lot of trial and error planning and trial and error commentary. I'm getting it. I'm moving over there. Describing their efforts but nothing yet in their language's prescriptive. And finally we get to a verbal planning stage where I'm going to use my language to self-direct, to talk about an outcome, to talk about how one action will result in this outcome and allow me to be more in control and to allow me to use self-talk for self-help and self-control. None of the kids who are in our clinic at this age are able to use language in this fashion at all. They're not yet able to have the syntax or the semantics to do that. But the way we use language so it should be planful so that we can have the ability to self-direct. We also want language to get to a point where it is internalized. It doesn't start out that way, it starts out as a very audible overt description of the problem and statement of our efforts. At some point it becomes subvocal as we begin to internalize

and have an inner dialogue per se. And finally we move to the point where we are using planful language in a strategic manner to direct our efforts with some kind of reasonably predictable outcome. Certainly shouldn't be trial and error and we're able to use this in an internal inaudible manner. Something else we want to be able to use language for not just to be planful and not only to be in internalized modality of self-regulating, we also need to use language in a causative manner, in a way to understand and then reflect cause and effect.

And this is a really fascinating study. Children of these ages, four-year-olds, five to seven-year-olds, eight-year-olds, a range of children, but their language clustered in these particular categories. So the younger children, the evolving ability to use language to describe. And finally by age eight, using language to infer the mechanism of what they were observing. In this task there were three tubes of water fixated in a wooden base. And what you can't see is that underneath the base two of these tubes are connected so that if you dropped a pebble into one tube of water, it would cause a pellet, actually this task has been used with crows as well and they can also do this. But if you dropped a rock into this tube and hidden beneath the base is a curved connector, it causes a displacement of the water in the middle tube and the food pellet floats to the top.

On the other hand, if you dropped a pellet into the other, the third tube, it is not connected underneath. And so you drop that rock in the tube and it simply sits there, there's no displacement of the food pellet. So this is shown to these children and there are different colored tubes and the four-year-olds just say green and purple. So how do you think it works? They just describe, but there's no association between what happens and the outcome. By the time children are hitting the five-year range, they're describing what is happening. The green tube makes water go down. the purple one, water goes up. By age seven, one tube makes it go higher, but the other doesn't, I don't know why. This one makes the middle tube rise, but this one doesn't do

anything. So more sophisticated, yet still we're just describing, we don't have causation. By age eight, look at this, the purple one has a connecting pipe, pushes it down and makes it rise. Pushes the water down and makes the food pellet rise. The green one has no connecting pipe. You can see there's been a leap of thought, a deduced awareness that explains what is happening. Or the purple works, but not the green. There's water underneath that stops the pebbles and makes water rise in the middle tube. If we don't have language that will allow us syntactically or semantically to give thought to these observations, we're going to be at a disadvantage in terms of ever hoping to be able to use language to plan or predict an outcome. Language to plan or predict an outcome.

So by the time kids hit adolescence and I do a group in the summer and I see clients all year round. I've got adolescents who cannot make predictions. Cannot determine how to approach a novel problem. Cannot use syntax to anticipate. Cannot use semantic features to describe the objects they're working with. And they are quite literally left in a state of trial and error. A 14-year-old kid who works and operates in trial and error and says, there's no way to know what to do to solve this problem. When you combine that with being impulsive, ADHD inattentive hyper motor, oppositional defiance or outburst disorders.

And they don't all have that, but sometimes that comes through. Anxiety, depression, I have kids with tourettes, I have kids with three to four different additional learning disabilities. These are kids who are highly frustrated in life. They're highly frustrated in school and they truly can't use language to help their EF systems, to get a hold of themselves and plan their way through their day. Coming back to this idea, what else do we need to use language for? We definitely use language as a self-talk tool to inhibit and strategically plan. So this is a really interesting study, this one about making kids try to solve plans strategically and one group being allowed to talk their way through it and the other group not being allowed to talk their way through it. So if you override

talking to yourself by making you do something else, strategic planning begins to fall apart. In this group, they asked if three-year-olds, what if we provided self-talk, could we help them inhibit and plan and shift? And in this study, that's exactly what they found. Let's take three-year-olds who can't shift in a card sorting task. They know the rules, but they can't override the rule yet. And that's normal for the three-year-old age range. There's nothing unusual about that. What's unusual is if these researchers took language tools and dropped language into the mix and said, let's label which one we need to do. Is this a red pile or a blue pile? Is this a truck pile or a star pile? Which one are we sorting to? And if the kids were able to label it before they executed it, they were able to override the initial impulse. And that's quite something to be able to use in self-talk for that. But also we use self-talk even for older children to minimize unintentional errors, to override impulsivity. These are in complex scanning tasks and complex mazes.

So if you slow down while you talk to yourself, these kids were able to statistically improve their accuracy on task, their planfulness so they did not commit any errors in these scanning demands where you can't go back over the line again. And the only thing that was different was overtly talking to themselves during the task. And so self-talk while we plan and while we predict. We need to be able to talk about our actions. It is going to fall. It is too far away. I think it will run out. I think this is going to happen. And if we can use self-talk to ask our own questions, how am I doing on this? What am I doing exactly? Or even as we model in therapy, tell me why you're doing it this way. Tell me what will happen when you do it this way. I wonder what will happen next. I wonder why it's going to happen. Let's see what happens. And so I'm talking about doing language therapy with actual tasks, with actual stuff. Not workbooks, not pictures, none of that. I'm talking about using hands-on problem solving tasks where we can physically see the impact of our words by describing what is going to happen, what will happen, why I think that will happen, how to execute and solve this problem so that I can merge the world of language and the world of executive functions. But



self-talk, if we're going to figure out how to even begin to internalize and use self-talk, we need to model some kind of a mantra and try to rehearse the use of this self-talk phrase for this child in a repeated manner, in context, in the situation. Get the child to say it with us. Keep it short and simple. Make it visual, not just verbal. So different self-talk mantras. Do I need some sort of self talk that should help me focus on the environment or notice what I am doing? Or maybe I need some kind of self-talk mantra that will help me inhibit. Wait a minute, what is my plan? Wait, I need to figure out what's working. Wait, do I even have a goal? Maybe I need to have self-talk that will talk me through in a strategic manner or some kind of planful and deliberate approach. So I should of course stop, think, plan, do has been around.

Or goal, plan, predict, do. Find, get, sort, use. Or I need self-talk to help me shift. This is not working, I need a different plan. Or to monitor, I need to check this, I need to fix this. Or to request some kind of help getting started. So I tend to try to look at language and ask myself a few questions. Is there enough language available to be used as self-talk? Yes or no. Is that language complex enough that it could be used for planful predicting? Yes, no. Is this language complex enough for the kids age? Whatever we expect. Is it complex that we can make inferences and deductions and understand cause and effect? Is this language readily accessible enough that it could be brought to bear in the moment to inhibit, to delay, to stall while I plan?

Is this language complex enough that it can be used in these fashions for some kind of tool? The next thing I try to think about for language is to what degree language is available for reasoning. And that is a much more complex level, reasoning is. So I go back to the kids. Most of them who are in this clinic, almost all of them have a language disorder. If you've got a language disorder, I may need to focus intently on shoring up your language skills before I ever really go do executive function therapy. So that's the other question that appears all of the time. Should I do EF therapy or should I do language therapy? Basically I keep coming back to the same general ideas that we

probably need to be doing both. Sometimes the priority for that particular child might be on language. So what if this kid with a specific language impairment doesn't even have enough of a language system to deploy to talk to himself? What if his language can't even be used to determine cause and effect or plan? Maybe I need to pay attention there for a while. Because ultimately where we are going by the time kids are in the teen years, many of them are being dismissed from caseloads in schools and not necessarily because maybe the SLP wants to do that, but often because there may be less time on your caseload or maybe the deficits are so subtle, they don't necessarily appear or they're assumed to have been fully developed already. Complex syntax and abstraction of meaning are really what we need to be seeing in adolescent language. So what's reasoning and why do we even care about reasoning? Well, we care about reasoning because if we can't, if we don't have the ability to reason, then I am not going to be able to use language to generate a relevant strategic plan.

And if I can't bridge that gap between reasoning and hop over here to the world of planning for EFs, I'm gonna be stuck in a world of needing somebody else to tell me what to do, how to do it, what order to do it in, when to do it, and why to do it. So, let's figure out a little bit about reasoning. Essentially, it's the upper end of language processing. If language processings where we begin at the lower level of that hierarchy to just classify and categorize and do a very basic feature analysis. Its use, its color, its physical size, shape, it's associated with, it's used for, it's kept in this area, it belongs in that category. That's all great.

But the teenage brain needs to be able to do that at an abstract level. So feature analysis and feature distinction is part of reasoning. Can I decide what's the relationship, if I said the analogy, let me think of an analogy, refrigerator is to zoo as food is to? What's the relationship? So how can I know the outcome? How can I describe the relationship? That's an element of reasoning and reasoning can't happen unless we have those foundations of basic language processing. If I want to be able to

write a paper that differentiates between the pros and cons of something, I have to be able to compare and contrast those outcomes. If I want to anticipate my actions, think about this, I've got a 13 year old kid with a nonverbal learning disorder, social pragmatic communication disorder, above average verbal IQ, had been in gifted classes for a number of years, is now beginning to fall apart, unable to read environmental cues, unable to organize himself, unable to anticipate expectations, unable to read between the lines. I take this kid outside, I say we have four water balloons and here's a bag of stuff. What I need you to do is figure out how to preserve. You're gonna throw the water balloon against the brick of this building, one at a time. But we only have four water balloons and I need you to figure out how to protect and save at least one of them, using whatever's in this bag of stuff. And inside this bag of stuff I have bubble wrap, kleenex, safety pins, paperclips, scotch tape. This kid with his high IQ, who's been in gifted classes up until now truly does not have a sense of being able to reason or deduce or know what the outcome is going to be.

And so we randomly tape kleenex to the first water balloon and I ask, tell me what do you think is going to happen? And he shrugs his shoulders and he looks at me and he says, there's no way to know. There is no way to know what is going to happen. All right, I write this down on the clipboard, execute, tell me what happens. It burst, I wonder why that happened. I'm not sure. Round two, he tapes paper clips to the balloon. We repeat this process. Round three, he grabs bubble wrap. Not with intent, but random. I randomly grabbed kleenex, I grabbed paperclip, I think I'll grab bubble wrap. And he tapes bubble wrap to only half of the water balloon. Only half. By the time we get to the fourth water balloon. I scaffold enough reasoning and I lead him to the point where I hope that I get him to conclude we need bubble wrap over the entire water balloon. Because by this point he is somewhat dejected and I don't entirely want to let this fall apart. But he's not able to anticipate and predict because he's got difficulty with comparing features. What are the features of water ballooness to kleenexness on a brick wall? What are the features of water ballooness with safety

pininess or paper clipiness? What are the features of bubble wrap and water balloon? And so what are the implications of my efforts? What are the behaviors that are going to come out of those actions and how do I predict that? All right this, this is a 15-year-old. This kid had some febrile seizures in his earlier months, about two months of age and then again at 14 months and he had had some complications at birth, a little bit of hypoxia. he had low average IQ and a peabody in the low average range, but he's 15 and his mom wants him to be able to stay at home for just a couple of hours after school until she gets there from work. Can he just try to solve a few problems? Could he get something for himself to eat? He is entirely prompt dependent for everything from take out the trash, notice things, start your homework and so forth.

So we spent two weeks for this particular task. He was given the task to figure out how to make a pizza. And we provided a can of sauce, some tortias, a bag of cheese and a bag of pepperoni. It took four therapy sessions for him to use verbal fluency to generate ideas. To also form those ideas for what he might do into some kind of stated planned steps. At no point in time when he was theoretically imagining his plan steps and no point in time was he ever able to tell me what the outcome would be. So here's his step. We'll open the can of sauce with the pair of scissors.

So on this particular day, after we have this plan that's taken two weeks to generate, I bring in an undergrad and this person is going to execute so that he can observe and watch exactly what he says. When he gets to the point where he says, open the can of sauce with a pair of scissors, she grabs the scissors, touches them down onto the top of the can and looks at him. And it is only at this moment where he begins to imagine and ponder and think, what's the relationship between canniness and scissorness? Can there even be any outcome with this? This ensues for about a 10 minute discussion where he says, we can open the can of sauce with scissors, I don't know, can we? What will happen? How will that work? He actually needs to try himself and he does so for about five minutes in multiple ways before he finally says, we cannot open the can

of sauce with the pair of scissors. So not able to use feature analysis to compare, to contrast, to predict the behavior of efforts upon items and objects. So in terms of reasoning we need to be able to pull at a moment's notice to have enough syntax that I can predict conditions and plans and outcomes and predict behaviors. These are the kinds of syntactical, subordinating clauses that kids need to have on board. And these are the kinds of modifiers about how, and when, and what, how often, or how frequently, or how routinely something will happen. So I'm also attempting to look at language from a more complex assessment level and see if those skills are available. It's also imperative that we think about verbs because verbs are what specify the action itself. When your brain hears a verb or when your mind watches someone execute a verb, there's a part in the brain, in the prefrontal cortex and in and around and near Broca's area where motor neurons are firing when you observe movement that are linked, and trigger, and fire, the semantic representation for the verb itself. When you say a verb, it fires back in and makes the motor movement neurons for the action, fire as well.

Say the verb, write the verb, gesture the verb, do the verb, make the action itself. All of those things light up this entire network. We spend in our profession a lot of time thinking about nouns and we need to not forget about verbs. So we need syntax to predict causation and relationships and just subordinate ideas. The if, then, therefore, in order to, so that, however, because, instead of, in addition to, always, sometimes, never, usually, might, could, will, should. Those are predictive terms that give us planful reasoning. We also need to use semantic features, much like what I've described with the scissor and can situation, to understand what's implied but not said, to differentiate and compare ideas, to be able to determine what we need to do without being told, so that I don't become prompt dependent. And this is the classic statement that I hear, you didn't say that I was supposed to. It didn't tell me that I was supposed to do that. How would I have known? How would I have known that you wanted me to execute it this way? I'll spend a lot of time trying to do higher level semantic work. Can you define

and describe and differentiate? Can you tell me why things are alike? Can you tell me how they are different? Can you deduce patterns that are implied and use features that you understand about things in order to predict? So here's an example. I use a task called flinker and I got it off the PBS kids website, the old TV show ZOOM. But flinker you have a container, a plastic container. Fill it with water on the outside, about halfway, it doesn't matter, take a marker, draw a line halfway down the water. I call this the flinkage line. Give the kid a cork and a bag of stuff.

Your job, figure out how to make this cork flink at the flinkage line. It shouldn't float on top, it should not sink to the bottom, it must flink halfway down in this container of water right at our flinkage line. So this is fun, this is hands-on. I can use semantic knowledge as I sift through the bag of stuff. I need weighted things, I need attachable things, I need the ability to compare features and think about what might be heavier or lighter. I need to see and use predictive syntax. What will happen if I attach this block to the cork? What will happen if I do this? And then deploy those language skills and make some kind of prediction. I don't want the kid to randomly trial and error and grab random things like a lego, which weighs nothing, and look at me and say, I don't know what will happen. I need there to be enough language to be predictive and hypothetical and anticipatory and strategic.

So we've got to have thinking and planning language. I'm trying to check my time and see where I am. If I work on semantic therapy, not only am I trying to do really complex abstract comparisons and differentiation, I'm also trying to require that the kid explain and clarify, what exactly should we do? In which way should it be done? Which one of those tools should I use and how exactly should it be engaged? So I might have the two cup water transfer project, for example. I have two plastic red cups, I have a bag of stuff, there's some water in cup A, there's no water in cup B. Your job, I sort of feel like mission impossible you still know that. Your mission should you choose to accept it is to transfer some of the water from cup A into cup B. But there are always constraints.

The two cups may not touch, water may not drip onto the table, and you may not pour directly from cup A into cup B. Here's your bag of stuff, figure out what do. Here we are, I have actual things I need to compare and use semantic knowledge. I have string, I have Q-tips, I have Popsicle sticks, I have cotton balls, I have tape, I have a hole punch. So I'm giving materials. Some of it's absolutely irrelevant and I know that. Some of it is absolutely essential and that's on purpose. And some of the materials in my bag of stuff are sort of could be, would be, maybe I could use this if I could adapt it. So again, what I want is to elicit a planful, syntactically predictive sentence. A semantically specific statement. What exactly should we do? What are your planned steps? Because your partner is going to have to execute your plan. So you can't assume knowledge. You can't point and show. You can't let it rest in your mind because you know what you mean. That isn't good enough. What exactly is going to happen? How will it be done? And then furthermore, I ask the question, why do you want to do it that way? So that I can elicit some kind of future prediction. Here's a transcript of actually one of the kids from this summer for this exact task.

He says, I could like tie, I could tie a string the cup, just pour it in, just pour it in. And the grad student says, what do you mean by that tie a string? Well like tape a string to this corner and put the cup down here and tie it in and put the table, wait, put tape because on the table then you can like pour next to that cup. He's 14. He does have cluttering. He has a language processing disorder. He has ADHD. But tape the string where? To which cup? Pour it where? What exactly do you mean? And finally he gives up and he says, well you put, you put it in the other cup, Ugh, on the floor. And then I don't know, it'll probably be a mess. And he ends. So that's his initial effort and I get that up on the whiteboard or the smart board and let's go back and edit because have we been able to clarify what exactly do you mean? Which cup? Pour how much? Tie the string where, how and to what end? Because I need for these kids to be able to develop thinking and planning language. I don't just need language in a vacuum. I need thinking in planning language. I want there to be adequate reasoning and if I am going

to get reasoning, it has to have a foundation of semantic feature analysis. I need there to be predictive statements and that is highly dependent upon syntax. And I need to pull all of that together so I can generate plans. I need kids to know, not guess. The adolescent needs to use language that is strategic, not trial and error. They need to use language and reasoning that is planful and strategic and inhibited so they can anticipate and reduce risk and not be tied to trial and error. All of this also ties back into requiring, I absolutely require inhibitory control because you can't touch the materials until you tell me what your plan is.

You can't execute the plan, any of it until you've generated a specific plan statements up on this board. And so we're imposing distance and time and refusing to allow, grabbing the materials impulsively doing things until we get a plan and then we transfer that plan into self-talk. So tell us what you're doing, tell us why you're doing it, tell us what your plan is and moving in that way. This developing planful language, this entire article is based on using a planful language model in a science based classroom where the teacher's actually used planning language to facilitate group discussion, group collaboration, where kids were taught to ask, what exactly do you want me to do? Why am I doing it that way? What do you think will happen? And they collaborated. How do you think it works? I don't know. Why is it working that way?

So we infuse conceptual understanding. Why is it working that way? Because this one always goes down when we push it over here to the side. So we can explain the features and the behaviors. This allows us to be more predictive in terms of cause and effect language, using conditionals. It usually does, it would if it were heavier, I don't think it will work that way. We can become deliberate controlled and planful with inhibition and strategic efforts. And then we can converse and discuss about the outcomes and the conclusions working backwards. Why did it work that way? Therefore what? I think it's also in addition to developing planful language, we need to develop exploratory language. And kids should become overtly aware of using



language to explore conditions, hypotheses, predictions. So in the group that I run or even when I don't have a group I work it back and forth between the graduate clinician and the student, I wonder why it will work that way. Tell me how you know that. So we require explanation. We require a defense. The answer because it just will, isn't going to help us refine our thinking and it won't help develop controlled planning and it won't help developed, controlled, self-regulated behavior. So that the two things we have to move away from are, I don't know, it just will or you didn't tell me I had to do it that way or the third thing, how would I know that? There's no way to know that. If you have an adolescent who's still struggling with a language impairment and is moving through those levels of school where people expect more deliberate, controlled, predictable behavior, we've gotta figure out how to do language therapy that pushes all of these levels and beyond that, develop metacognitive self-awareness. This is the other problem that really worries me about this particular population of kids with language impairment and can commentate executive dysfunction. They tend to not be able to recognize the impact of their nonspecific language.

They tend to not realize why anybody would be confused by what they say. They tend to be kind of operating in a gap where they truly don't understand why they should know this or should be able to plan that. So trying to make them aware of what exactly am I doing at this moment? What am I talking about doing? How am I executing those actions? Am I focused on what I'm doing? What is going to be happening and what kinds of language tools am I using to explain my plans? I need to explain my plans, clarify why think that will work instead of this other way. And recognize that people listening to me are going to be confused by my inability to specify or clarify intent and purpose. And then from a parental perspective, honestly, parents most of what they are communicating to me is a certain sense of, will my kid ever be able to tell himself how to get his planner together or get his backpack together or figure out his own plan for how to manage this complex group assignment or manage this complex 10 page paper. I mean, the other end of the spectrum, I also do consultation for our program on

campus with students who are enrolled. They're admitted to the university and they also have autism. And we have a transitional program for them. And part of my job is to do intake consultations, to evaluate social cognition, to evaluate high level language and evaluate their EFs. The main goal for all of them is their parents themselves. How will I get away from needing to be told and prompted by somebody else? Do this, start the paper, get the paper, read the articles, study for the quiz, show up for the quiz. Because right now they're prompt dependent. So I'm trying to work on this at a foundational level with eight-year-olds and 10-year-olds and 12-year-olds and 14-year-olds. Because those same kids I see them, give it 10 years and they're 22. And here they are and we're still not able to make predictive planful statements. I could talk for a whole day on this and if I didn't have to just, I feel the sense of urgency as a therapist myself to figure out the one answer.

And I also feel the exasperation myself as a person who reads and absorbs and try. You should see my office, it's a disaster right now. There are articles everywhere. I wish that we had three simple answers and I could give them to you. But right now we're talking about syntax and then complex semantics and reasoning and planful language and thinking language and language as an internal self-talk guide. And now I want to talk about what to do in therapy because I really believe at this level of merging the language, EF problem, we have got to move away from verbal, hypothetical problem solving tasks. It does no good to pull out the worksheets and the picture cards at this point.

Verbal problem solving only generates a road response. The questions tend to be focused on overly simplified life experiences, general expectations, and if you ask a verbal question, what are we really doing? I'm making the kid do verbal attention, verbal language processing, comprehension of my question. I'm requiring him to formulate a spoken response and he'll give me a canned answer. It has absolutely nothing to do with being faced with a hands-on tangible problem. Executive functions

come online under two conditions, well, all the time, but in two main conditions they really have to amp up the level. One, is this situation I'm in highly complex, so complex it's pressing me? And two, is this novel and unfamiliar? Is it novel and unfamiliar? Listen, we can't teach all this problem solving routines and scripts that exist for the rest of life. We can't, it doesn't work that way. So I need some kind of task that requires the use of actual EFs, not just verbal statements. I need to solve something hands-on because I need to be able to see what are the implications of me putting a lego onto the cork. If I couldn't verbally predict it and I have to be able to see it, then I've seen it and then I can pull up my language and try to semantically describe what happened and why the lego didn't cause the cork to sink. And then I have syntax because I need to explain conditions and subordination and relationship and I need to also, honestly, it's more fun to build stuff. I desperately need this. If you have an actual hands-on task. The egg drop, you've got two eggs, here's a bag of stuff. Your job today is to build an egg-containment device and when you've done this, we're going outside and dropping your egg over the second storey balcony. You've got two chances to make this happen. Because when you've dropped the egg and we all go downstairs and you pick up your egg in its egg containment.

And you open your egg containment device. Let's see if you've been able to preserve the egg

I've got to be able to see the actual physical The physics, I need to see the physics, is what I'm talking about, that's why, that's why that other study in, I think they're in London, used their playful language and their exploratory talk in a science classroom. I need to see cause and effect

Then I can, I can actually require a novel plan. I can require actual shifting, Actual inhibition, I can see quite literally, the impact of my planning statements and what I have predicted and what the outcome will be. Okay, planning and problem solving. So, if you figure out some kind of task, the materials are your therapy tools. Instead of worksheets or pictures or conversation.

Ice cube preservation. We got ice cubes. Your job is to figure out, we're going to build this first and we're going to come back to it in a half hour. Um, we need to see if we can make it so the ice cube will not melt. So that's a novel task. It's a challenging task. Yet we have some familiarity with the, you know the melting of ice cubes. We have some familiarity with the fragility of eggs. WE have some familiarity with the fun of throwing water balloons against the side of a building. Who doesn't want to do that?

I can also, I need to think about a task, that is not so challenging it exceeds their zone of proximal development. I need to be able to scaffold linguistically and plan fully.

And that I really need to pay attention and try to target just some key EFs. You can't. There is no way, in any particular therapeutic approach to target all of your EF skills at once. They may be all employed at once but I need to write goals and narrow in. I'm going to work on strategic planning and predicting for this kid.

For that 20-year-old college student who comes to my EF time management group. I'm going to work on accurate time estimation. I'm going to make him estimate time for plan steps and then write down the actual time and make comparisons.

For this other kid, I'm going to work on being able to use self talk as a tool to initiate and then shift. For somebody else I may need a goal for self-talk to regulate by inhibiting long enough to generate a strategic plan. From a language perspective? So you gotta figure out and then target EF skills or target language. Maybe I have two goals from a language perspective for that group. Generate planful strategic statements, uh I need to think back, there's an entire goal bank at the end of this by the way. Um, use subordinating charms to, um, to generate a syntactically complex utterance with predictive outcomes, use a, produce a complex utterance, that means

embedding a cause. Use a complex utterance, um, that, um that reflects a condition and rationale for this statement.

Alright so target what we're doing. And the last thing I want to say about these tasks is that I'm not giving you a to-do list. We're not making an egg containment device to quote get it right. We're not there to do it the right way. We're not there to teach you how to protect eggs.

He should never leave therapy and tell his parents, "Today I learned how to make an egg protection device" All of this needs to be focused on how we are thinking, how we are planning so that the person needs to understand and tell parents I'm working on strategic planning, I'm being a scientific detective, I'm being a, I'm working on being a reasoned and planful, um, problem solver.

I am working on planning language using my brain. I'm being a word detective on how things operate. I'm working, I'm working on scientific hypothesis generation. Those are the goals of therapy.

Not to go home and say, um, I played in the water today. So tasks have to have an outcome. There have to be constraints and there need to be materials. So the outcome, make the cork flink at the flinkage line, and you can even add a time frame, for at least five seconds. However, you may not use this, it may not float to the top or make, um the water transfer, as I have repeated earlier, the constraints being you can't pour directly from A to B, the water can't touch the table and so forth, and then materials.

Some are necessary, some are irrelevant, so I've got to provide them with materials they actually need but I also want to give things that could be used because you know there are many ways to flink a cork. I don't care how you do it. I only care that you

develop and deploy your most complex semantic tools to tell me what exactly are you doing. Which way will it be done. How exactly do you want me to do that. And I want you to deploy your most complex syntax to tell me the conditions, the order, and the anticipated outcome and why you think it will work that way.

Because there is only so much, if I've gotten you to the point where you understand how to combine a few, I mean don't get me wrong, I need to back up and lay the foundation. If you don't understand because, this is not necessarily the first approach I would use, I'm still doing some intensive, um, skill building for these syntactic features or semantics, but at some point If I need the kid to have meta-cognitive awareness of the impact of his language in daily life and meta-linguistic awareness for how the use of language can be a tool to help them have more control, more deliberate effort, less frustration. Then at some point I want to bring them in and do some hands on planning and problem solving.

I also want to try to make things more or less difficult. I can withhold materials to promote flexible thinking. And simply say, Gosh I don't know, we don't have any of those. We'll have to figure out how to make do. I um, I require planful intent before action to continually reinforce inhibitor control. I might have goals that might focus on self-monitoring and self-appraisal. Tell me how you think this will work. Tell me how you think you're doing. Tell me how many tries you think you might need. Tell me, are you, you decide, will you overlook anything. So that they begin to have brain ownership of monitoring and noticing, I allow natural consequences within reason, for safety tolerance, for their self-esteem. Like the kid with the water balloon. I know I gave you four water balloons but if that kid's self-esteem can't entirely handle the deflating feeling of not protecting any water balloon. I'm going to amp up my scaffolding. On the other hand, if I feel like we have a trusting therapeutic relationship I'm gonna let the errors happen. Because now you see EFs come onboard to monitor what happened, how did it go, what was my oversight, what should I change. How should I change?

And if I intercede, if I say wait, don't do it that way. If I say, oh wait stop- oh I'm sorry, we don't have, um, we don't have a can opener here. Let me go get one. I'll be right back. We don't want to use the scissors. If I enter, if I insert myself as that frontal lobe, then I have removed your EF opportunity. I removed that teaching opportunity. I've removed the potential for an ah-ha moment. I've completely obliterated the dialogue of exploratory talk. I've removed a therapy opportunity for causation, and predication and comparison and reasoning. So failure has to happen, because failure is also a therapeutic material. It's the opportunity where you allow the kid to go "Ohhh I get it" I have a new idea. And the whole cycle of EF starts all over again. I have a different idea. I think I can do it this way. I want to try this other plan. And so we go.

SO I'm trying to use guided discovery where I discover along with the student as a colleague. Not as a director. I try to comment on their planning skills or the language skills. I like how you predicted what would happen. Oh I noticed you used one of our glue words because...Oh I like how you told me which way to do it. You told me exactly how to do it. Nice job with those word tools. And I ask a lot of questions that provoke thinking as oppose to telling what to do.

Okay so I need to wrap this up. I think we're doing both language and executive functions at some point in time. There are moments that I'll only do language therapy for younger children. By the time we get to adolescence, later childhood and adolescence, I'm doing both. By the time I see kids, uh kids- adults in their twenties- I may be pulling you out and doing only EF therapy but I'm still mindful of those who may need to back up and work also on reasoning.

Sometimes we're going to do language therapy. Sometimes we're going to do social therapy. Sometimes we're going to do EFs. And sometimes we're going to do all three. There is no one answer. The relationships are really kind of muddy and complicated. But the best thing we know right now is that they're not causative, but they're related.

And so, I think if we can do, a thorough assessment and figure out that child's profile and decide what the priority is at 8, which may not be the same priority when you're 10. And certainly isn't the same priority when you're 15. And so things shift. The approach shifts over time. Okay I'm going to stop talking.

[Amy] Thank you Jill, it does look like we have a few questions here in our Q&A pod, so let's see what we have and um see how many we can get too. Um there's sort of a comment/question from somebody whose wondering about, um, what sort of stereotypically are generally the more directive parenting styles of today and kids being given fewer opportunities to fail and learn consequences, do you think that is causing or could cause an increase in executive function difficulties.

[Jill] Yes, you know I'm doing hands on problem-solving therapy but with two caveats. Obviously, I'm not going to let you shove a pair of scissors into a can. I mean, you know, so safety containment and your self-esteem and whatever that levels for that kid, but absolutely if you cannot direct cause and effect in a physical sense, its' very difficult to envision that abstractly or theoretically. I really believe we have to have, younger children need more explorative play, imaginative play, social collaboration, problem solving, dialogue, exploration, um I think it's really vital to being able to internalize language, be playful and deliberate and employ all of our EF skills.

[Amy] Very good. Um, someone else is asking how executive function skills effect reading and it seems like that may be multi-faceted or multi-level type of effects.

[Jill] If you're easily distracted you can not maintain focus attention over time, you're going to be overlooking content and material. If you can't update new or conflicting details as you read that passage. To reassess the meaning, um then you're going to have gaps in what you understand. Um also if you have, inhibition or impulsivity, um, and are jumping between different aspects of text, and so it really interferes more with



the reception of the information and the integration of the information, um, inhibition also, to inhibit your initial thoughts and meanings for this contextual meaning and to override that and search for alternative meaning.

[Amy] Great, um there's another question here, I think there was a similar one last week, but um, do you work with parents or kids or teachers um, on limiting screen time/ tech time for these kids with EF problems, because she's speculating overusing such devices could impact executive function development.

[Jill] I haven't gone so far as to, in any sort of organized fashion to work with parents per say. If they asked for my opinion, I'd give it. If I feel like I have enough of a relationship with that parent, that I could infuse those ideas into the context of our overall conversation I will. Um sometimes if I can provide that in a general list of ways to to support development, I will throw that in. Many of the parents that I interact with, I may only see once for four hours on a Friday. And I may be in the process of having to tell them a lot of things that may be difficult to hear. Whether or not I'm able to go into that conversation. The answer is it really often just depends.

[Amy] Someone else is asking about non-verbal problem solving, and wondering if some kids perhaps visualize concepts or answers or solutions rather than via verbal language, means do you have any thoughts on that?

[Jill] Yes, and so any, any and all of those EF skills can be evaluated through verbal modality and through visual modality. So you can still view and observe non-strategic, non-verbal planning or strategic non-verbal planning. You can still observe strategic or non-strategic, non-verbal attention or shifting. Um, so yes. Some kids are maybe going to perform those solutions more visually and if that's, I don't know, it's a complicating factor. I guess, what I have seen is that, um, I've not necessarily seen a kid who

couldn't verbalize any of it but could do all of the hands on aspects of it. That's probably a whole other area of research.

[Amy] So, there's a couple of comments that have to do about the safety implications of these executive function problems and um how picturing these kids driving is really scary.

[Jill] Yes it is.

[Amy] But the ability to start driving could be a huge motivator to work on some of these things which I think is a great idea. And she also mentions too that she likes your expectations about having kids come up with a plan before they start even touching the materials which she talks about the prospect of perhaps pairing with science teachers for lab safety type issues.

[Jill] Absolutely, and I have actually physically held the box of materials myself while I have had kids across the table from me having an absolute meltdown. Because they want, they want the stuff. And I know you want the stuff. And I will give you the stuff. And sometimes I've dropped the expectation all the way down. Um, well connect four- this is just an example- I've got the checkers, you don't have to get anywhere- this is a younger kid- all I want from you is if you have a blocking plan or a winning plan. I don't care about anything else. If you just verbalize one word, you can totally have your checker. Which is a younger simplified way of trying to start an inhibitory control and pair inhibition with intent. What's the intent and then the action. What's the intent then the action. As opposed to do it, and I'll see what happens later.

[Amy] Right, exactly. Think it through before you barrel ahead. Well, thank you Jill, alright I think we are going to go ahead and wrap it up there for today. Thank you so much Jill. This was really a wonderful series, I just wanted to remind our audience that,

again, if you missed part 1 from last week, that is available in video format in our video library. If you missed any part of this event today and you want to listen again, it will be available in video format as well within a couple of days or so usually, and again Jill thank you so much again for your time. This was fascinating information and I love all the practical examples and activity ideas you have for working on these skills, so thank you so much for being here.

[Jill] Thank you so much I appreciate it.

[Amy] Alright everyone, we're going to wrap. I hope to see you at another webinar before too long. Have a good day.