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Remote CART Captioning

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[Captioner standing by]

>> Do you see this?
>> Can you all see that?
>> I can.
>> Yes.
>> Okay.
>> We're waiting for them to call in.
>> Are we in?
>> Yeah, we're waiting on the presenter.
>> That's me.
>> I didn't look up. Oh, my God! Yay! You got in.
>> Yeah, sorry about the technical difficulties.
>> Yeah. That's on this end, I think.
>> So I'm sharing my screen with your slide, if you want to try, do you prefer to steal the screen from me?
>> Sure. Let me give it a try.
>> Okay. Let me stop sharing.
>> Okay. Are we all good?
>> We are. So let me -- we'll go ahead and get all situated.
>> Okay.
>> Yeah, let me know when you're ready.
>> Yep. I'm just going to hit this and get us going. I think everyone is situated.
>> Okay.
>> Okay. Go ahead, Dr. Long.
>> Great. Are you hearing any echoes at all? Probably not. I'm using my headphone trying to minimize those. Thanks for having me again. My apologies having technical difficulty getting into the meeting. I know we're short on time so I'll try to accelerate through the presentation. I'm Dan Long, I'm a staff Psychologist at the Carruth Center for psychological service and I'm also the Director of Assessment services at something called the MindFit Clinic which began in 2009.

The mission of the MindFit Clinic is to broadly help students overcome academic obstacles and we do that in a number of ways. Before we lead in, you may wonder why I have

this individual on the screen swinging a kettle bell. And the reason for that is, we think about the MindFit Clinic kind of like a mental gym, a cognitive Jim for folks to come in. And, so, their attention in cognitive functioning. And the other reason we have it up there, any time you improve cognitive functioning, you potentially can have benefits from purview of the brain, so not surprisingly, athletes are starting to use some of the interventions we have here in our clinic for the purpose of performance enhancement. So, we'll share the three broad areas of MindFit. And how we got started, we actually got started in 2009. We were approached by the psychiatric colleagues at the time. If they expressed a lot of concern about epidemic that was not only occurring here on the campus of WVU, but of course nationally. And that epidemic, of course is the one that we're all familiar with which is college-age students presenting sensibly with symptoms of attention difficulties and asking for stimulant medications. We know based on the literature about 35% of those who present were ADHD symptoms are probably not earnest in their presentation. There's some studies shown again up to 35% on malingering. So we actually got our start, because we wanted to try to offer psychiatric colleagues some data, some objective data to help further inform their medication evaluation decisions.

We created a screening clinic. That screening clinic was up in exist tennis up until year ago, and we saw 100 to 150 students per semester. And we published the study last year in applying neuropsychology to adults. And it was kind of an interesting study where, with a sample size of 350, of course you can look this up, but in the study, we have college students coming to our clinic who are seeking clinical medication with psychiatry if if we put them through some of our testing, including a performance validity test and what we found is that consistent with the literature about 35% failed at validity test and this is a test that is an effort test, but it looks like a memory task, and people with severe form of pathology and memory issues pass this with flying color. So people with alcohol acetyl syndrome do well on this test for them you're a 18 or 19-year-old, do you well and you're failing this test, then there's some real problems.

And then based on the failure rates, we were able to look at what are their pattern performance on computerized potential for screening and so we started doing those as well as our comprehensive service assessment and moved on to adding some services the following year. The first area that we added was cognitive enhancement services. And this really came from some frustration not having other options for students. You know, for many medication as contraindicated. There can be adverse site effects or simply students don't, they would like another route. They don't want to feel they have to rely upon something external to enhance their performance and their cognitive functioning, so we brought a neurofeedback and cognitive training. We're one the first, one of the first university counseling centers to do that.

We have been doing that for almost 10 years and have a really great track record doing that. And we'll talk about that in a moment. Second area is our academic enhancement area. We added that in 2014. This is not just tutoring, but it's sort of specialized coaching the ideas to try to teach students how to become better learners, so they can become more autonomous. If would do our job right, so it's capacity building in that regard. We're trying to improve their executive functioning and generally their approach, habits, skills, and attitudes as academically speaking. And, so, the hope is after we work with them for a semester or two, they don't need us anymore. So it's a failing business model if it goes well as it were.

And then of course the last areas are assessment services. Which we just talked about. And, so, we do all the LD/ADHD testing to provide the documentation requirements necessary for student to be granted academic culmination to the university. And we're increasing our

standard of practice over this year, so we've done away with the screening, and now it is policy that if someone wants to be seen here at Carruth, one of our psychiatrist, they go through the testing clinic first. And as I allude to do earlier, we've done some work with peak performance. First was working with rifle. We had an Olympian come to us and say, this guy from India was doing neurofeedback and ended up doing gold medal and I want to do neurofeedback. We work for rifle for NCAA championship and we had some athletics for few years and worked with different teams and we've also worked with Olympic athletes and then last year, I was a consultant for Nike Oregon Project with the marathon runners.

And, so, all those intros out of the way. Now you understand a little bit about what the clinic is involved in. The next thing to talk about is kind of the spirit of the clinic, the spirit of it is all about growth mindset which is a term that was popularized by Stanford psychologist. And it's a type of spirit and mindset often that contained within university settings and cultures, typically a university operates more from what we might call fixed or disability-based mindset. So the idea there is that, in fact, intelligence, et cetera these are fixed and rigid. They're immutable and they're unlikely to change over time. If that's the case, if the person comes across or comes up against adversity, then this becomes really an opportunity for embarrassment or shame, and, so, adversity is something to be avoided. And person really grows, the growth mindset is a very idea. It's the idea that a lot of these variables that we just discussed are flexible. It can be cultivated. It can be trained over time. If that's the case, then adversity is not something to be hide from or avoid, rather, it's an opportunity for learning and growth.

And, so, that's really the spirit of mindset. So there's some controversy around this topic. Can we improve attention and memory in vast cognitive performance and probably the answer is to some degree. You know, there's some research that will kind of talk about here briefly. But first let me introduce you to some of the intervention that is we use. So the first area is neurofeedback. It's kind of like if you don't know anything about neurofeedback or EEG, Biofeedback. It's kind of like doing mindfulness meditation but with a computer. The importance of the feedback is straightforward. If I'm walking down the street or walking in front of the department store mirror and I look into the mirror, I can use the feedback from the mirror to make adjustments to how I'm doing. I can see I need to suck my gut in and get rid of dirt on my shirt and so in the same way, we're want to go provide feedback to the brain. But we're providing feedback about information that ordinarily does not have access to. And information is how well, it's regulating its own, the electrical functioning. We know about the great proprioceptive and teraceptive capabilities of the brain and this is certainly one area of the brain where some source of external feedback is useful in helping the nervous system learn how to better regulate itself.

The research is promising for certain things. We have to be careful. There are some folks out there who sell neurofeedback like it's the great panacea. It seems like there's snake oil salesmen . And they're attempting to state neurofeedback can be used for anything and everything under the sun. And I don't believe that. In our clinic, we try to stain our lane. We try specialize and circumscribe problem areas which is boosting attention functioning. And with that regard, within that area of research, what we find is that neurofeedback can be just as effective as medication in some cases.

If you have never seen it now, I don't know if this will play. So you have to let me know if you can see this. Can you see this video playing right now? If so, hopefully you can. If not, you can see it on play back. But this is from 2010. And I'm putting sensors on this young women's scalp. She was a trainee here. She's playing a video game. She's flying a spaceship.

And she's controlling the direction with a PlayStation controller but the gas pedal is her brain and so the brain is making a certain pattern as space ships speed up and as the sound gets loud light gets brighter. She's driving a car, what you don't see is I'm off screen trying to distract her a bit and what you notice is this car is going to begin to slow down and sky is going to go in flicker Black. And eventually, it's going to come to a complete halt. And what this is doing is giving real-time feedback to the brain about what's going on in that space between the ears. Here's some very old EEG software we used to use where we're light-years beyond this now. But it's interesting for posterity to look back.

Here, she's watching a movie while detouring neurofeedback. Umm notice the screen is beginning to shrink there and the sound will begin to die, even the screen will begin to gray or blackout. So, hopefully, it gives you just a little bit of a sense of what neurofeedback looks like.

Some of the research. Here's some interesting 2010 data. What they did across the x-axis on the graph, those are individual participants. So participant 1 all the way to the left to 27. And axis is dependent variable in the study. And it is their scores on a CPT measure, continued computerized performance test. There's a four subtest combined into one composite. And what you find is really interesting. For the most part, most people get better. They show, they demonstrate real big improvements on this test with attention. And the other thing you'll notice is that not everybody gets better. There are some cases who actually stay about the same or get marginally worse.

So, clearly, there, right away, you can see statistically, just like therapy doesn't help for everybody and medication doesn't work for everybody, et cetera. But the other interesting finding here is those who startle off with a lower pre-test score, my apologies, pre-test is the pink lines or blue line after neurofeedback. What you can see is those who have a lower pre-test score all the way on the left, like participant 1, demonstrates or exhibit the greatest increases in performance on this test. And, of course, those who already start close to the ceiling on the right, they're not going to make much change. But they nevertheless, some of them still do. So that's kind of fascinating finding.

And this next slide this is probably worst slide I've seen prepared in scientific publication, but we'll go ahead and schlogg through it. Essentially, they're comparing medication group, and a neurofeedback group. And what they're expiring is those two treatments on the outcome measure is one of these CPT is continuous computerized performance test again. And you'll see there are number of lines, four lines on there. And each line corresponds to one of the facets or indices of this measure. Response time, variability, which is important because the greater variability in reaction times on a computerized mention tells you that the person's attention is not consistent. There's times when they're spacing out. Times when they're little more tasked. And lines of omission and co-mission. Errors of omission refers to times when you're supposed to perhaps click on the mouse but you didn't. And that would indicate you weren't paying attention. Co-mission is when you clicked and you weren't supposed to so that's evidence of impulse control issues. And, so, what they're showing here for each line take response time, for example, the first dot on the lower evident of that response timeline corresponds to the pre-test, the baseline performance on the computerized measure. So the medication groups scored about 85. The neurofeedback group was a little closer to 88. And then the second dot on that line is their post-test scores that corresponds for post-test for each group. If the line is slanted a little more vertically, that would indicate preference towards the neurofeedback group. If it were a little more horizontal, then it would show prevalence to the

medication group. If it is parallel with the diagonal line essentially to the graph, that would indicate there's no preference. One treatment didn't be doubt the other one.

So you can see the medication was slightly better with the exception of variability, variability was very parallel with that central line. And, so, this shows, again, that at least for this particular sample, neurofeedback was about as effective or marginally better than medication.

Here's another little study that Thomas Fuchs TOVA data. And what you see is neurofeedback really be out Ritalin in a number of areas in the CPT measures with the exception of reaction time. Which is not surprising if we're taking method fete mean. And if we were to do neurofeedback.

You know, ADHD is extraordinary heterogeneous disorder. Some believe there are various end phenotypes. Others believe it's a catch-all category that we use when, in fact, we don't have a known etiological mechanism. So any number of people we see presented are attention issues, we find out they have a head injury. Or they have had some mild TBI. Some neural cognitive decline as a function of that. So we do end up seeing some folks who have mild or traumatic brain injuries. And there's some research out there, of course that looks at that as well. And, so, here's one study that shows there's some significant improvement. It's sustained attention individuals diagnosed with MPVI. And, so, we started do some research on a particular type of neurofeedback called infra-slow training. Or ISO is oscillation that occurs well below 1 Hertz. They are empirically associated with number of different things. These are non-rhythmic oscillation that are occurring.

At .5 Hertz, we know those oscillations tend to be more associated with things like hemodynamic astrocytes. But, the research actually indicates that probably what we're doing with this really slow training has less to do with any biological process, that is occurring in the body and probably more to do with time constants and, basically, cut-offs where essential wall we're doing when we lower our frequencies is we're creating really long y pox against which we can compare baseline with a particular frequency range.

And what we're finding in research is coming out now is really exciting about it is ISOs are associated with important things like neuroplastic and number of really interesting studies coming out about this. So anyway, we started looking at this here and we're starting to do some research where we have folks coming in, and the college-age population identifying with the attention concerns. And our department variables, we do a QEEG that measures attention and measures executive functioning. And we just want to see some pre/post comparisons after 10 sessions of ISF neurofeedback. And the idea was to do a comparison with the no contact group. And I say that past tense, because we're actually going to switch gears. This year, we're starting to develop a new intervention that utilizes ISF, but it combines it with cognitive training and, so far we're really liking the effects of it so we're doing the research. If we're not conduct that go research, then we have to talk to some folks to see if they're interested in looking at what we're doing. But let me give you an example of someone we saw in ISF training. We had a young man came in. 19-year-old, Caucasian male. Long-standing diagnosis with ADHD. I get to the clinical interview if ask about head injuries. And he recalls that he was told he was dropped when very young and I said do you know if you were taken to the hospital? Did they do any imaging? I think my mom has something. And this is what he brought back. Which is pretty amazing. So you can see pretty clearly he's 2 to 4 millimeter of lesion. So we're not necessarily looking at ADHD here. This may actually be the attention symptomology of a larger issue. So we do something called QEEG. It's a quantitative EEG. And we're putting a 19 general cap over

someone's head and we're recording electrical values over period of time. And then we take those aggregates, and we compare them normative database. Couple of thousand people who have been really thoroughly tested and they have no history of the neurological or psychological issues. And we ask are there electrical deviations that are significant from this database? And that's what you're seeing here. This is a map sometimes we refer to as a brain map. And you can see along the top row, that's the absolute power metric and it shows absolute power relative to the normative database in each of these five EEG components, Delta, feta and and, so, you can see the deviation. Delta and Theta and so that would correspond with some of the symptomology he was reporting. We did a computerized CPT. Computerized measured impulse control. And you can see there's some real significant impairment both in his attention quotient as well as his response control over impulse control quotient, if you will.

And, so, we only saw him for 8 sessions. He had to return home for some internship activities. So 8 sessions is not even half of the amount of time we would normally see someone. So we didn't expect much of a change. Yet, for this young man, there was quite a change. The quotient normalized to average range and high range and quotient portion falls 3 points of shy to average range. And this meant his day-to-day experience, he reported number of improvements. Most notably with attention and working memory that left dorsolateral prefrontal cortex and lots of different things.

And, so, here's his brain map after training. And as you can see, those frontal slow wave components are no longer deviant Delta and Theta look pretty good there. There's still work to be done in the connectivity amplitude symmetry of coherence, but for 8 sessions, I'm pretty happy with that. So that's neurofeedback in a nutshell. In our clinic we also do cognitive training. We have our own approach to cognitive training we've been doing for about 8-9 years? 8 years, I think.

We developed it and I did some training with someone who developed cognitive training methods. And he said you have to do coaching with your people. And I said what does that mean? I wasn't exactly sure. So I did what I thought was coaching. And I have a pretty deep background in cognitive psychology. So I was using principles from cognitive psychology to try to help coach students through some of these cognitive tasks, and it turns out our approach is unique. There aren't many people who do it things quite like our approach to cognitive training, which is kind of interesting, because once you hear a little bit bit, you expect everybody would be doing it that way.

So what is cognitive training? It's essentially an approach which cognitive action to enhance cognitive performance. They're often presented in game-like format but it's not necessary. They're often computerized, but that's forsake of convenience. We're not a computer only model. Sometimes we use cognitive training in tangent with neurofeedback. Sometimes we use neurofeedback ready to brain. There's a cool study out of 2013 where they compare neurofeedback to a sham condition and they find some significant gray and white matter value changes in a very short period of time. And, so, it's kind of neat to be thinking about some of the preparations we might be doing with neurofeedback and once we lay the ground work, we harness that state of readiness and guide the brain with cognitive training.

Oftentimes when we hit a plateau with cognitive training, we may switch back to neurofeedback and vice versa. So usually when people hear cognitive training, if they know anything about it at all, immediately, they tend to be somewhat dismissive. The first thing people often think of when they hear cognitive training are commercial brain games like velocity. The only similarity what we're doing with things like Lumosity is both are purported to

improve cognitive functioning through cognitive task or training. And there are, however, number of really big differences. And we can talk about that a little bit here.

Other approaches first of all, they tend to be what we call computer-only models. You sit down and click start the app. Or someone clicks go and away to the races, right? The problem with that is a lot of times, people then hit a plateau, even if the game selected somehow were pertinent to the individual. Once they hit a plateau, that's pretty much it. They get demoralized, frustrated, and they close the app and that's the end of it. Our approach is client-centered and clinician-driven. So the clinician is trained in basically how to watch a person perform cognitive tasks and how to assess and identify where the weak links are in the cognitive chain. And then how to intervene and how to accommodate the task or scaffold the task and strengthen up the weak link in the cognitive chain.

So what about cognitive training? Is it effective? And there's mixed results. Here's one study, here's a generated total of 4932 publish indications in meta-analysis. And really what they're finding is only 28 were included in the review, which already tells you that the research on cognitive training is quite poor. And then what they found of course in the 23 that met the inclusionary criteria said there were significant improvement in attention of executive functioning. But, again, the empirical efficacy is often mixed and we're not doing a good job of studying cognitive training or defining it. And that's the first issue. Cognitive training is poorly defined and operationalized in the research. Sometimes they define cognitive training or they will use poor content validity and say, okay, we're going to study cognitive training and we're going select this one task. We have no idea if this is pertinent to the training. And we're going select that and say that's the representative of all cognitive training. And that's an error. Here's a great example. Some of the studies in cognitive training look at things like N-back tasks. And what we find is that N-back tasks are face value of working task but they don't demonstrate any conversion validity of any working memory. So that's a problem, yet people, researchers who are conducting research on this kind of thing are unfortunately thinking that an N-back task is representative of cognitive training. If you don't know what N-back task is, here it is. N, N is a variable load that can change or increase the difficulty in the load on working memory. So you'll notice that there's two examples actually in this picture. The individual sees each one of these frames systematically one after the other. And the job, the instruction is you are to click, since this is a 2-back task in the verbal example, you are to click any time you see a letter that occurs two frames ago. So the first frame you see a V. Second frame you see a V. Third a Q. Fourth R and fifth Q. So on the fifth frame you're supposed to click. Because the Q responds to the Q that occurred two frames ago. And you can do this spatially as well. So bottom of this little figure shows the spatial example. You will be pressing on the third slide the first time Q appears. Because it's spatial location is the same location of the B, excuse me, the V and the first frame. And, so, this is often employed as cognitive training task.

It would be considered one type of working memory called updating models of working memory. But it's still a very controversy thing to even look at. So some other problems with the research in cognitive training, they often use one-size-fits-all approaches. That's really an issue. I use this image, because I thought it was funny. It would be like if you were trying to determine visual acuity by showing this massive letter E and well, you can see it and your eyesight is fine. Of course this giant E is going to help differentiate whether someone can see or not. It's not going to help or tell us on a granular level of acuity we can get from a test and other is -- someone has their microphone on, I think.

So, attention and working memory, we often talk about them, yeah, that's that one thing that occurs in the brain. But really, that's not how these things work from cognitive standpoint, certainly from a cognitive neuroscience standpoint. Someone says I have poor memory. Well, here's human memory. Which part of memory? Let's suppose someone says short-term, we don't really call it short-term anymore. It's short-term storage but it's part of the working system. So they say short-term is not good. Even then, what part of working memory is problematic? And this is only, by the way, what you're looking at, only one of 3 or 4 different empirically researched models of working memories. And my other favorite one is students come in and say, my attention is poor. Well, I don't know what they mean by that. I often am left kind of doing formulas in my head trying to understand what they mean when they say I have bad attention. When you pick up any classic textbook, psychology textbook in the '90s, you see there's four oftentimes, four major types of attention. There's signal, selective, alternating, and divided. And then little more recently, Mike Poser, who wants to tied cognition to empirical neuroscience and he looks at alerting and executive types of attention, and even more modern, this is not an exhaustive list. We have large-scale brain network. Dorsal tall attention, ventral attention, frontal parietal. And, so, when somebody comes to us and say poor attention, we want to understand in a granular way what's going on. And we think a lot about and nerd about how these concepts are linked.

And, so, we're looking at QEEG, we're looking at clinical interview, we're looking at our cognitive testing, and then coming up with a treatment plan to try to help them with whatever attention means. And, by the way, attention could mean they have chronic sleep deprivation, poor nutritional and substance abuse. Many more issues that could account for attention problems other than purely cognitive ones.

Other reasons why cognitive training research is usually bad. Well, if these things are not unitary, things like attention or working memory, that means that we would need to be doing studies on all the lower order components of the systems. So in the working memory model, all these models, individual slave systems, in ways they exact with executive and, et cetera. To really do cognitive training research. I think you have to do research on those order of component scales as well as how they're orchestrated at a more executive or higher order level.

And then as we discussed before, the computer-only model failed. And they put the computer in front of people and computer is dumb. It runs on crude algorithm and schema that really can't help continue to train the person once they hit a plateau.

And, finally, maybe last issues is that usually there's a mismatch between the scope of the cognitive task and the dependent variable being measured. So you see a lot of this thing occur in the literature. We're going improve some facet of working memory and then we're going to test someone's IQ. And then when they don't find a huge difference in IQ, which is a huge multi-faceted construct, they conclude cognitive training is not effective. Well, that would be very much like training someone's bicep and expecting their squat numbers to group. We shouldn't expect one to necessarily create huge changes in the other.

Our approach, as I've said is much different. Cognitive function is like much of the body can cultivate and strengthen. We I don't understand cog Cognitive Component Analysis. So we look for how the person is going through a task and identify where the cognitive systems and things have gone awry and we scaffold the task to address those issues.

For us, therapeutic relationship is really critical to discuss the training. I'm asking people to do things which are demoralizing and which reveal long-standing cognitive issues. And that

could be embarrassing and shameful so, we have the relationship to hold and help clients get through those things can be quite useful.

Cognitive training for us does not rely on computer software. If the computer goes down, we need to be creative enough and flexible enough to draw upon the broad principles of intervention to improve someone's work. I usually say I with an watch someone at work and have tips on what to improve, we don't need a computer to do that.

There is no one path to improve. I am often asked by interns, can you make a flowchart of how we're supposed to be cognitive training and neurofeedback? It's hard to do that. We armor ourselves and flexibly draw from them as needed. Why does our approach work? We're not entirely sure. We know we're seeing big changes. But I cannot tell you why just yet. We don't have the research to tell you why. We would love to think what we're doing is directly improving, you know, facets of person's cognitive system. But there also could be some other mediating variable that help them to get better, everything from determination, instilling growth and mindset. And maybe sitting in a room for couple of hours a week and concentrating really hard. Or improving their internal sense of agency is really big.

But for whatever reason, we are seeing effects. So we did a, we're going publish this this year. We have a cohort of 3 years of students who only receive cognitive training, which is actually quite a small number, because most of them are getting neurofeedback and cognitive training. And, so, we looked at those receiving cognitive training. It was about 40 college students in this and what we're finding is that after 10 weeks of training, we train twice a week. So that's 20 sessions. There was about 2 standard deviation and sample no longer exhibits quantitative attention in CPT. Now we're going to start collecting new data that includes much more than CPT data. We have to get to executive functioning. What we want to do is demonstrate something called far transfer. Which is the issue that comes up and makes cognitive training controversy. The idea of does training in a particular task make you just better at the task? Or does it confirm benefits to your everyday functioning? Your everyday cognitive functioning? Excuse me.

So here's someone we saw who only did cognitive training. Another 19-year-old. Previously treat we had stimulants. And here you can see there are attention quotient looks good in 117. But there aren't response control that looks poor. They're quick all the time. So artificially inflates the attention quotient and shows they're clicking when they're not supposed to. There are attention after, just look at the full scale number here. After cognitive training. Did you tell change because you're kind of at the ceiling. But the response control goes up massively. So 78 points which is actually over few standard deviation there for this person and their brain map which went from problematic really improves remarkably. This is no neurofeedback.

So I see we're almost out of time. I don't know if we have time to give any kind of demonstration of cognitive training at this point. Do we need couple of minutes for questions or anything of that nature?

>> LESLEY COTTRELL: Can you hear me?

>> THE PRESENTER: Yep.

>> LESLEY COTTRELL: I think it would be definitely good to leave some time. I don't know how long does the demonstration take?

>> THE PRESENTER: Yeah, probably more than what we have.

>> LESLEY COTTRELL: All right. We can bring it back another time for that then.

>> THE PRESENTER: Sure. That sounds good.

>> LESLEY COTTRELL: So with that, thank you for that overview. I think those who are on the call, if you don't care to unmute your line if you have a question, or use the chat function.

>> DR. DAN LONG: Let me bring the chat thing up. I may not see it.

>> LESLEY COTTRELL: Also, I'll start with question to you. Knowing that many people in here knowing what traumatic brain injury represented, assistive technology, or PBS, positive behavior. Many of these teams interact with individuals who may benefit from this. What is a good way when you're serving someone for the particular focus, what's a good way for us to identify who might be eligible for what do you? And what would that process look like? What are the opportunities for bringing that research to practice?

>> DR. DAN LONG: That's a great question. Currently we're only seeing WVU students and we're in discussion with next clinics and I would love to see that happen in the coming years. But if you have students that you think would really benefit from our services, you can simply send them along for what we call MindFit consult. And I'll be happy to meet with them for, you know, half hour to hour to assess their readiness and their interest in the program, their motivation, the big things I'm usually looking for as exclusionary criteria and, so, I'll share this with you for your consideration. I want to know about lifestyle issues, what their sleep is like, substance concerns, mental health concerns, of course if there's anxiety, depression that I believe could be treated or ameliorated through some therapy. I might try to help them get connected with a therapist first. If arousal and composure issue which is fundamental, when I say is a arousal composure, it could be sleep deprivation, and PTSD, and we want to try to Pali. So those things before we can make a big effect with cognitive training and neurofeedback. With that said, I wouldn't necessarily rule it out either. So if you have someone you think would benefit from it, we would be happy to meet with them and we can try along with the client to figure out whether our services will be best for them.

>> LESLEY COTTRELL: Okay. Great. Any other questions?

>> AUDIENCE MEMBER: Only question I would have, I know with your study that you're just doing WVU students, but has any study similar to this been done with younger students?

>> DR. DAN LONG: Yeah. There's actually a lot of research out there. So you're right. I'm only talking about the folks that we serve. But for instance, neurofeedback is beginning to be regarded as a first, potentially first line treatment. I want to be careful about what I say here. But I would encourage you to look at the literature and what we're finding is that it's really being regarded as a very viable approach to the treatment of attention concerns and there's also data out there that supports and that could be helpful for TBI as well. Some of the cognitive training tasks, by the way, are built and really geared towards children. Sometimes I have to preface working with a 18 or 19-year-old young man or women, and some of the games their going to see may seem childlike. Because the software is really oriented towards children. So there's a lot of things that happen with that age range. Yeah. My goal, too, and this is something I've shared with Lesley once before. Really, my goal is, I want to be effective with our interventions. I want to help the people in a very real way. And then what I'd like to do is I want to start disseminating this. I want to get more folks who work with individuals experiencing attention cognitive issues.

I'd like to put this in their hands so they can begin to offer this as an intervention themselves. Having something here at WVU clinic does not help the entire state where a land-grant institution and part of our 2020 plan is of course to find ways to be meaningfully engaging

with the rest of the state. So my greatest hope is we'll start offering training in time to come so that we can get more practitioners out there.

>> Umm-hmm.

>> LESLEY COTTRELL: Okay. So in the meantime, would you have any materials that you would advise people? I know your pointing us to research, which is making sure we use evidence-based materials, which is great. Do you have some that you would recommend for, again, people that we serve or give to them?

>> DR. DAN LONG: I have to think about that. You're talking about getting it too the clients that you serve?

>> LESLEY COTTRELL: Right. I don't know if the research is to the point where there's certain activities where they can do in their recliner or in their own house just to start with the focus, you know, the frontal lobe activity. Or anything about cognitive therapy.

>> DR. DAN LONG: Right. I can certainly get you something that gives some description and overview of those interventions. I would have to do some research. I know what you're asking for, which is are there good things that you can do for your brain that don't require a clinician? And I think the answer is yes to that. I don't spend a lot of, because I'm a clinician, that's my role in a person's life. So some of the recommendations I'll give them from day-to-day might seem a little lame. [Laughter] To put this out there broadly. But I'm sure there's good resource that is would offer those activity list for people to do. I mean, the brain benefits from just about anything you could do and challenge it. Even just changing or reversing the order which you brush your teeth is kind of a helpful thing. One thing I'm doing is teaching myself to learn how to write with my right hand. I'm left-handed. And, so, you know, there's some, of course neural protective things that a person can do that might be helpful. But usually, my lens is just on the more of the clinical intervention stuff that we do here in MindFit.

>> LESLEY COTTRELL: Okay. Well, with that, we're at 3 o'clock. We're past 3 o'clock and we really appreciate your time, Dr. Long. And hope this goes into something greater in terms of collaboration with the center.

>> DR. DAN LONG: Absolutely. Yeah, I appreciate your time. Thank you very much. If you have any other questions, please reach out and I'd be happy to answer them.

>> LESLEY COTTRELL: Okay. Thank you, everyone. Everyone have a nice Thanksgiving and we'll send out a follow-up evaluation for this presentation shortly. Thank you. Take care.

>> DR. DAN LONG: Thank you, bye-bye.