56| The D-KEFS, D-KEFS 2.0, and CVLT-3 – With Dr. Dean Delis

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Speakers: Dean Delis, John Bellone, Ryan Van Patten

🔊 **Intro Music** 00:00

John Bellone 00:17
Welcome, everyone, to Navigating Neuropsychology: A voyage into the depths of the brain and behavior, brought to you by INS. I'm John Bellone...

Ryan Van Patten 00:25

...and I'm Ryan Van Patten. Before we get into today's episode, we want to remind everyone that select NavNeuro episodes are now available for CE credits through our partners at the International Neuropsychological Society. If you need continuing education credits, and you want to support the show, visit navneuro.com/INS.

John Bellone 00:48

Today we speak with Dr. Dean Delis about executive functions, the Delis-Kaplan Executive Function System, or D-KEFS, the upcoming D-KEFS 2.0 and the California Verbal Learning Test, CVLT 3rd edition. Dean is a board certified clinical neuropsychologist and a professor emeritus of psychiatry at the UCSD School of Medicine.

Ryan Van Patten 01:13

We were fortunate to carve out a few minutes at the end of the conversation to talk about test development more broadly as well, which was really nice because Dean is an incredibly successful test developer in neuropsychology, so his advice carries a lot of weight.

John Bellone 01:27

A few caveats to this episode. First, we want to be clear that we have no conflicts of interest related to Pearson and the D-KEFS and CVLT, so we aren't unduly influenced here. Obviously, Dean does have a potential conflict of interest, but we found him to be quite honest regarding the pros and cons of the instruments that we discuss. Second, we recorded with Dean back in February of 2020 before the pandemic was widespread in the US. Dean briefly sketches out a timeline for the release of the D-KEFS 2.0 but this might have changed in the current COVID-19 climate, so don't hold him to that timeline.

Ryan Van Patten 02:05

And, finally, due to time constraints, we weren't able to ask Dean as many follow up questions about the D-KEFS 2.0 and CVLT-3 as we would have liked. So stay tuned after our interview ends where we provide a bit more info in the outro. And without further ado, we now give you Dean Delis.

🔊 **Transition Music** 02:25

Ryan Van Patten 02:34

Okay, we're here with Dean Delis. Dean, thank you so much for coming on NavNeuro.

Dean Delis 02:38

Definitely.

Ryan Van Patten 02:39

We're thrilled to have you. So we'll jump right in. We'll begin broadly at the construct level. There are a lot of diverse definitions of executive functions, or EFs. How do you think about or conceptualize executive functions?

Dean Delis 02:52

I think about it in terms of three levels. There is what I would call the cognitive level. These are the traditional aspects of executive functioning that we usually think about in terms of multitasking, abstract thinking, creativity, problem solving. But also there are the emotional and behavioral components of executive functioning, like rapid mood swings, apathy, impulsivity. And together they form the cluster of executive functions.

Ryan Van Patten 03:30

Yeah, that maps onto the hot cognition and cold cognition distinction a little bit.

Dean Delis 03:35

Correct.

John Bellone 03:36

I also like how you said in the D-KEFS manual that executive functions draw upon the individual's more fundamental or primary cognitive abilities, perception and language and attention, to generate those higher levels of creativity, abstract thought. I like that conceptualization.

Dean Delis 03:54

Correct. That was one of our main goals in developing the original D-KEFS. To empirically allow neuropsychologists to parse out the more fundamental or component aspects of cognitive processing from the higher level aspects such as multitasking, creative thinking, problem solving.

Ryan Van Patten 04:21

Something else that is commonly discussed with regard to executive functions would be heterogeneity. So just thinking about the cognitive executive functions that you mentioned - working memory, inhibitory control, problem solving - given that these are different types of skills, but related, how do you think about grouping them under one umbrella?

Dean Delis 04:41

I think that because they are hierarchically, a higher level of cognitive functioning, I think it makes sense to group them into what we call executive function. But there is tremendous heterogeneity among these different cognitive aspects of executive functioning that are important to assess and try to isolate as best you can.

John Bellone 05:13

I think it's intuitive for us - Ryan and I are both adult neuropsychologists - it's intuitive to think of executive functions as it relates to adults. But it's also relevant to kids. I wanted to know from you what the importance of testing higher levels of cognitive functioning is in school age children?

Dean Delis 05:31

I think it's absolutely critical. We published a paper where we looked at the correlation between IQ measures and executive functions. We looked at various subgroups of normal functioning children, in terms of their relative IQ skills versus their executive function skills. The title of that paper was "Creativity Loss: The Importance of Assessing Executive Function in School-Aged Children", or something like that. I can't remember the title exactly. [laughs] But it was really fascinating that, in the normal children population, there are some children with, for example, average or above average verbal IQ whose executive function skills are significantly lower. And there are other children whose executive function skills are high average to above average, and their verbal IQ or performance IQs are average or below average. And this is the normal children population. The reason we were able to do this study is because the original D-KEFS was co-normed with the original WASI, the Wechsler Abbreviated Scale of Intelligence. So we had for our children population, the WASI and the D-KEFS and it allowed us to do this analysis. And, to me, this was a really critical finding.

I can explain to you one of the implications of what I thought of this finding that, for example, there is definitely a subgroup of children whose executive functions - multitasking, problem solving - are high average to above average and their verbal

IQ are average to low average. I think there were like 10 to 13% of normal functioning kids that fell in that little subgroup. When you think about it, these are super bright kids but because their verbal IQs are only average to low average, they're at a tremendous handicap in terms of advancing to higher levels of education because the tests that are used to be admitted to say graduate school, they're so heavily verbal IQ based. So it's kind of unfair for those kids.

John Bellone 08:21
So we really have to, for the pediatric neuropsychologists out there, this is something to pay attention to. Definitely.

Ryan Van Patten 08:27
Yeah. There are structural changes that would need to be made in order to fix that issue. Our standardized tests would need to not rely so heavily on vocabulary, for example, but also take into account executive functions like creativity.

Dean Delis 08:41
Completely. I think that tests to be admitted to creative fields like PhD and research psychology should somehow incorporate executive function measures in some standardized manner.

Ryan Van Patten 08:58
Well, I'm glad I didn't have to take the Tower test to get into grad school. [laughs]

Dean Delis 09:03
[laughs] Exactly.

Ryan Van Patten 09:04
[laughs] That's a good point.

John Bellone 09:05
Yeah, very good. So why don't we talk about the D-KEFS. We'll start off with the original version and then we'll talk about the D-KEFS 2nd edition. What was the genesis behind the development of the D-KEFS? What specific niche did it fill?

Dean Delis 09:19

The D-KEFS came about because in the early 1990s I developed a sorting test, which is the D-KEFS Sorting test. The original study that we did with the Sorting test looked at patients with focal frontal lobe lesions and patients with classic amnesia syndrome. I published it with Larry Squire and used his amnesic population as well as he actually had a postdoc who had a focal frontal lesion group. So I developed this new measure, we collaborated in doing a study, seemed to be very promising, and published it in Neuropsychologia. After that publication, I started talking with the Psychological Corporation at that time about how it would be really fantastic to develop a battery of executive functions where we would use tests, like the Sorting test, which incorporated Edith Kaplan's process approach to really assess both the component skills and the higher skills that had really focused on strategies and error types and try to improve on both current executive function tests and new executive function tests that had been used in the experimental literature but had not crossed over into the clinical. I think I lobbied for that for a few years. And then finally they...

John Bellone 11:03

They caved in. [laughs]

Dean Delis 11:06

They caved in. Well put. [laughs]

John Bellone 11:10

This was the first nationally normed set of tests designed exclusively for the assessment of executive functions, as I understand.

Dean Delis 11:17

Correct. And also the first to be co-normed with both children and adults.

Ryan Van Patten 11:22

Yeah. The age range is impressive for sure. The fact that the tests are appropriate for ages 8 to 89. So moving deeper into the D-KEFS, can you describe the cognitive process approach that you took in the development of the D-KEFS tests and how that compares to the single score method?

John Bellone 11:39

You mentioned Edith Kaplan. I think other people call it The Boston Process Approach, right?

Dean Delis 11:44

Correct, correct. Well, Edith's process approach has always been to go beyond the single overall achievement score in order to assess error types, strategies, processes, which provides a richer assessment and provides data that allows you to identify different subtypes of neurological conditions, as well as increase the sensitivity of your measures. So that was a fundamental goal, to incorporate Edith's process approach into the assessment of executive functions. Also, we wanted to take tests that were absolutely superb tests, and try to make them more sensitive to subtle cognitive decline. So that was another goal. Another goal was to have more conditions for each executive function task that you were assessing, so that you could better empirically parse out the more component cognitive skill from the higher level cognitive skill.

The Trail Making Test that we ultimately came up with illustrates all of those things. We expanded the number of conditions so we could assess the different component functions - visual scanning, motor speed, number sequencing, letter sequencing. And, on top of that, you could better evaluate a switching deficit relative to these other components skills. We tried to make the test more difficult to raise the ceiling effect, so we put it across two pages instead of one page. That would tax this visual scanning component. And because that increased processing demands, it would make it more difficult to do the switching. So that was another aspect. We incorporated some features, like Edith came up with a brilliant idea of what she called "capture stimuli." A few are switching from 1-A, 2-B, she would put the letter C right close to the B. Right near the same line, you would have to go to the next item. So in other words to pull for that error. So these were all aspects that we put in, as well as scoring the different error types - set loss errors versus sequencing errors.

Ryan Van Patten 14:28

Are there any circumstances where you think it would be advantageous to administer the non D-KEFS versions of Trails or the Golden Stroop? Or imagine that a clinician came to you and said, "I want to give Trails and I'm considering Army Battery Trails versus D-KEFS." Would you say under all circumstances D-KEFS is better? Are there any circumstances where the original version is better?

Dean Delis 14:53

I think, for example, the original version can be better if somebody has a motor problem or a visual scanning problem. Because there is a greater taxing of those abilities on our version, it might be better to give the traditional trails for that. Also, if you have limited time and you only have time for a brief assessment, you might want to give traditional trails. I think there are situations like that.

Ryan Van Patten 15:29

Makes sense.

John Bellone 15:30

Yeah, I like the efficiency of the D-KEFS measures. Like you mentioned, we get lots of data from these tests and you're measuring both the different levels, different components and it's just more efficient because you get multiple data points from one test rather than just one score from these other measures. So I do like that. And like you said, we're tapping into lots of different abilities, lots of different executive functioning abilities - the switching, the capture stimuli, the processing speed demands. I'm curious if you could talk about the importance of comparing nonverbal and verbal executive functions because the D-KEFS does that well, too.

Dean Delis 16:06

That was another one of our main goals - to have a mixture of primarily verbal, primarily spatial, and a mixture of them. For example, in our Sorting test, there are ways that you can sort based on the words, so you have to use a verbal sorting strategy. You don't see that on a lot of tests. Like the Wisconsin doesn't have those words. Plus, there are nonverbal or perceptual strategies. And, again, rather than collapse those two aspects of the task into a single score, we generate subscores for those different aspects to parse out those abilities.

Ryan Van Patten 16:50

In my experience, clinical neuropsychologists tend to use the three heavy hitters of the D-KEFS - Color-Word Interference, Verbal Fluency, and Trails much more often than the other six tests - Word Context, Tower, 20 Questions, etc. I'm wondering if you have an idea or theories as to why this is and certain circumstances under which 20 Questions, Word Context, Tower, Design Fluency are very helpful clinically.

Dean Delis 17:17
Excellent question. Whenever you develop a test, you look at things you did that were pretty good and then things that you did that were not that great.

Ryan Van Patten 17:31
[laughs]

Dean Delis 17:32
You kind of look back and for the 10 or 15 years you have to wait until the second edition, you have to live with those aspects of the test that you wish you had done better. The tests have their strengths and weaknesses. I'll start with the good news, some of the better things that we did. One of the main aspects that I wanted to include in the original D-KEFS was to add as many switching conditions as possible. Basically, my logic for wanting to do that was, if you take two of the greatest neuropsych tests ever developed, Trails and Wisconsin, the fundamental aspects of those tests are switching, flexibility. They are so incredibly sensitive to frontal lobe dysfunction. You could do a Similarities item, "How are the two best executive function tests alike? Trails and Wisconsin."

John Bellone 18:43
[laughs]

Ryan Van Patten 18:43
[laughs]

Dean Delis 18:44
They involve flexibility of thinking, that's that answer. So I extracted that out. I wanted to add that to as many tests as possible. So we added it to Stroop, and that was Golden. That's [one where] switching was such an advantage. We added it to Design Fluency. That proved to be the best measure. Some tests, we didn't add it to, like Tower, and I wish we had because I think it would have made Tower test more sensitive. I'll tell you one thing about Verbal Fluency, when we were developing the switching condition, I was internally debating whether the switching condition should be between a category and a letter. So you would first say a category like musical instruments, and then you would say a letter like a letter beginning with the word L.

John Bellone 19:50
Or a word beginning with the letter L?

Dean Delis 19:52
Yeah. What did I say?

Ryan Van Patten 19:56
A letter.

Dean Delis 19:56
[laughs] Okay.

Ryan Van Patten 19:58
That would be a different switching task. [laughs]

Dean Delis 20:01
Thank you. Then I thought, you know, that might be just a little bit too hard. So I said, let's just switch between two categories. I'm glad we added a switching condition, but that switching between two categories isn't really that much more sensitive. It is more sensitive than straight category fluency but there's no doubt in my mind, if we had done switching between a category and a letter, that would be far superior, far more sensitive to brain damage because you have to switch your cognitive set, your whole mindset. Looking back, I'm glad I added that switching condition, but I cursed myself that I didn't make it between a category and a letter because I think it would make the test more sensitive. But fortunately, we're developing the D-KEFS-2 where we will have those new tasks.

Ryan Van Patten 21:02
Yeah, you've waited your 15 to 20 years. [laughs]

Dean Delis 21:04
[laughs] Exactly, exactly.

John Bellone 21:06
Make sure you don't make errors with this one, right? [laughs]

Ryan Van Patten 21:09

Speaking of errors, can you quickly touch on the significance and the difference between completion time and errors on a test like Trails, and what information we're getting through looking at errors in addition to a simple completion times?

Dean Delis 21:24

Definitely. completion times are, one, they're excellent measures. They're a great overall achievement measure. They can be reduced for a number of different reasons - or, I should say, your latency can increase for many different reasons. One, is just slow processing speed. Two, you're mentally making some errors but you're self correcting, or you're just going very slow but you're not making errors. Three, a processing speed trade off where a person has a response style of being super cautious, not making errors, and therefore going slower. Four, the person is making errors and every time they make errors, it adds more time. Five, impulsive approach where the speed-accuracy trade off is such that the person wants to go so fast, they're making a lot of errors. So time to completion is more of a general index that you really have to parse out the neurocognitive mechanism of why that is slow. But the error measures really get you closer to brain functions. If the person does make errors, they really do get you much closer to the mechanism of the dysfunction. So if somebody makes a lot of set loss errors, is going very fast, I mean, that's a classic impulsive approach where the speed-accuracy trade off is the person is tremendously sacrificing accuracy for speed versus other mechanisms.

John Bellone 23:15

So let's jump into D-KEFS 2nd edition then, which is in the works. I guess the first question is, how does it differ from the 1.0 version? We can look at this in terms of the normative sample, the administration and scoring, the subtests. I know one big difference is that it's fully digital. There's not going to be a paper and paper and pencil version. Right?

Dean Delis 23:37

Correct.

John Bellone 23:38

That's my understanding. So talk us through the 2nd edition, please.

Dean Delis 23:42

Sure. First of all, we've talked about developing the 2nd edition with my research colleagues at Pearson, namely Dr. Jim Holdnack and Dr. Lisa Drozdick, who've been working on this project for years with me. We have been strategizing. We have been thinking about the mistakes we made on the original, what we want to do with the 2nd edition and they've had some pressures in terms of how the tests need to be developed. But what we decided was we first did not want to do something which is commonly done currently where a test is brought out in both a paper-pencil form and a digital form. We did not want to put it out both in a paper-pencil and digital because, if you do that, you really limit what you can do in the digital format. Because if you are creating a test in a digital format, and you have to also be able to do it paper-pencil, you kill or greatly limit what you really can use the digital format for. So Pearson initially wanted me to do both and I lobbied extensively for just doing all digital. And Jim Holdnack, who was my original project director with original D-KEFS and Lisa Drozdick, who's been a project director and worked on a number of projects like the CVLT-3, had my back on that one with the higher ups at Pearson. We finally convinced them of that. So that freed us to really be able to develop tests that would maximize the uses of a digital platform and take it to a new level. Also, what we argued for, or pushed for, was that the paper-pencil test, since we're not going to be coming up with a newer version of the paper-pencil test, would always continue to be published. So unlike other tests, where once a new version of a test comes out, like the WAIS-V, in the end, the test publisher stops offering the WAIS-IV. The original D-KEFS will always be offered in paper-pencil. But by being freed from the constraints of having to come up with an equivalent paper-pencil, we've had freedom in test development. That is pretty unique and it has been very, very exciting. That has allowed us to try to take the assessment of executive function to a whole new level.

John Bellone 26:50

For full disclosure, Ryan and I just sat in a lecture of yours about the D-KEFS 2.0. So we have a little bit of insider info. We were both really impressed by the presentation.

Ryan Van Patten 27:01

Is there any other info you want to give? Examples of how you're capitalizing on a digital platform to increase sensitivity, to increase the ceiling and floor and make the tests better overall.

Dean Delis 27:13

Definitely. I'd be very happy to start talking about the test. We've been working on this test since 2011, believe it or not. We've done pilot studies with over 600 individuals and clinical groups. It's been a long road, but a very helpful road because it's allowed us to see mistakes that were made through these pilot studies and correct them. But I'm very happy to talk about the test. We've just about wrapped up our last tryout study of about 300 normals and clinical groups. We're going to analyze those data, do final tweaking on the test. The test should be going out to national standardization this fall. Also, we are going to be allowing any researcher who wants to start doing research with the test to have the opportunity to apply and start using the tests when we start standardization. In other words, when the tests are locked in, there's not going to be any more changes.

But here were our goals in developing the new test. We wanted to make sure that once we made these new conditions and new tests of executive function on a digital platform, we wanted to make sure that they increased the sensitivity of the test to detect subtle cognitive decline. We wanted to create tests, because they were administered only on an iPad, that you were able to capture a much richer variety of process data - errors and strategies and other process data. Another goal was, because there is instant automatic scoring of the test, we wanted to be able to come up with quicker discontinuation rules. So that if a patient is struggling on an executive function test, you don't have to wait 3 or 4 minutes to reach the discontinuation time, which can be torturous for both the patient and the examiner, but you can reach that much quicker. Then we also wanted to increase the ceiling so that our tests are for really high functioning individuals, really bright, high functioning individuals. It really can hopefully detect - that these tests are so hard that they challenge super high functioning people so that you can detect subtle declines in those areas. So that's what we've been striving for.

John Bellone 30:16

Seems like some of the new trials are going to be pretty difficult. So there's a distraction trial to the Trails, there's a working memory piece, there's a conditional switching piece. It looks really exciting. You said this is coming out in the fall or you're going to do the national standardization in the fall. When do you think it would be available to clinicians?

Dean Delis 30:38

I believe the target date is probably mid 2021, but I'm not positive.

John Bellone 30:45

Okay. Something to look out for.

Ryan Van Patten 30:47

Yeah, for sure. Well, we wanted to ask you a few questions about the CVLT. We've been talking a lot about the D-KEFS first. I just learned a few minutes ago that it was almost a BVLT, right? The Boston Verbal Learning Test. Kaplan wanted to call it the BVLT.

John Bellone 31:02

[laughs]

Ryan Van Patten 31:02

But you advocated for the great state of California. [laughs]

Dean Delis 31:06

Right.

Ryan Van Patten 31:08

Yeah. So a question that I have about the CVLT is, we're just going to assume people listening know a bit about the CVLT-2, could you talk about the CVLT-3 that recently came out and what's different? What are the updates?

Dean Delis 31:23

Sure. First of all, one of the goals is to always add or include new process measures that allow you to make finer distinctions between different types of memory disorders. So the 3rd edition was an opportunity for me to add new process measures that I've observed clinically in patients and wanted to get them in the test. One of the measures that we added, which I'm very excited about, we recently published an article on that, I think it was in JINS, Lisa Graves, one of my postdocs was first author on it, but it's an analysis of new intrusion subtypes on the CVLT-3. Over the years, in giving the CVLT-2 clinically, I've noticed two general patterns of how patients make intrusion errors. One pattern is what I would call a more frontal system error, where on the immediate recall trials, the patient says an intrusion. Usually, I think those early intrusions on immediate recall are elicited in frontal lobe patients because of some impulsivity and disinhibition. So that when they're recalling words from say, animals, semantic categories are activated and there might be some disinhibition in which they say a prototypical member of the

category, "dog", on the immediate recall trials. Then what I would notice is that once a patient with frontal involvement said an intrusion in a disinhibited manner on an early immediate recall trial, then they were vulnerable and very likely to keep saying that same response for the rest of the trials, for the rest of the test - it's locked in.

John Bellone 33:48

Yeah. And in the delayed recall as well. And recognition.

Dean Delis 33:51

Delayed recall, recognition. It's there, but it's the same word. It's not like they're giving a lot of different intrusions. It's just that one word, but they're just locked in on that intrusion.

Ryan Van Patten 34:06

Perseverating on it.

Dean Delis 34:07

Exactly. And so they could very well have a significantly elevated intrusion rate. But it was quite different than what you would see in a patient with more medial temporal involvement, like early Alzheimer's, that isn't just locked in on one intrusion but gives lots of different intrusions. Patients with more mesial temporal involvement tend actually not to give that many intrusions on the immediate recall, but it was on the delayed recall trials, especially on cued recall, where those cues really pulled for intrusions and a lot of different intrusions. So seeing this difference in the type of intrusion errors that these two general classes of patients made, I wanted to come up with a measure that would allow us to empirically assess and distinguish between these different mechanisms of intrusion errors. I came up with the idea of what I call across trial repeated intrusions versus across trial novel intrusions. So we now code intrusion errors on the CVLT-3 in terms of, if a patient generates an intrusion on short delay free recall and he or she has not generated that same response on any of the earlier trials, it's a novel intrusion. But if that person gives an intrusion on short delay recall and had given that same intrusion at least one other time on an earlier trial, then it was coded as a repeated intrusion. So we coded the intrusions in terms of whether they're repeated or novel. The new part of this is that it was the first time, clinically, a test was actually coding error responses, not in terms of that single trial that's occurring but based relative to all the earlier trials of the test. The first person who did this was David Lavone (?) back in, gosh, it was the early 2000s. He did this initial analysis which was brilliant. But anyway, so we code these words. We then went and we did a study where we

looked at Alzheimer's patients versus Huntington's patients - early Huntington's patients that have more frontal system involvement versus early Alzheimer's. And we found a beautiful crossover effect, where Huntington patients tended to give repeated intrusions and Alzheimer's patients tended to give a much higher proportion of these novel intrusions. So it increased our ability to distinguish between the memory disorders of those two groups.

John Bellone 37:22
I want to ask you something about test development, just generally speaking. Any words of wisdom you have for listeners who might be interested in test development -validation, standardization, psychometrics in general? What does it take to develop a test or a battery?

Ryan Van Patten 37:37
It's easy, right? [laughs]

Dean Delis 37:38
Yeah. [laughs]

John Bellone 37:39
Easy to put it together. [laughs]

Dean Delis 37:40
Exactly. [laughs] Right. The original D-KEFS, from start to finish, took us 10 years from when we first signed the agreement, the contract with PsyCorp to start developing it to when it first was developed. When we started planning the D-KEFS-2, we were all convinced this would only take like 3 or 4 years. We're at like year 9 right now. It is an extraordinary amount of work. I think the amount of money it takes to develop these tests, especially nowadays, is incredible. I think the D-KEFS-2 is probably going to cost 3 or 4 million dollars total when you look at all the pilot studies, the programming, the corrections, the national standardization, the data analysis. They're just a long process. But I do feel that more people should strive to develop tests. And, again, I think where people can really make contributions is by integrating different - not just staying within our traditional neuropsych paradigms, but going beyond that, taking principles from cognitive science and cognitive neuroscience and trying to integrate them into neuropsych tests. I think that's where there's a tremendous need to develop new tests.

John Bellone 39:13

I don't know, Ryan, I think our NavNeuro battery is gonna have to wait given the millions of dollars. [laughs]

Ryan Van Patten 39:18

Right. [laughs]

John Bellone 39:19

I didn't know about that. [laughs]

Ryan Van Patten 39:20

Yeah. So a more specific question about test design. Some of the tests in the D-KEFS, such as 20 Questions, might fit under the gamification umbrella. Can you talk about the advantage of creating neuropsych tests that look and feel like games and how that helps?

Dean Delis 39:40

I do feel that those are very helpful. That was one of our goals. Especially when you're dealing with children, I think those are very, very helpful. That was one of our goals with the D-KEFS Sorting test. It wasn't the right/wrong feedback. So whenever you can make it into more of a fun game or have more relevance that can be helpful. I'll tell you a little story about the original CVLT. We developed the original CVLT, Edith and I started working on it during my postdoc in 80, 81 and then we brought in my first postdoc, Joe Kramer, and another postdoc Beth Ober. But when we were developing it at that time, the field of neuropsychology was just taking off really. Lezak's first book came out in 76, that helped launch the field tremendously. The field was just taking off, but there still was a lot of resistance back then about memory and cognitive testing. There were a lot of neurologists that felt that neuropsychologists were intruding into their area. That's changed tremendously now. Now neurologists, almost uniformly realize what we offer, which is assessment of cognitive functions that they only assess crudely. But it was not uncommon to test patients, especially older patients, who said, "What's the significance of this? Why do this?" You don't get that now, hardly ever. Is that accurate?

John Bellone 41:33

I actually just got that this week.

Dean Delis 41:34
Okay. [laughs]

John Bellone 41:35
It was one of the first times I've gotten that to this degree, at least. But, yeah, I agree with you. I think, typically, people are pretty tolerant of these tests and find them useful.

Dean Delis 41:46
People now realize the importance of testing memory. Back then, you never heard about Alzheimer's in the media. People were always saying, "What's the relevance?" There was a general movement in clinical neuropsychology that you had to make your test ecologically valid. So that gets to your game question. So the first version of the CVLT, we were going to make it ecologically valid, and it was a shopping list. It was, "Let's pretend you're going shopping on Monday. I'm going to read a list of items for you to buy, blah blah blah." So that was one constraint we added to the test. But we had a whole bunch of other constraints, goals that we were trying to reach. We wanted to have a list of words where there were four categories. The words, as most people know, they're not presented together so we could assess semantic organization using a more active organizational approach. So we had four categories. And then another constraint we had is because we were using a categorized list, we couldn't have the four most prototypical members of the category on that list. Because there was a very important paper published right around the time we were developing the CVLT by Laird Cermak, who was a famous learning and memory researcher at the Boston VA back in the 70s and early 80s, who found that on categorized list, when patients made intrusion errors, they were almost always the prototypical members of the category on your list. So if you had the three or four most prototypical members of a category on your target list, when a patient made an intrusion error you wouldn't know if it was an intrusion or not. So we excluded the four most prototypical members of each category. But then we had this constraint that it had to be a shopping list and we had to have four categories. It had to be something you could buy, and it had to not be prototypical. So, like, one of our categories was spices and herbs. And so we had to exclude salt, pepper, I forgot the next two.

John Bellone 44:23
Cinnamon.

Dean Delis 44:24

Yeah, exactly. We were really struggling to find words that were something you could shop for. And we finally had to settle on one word, paprika. So that was on the original CVLT. Now, again, we're trying to make this relevant, but paprika is a very low frequency word for some populations, especially some male populations.

John Bellone 44:57

[laughs]

Dean Delis 44:57

And I can't tell you the number of times I administered this CVLT and the person went, "Peppa Rica, what the heck is that?"

John Bellone 45:06

[laughs]

Dean Delis 45:06

Every time I administered the CVLT and I read the word "paprika", I shuddered. I hate that word. I remember testing one lady once [and] every time I read the list, she stopped and said, "That's the screwiest shopping list I've ever heard."

Ryan Van Patten 45:29

[laughs] What are you making? What are you cooking with that?

Dean Delis 45:31

[laughs] Yeah. So I'd read the list again and she'd pause and say, "That is the stupidest shopping list ever." So finally, she said, "Who in the hell developed this test?" And I said, "Well, actually, I helped develop it." And she goes, "Oh, I'm sorry." [laughs] But I did say, "You're right. This is kind of stupid." So going back to your question about game-like or ecologically relevant, I actually feel that that's less important nowadays because it can get you in some boxes.

John Bellone 46:05

So Dean, you mentioned Edith Kaplan a few times, I'm curious what it was like to work with her. I know if listeners probably have heard her name, but maybe not much about her. What was it like working with her?

Dean Delis 46:18
Working with Edith was one of the greatest experiences of my life. She was one of the most brilliant persons and clinician. Her clinical acumen was astounding. She was so fun to work with. She was as wild and disinhibited a person, if you can imagine.

John Bellone 46:43
I saw a picture of her desk and it gave me a lot of anxiety. [laughs]

Ryan Van Patten 46:47
Papers piled up into the ceiling for all the articles she had written.

Dean Delis 46:50
Exactly. It was always total chaos when you worked with Edith, but it was so fun. It was just a blast. I viewed her as really one of my best friends. But it was really her brilliance and her generosity. She could never say no to any student. I was in some low level clinical psychology program. When I started graduate school in clinical psychology, I never heard of neuropsychology. I got interested in it and I wrote Harold Goodglass and her begging, "Could I come out and start training?" She accepted any student who wanted to work with her. She lived and breathed neuropsychology. She would stay in her VA office till 11, 12 o'clock at night supervising interns and postdocs. When I first went there as a summer clerkship, I was the low person on the totem pole. There were postdocs, there were interns, and then there was me - she just took me in as a summer clerkship. I would have to wait till 10, 11 o'clock to get supervision from her from a case I saw because she had this huge line of other students. A lot of times, I would have to also, like all the students who've ever worked with her, if you waited till 9, 10, 11 o'clock at night to start getting supervision, you might have to take her Chinese food to eat, pick up laundry, run errands with her, but that's how you get your supervision.

Ryan Van Patten 48:37
Wow.

John Bellone 48:38
Yeah, it's awesome.

Ryan Van Patten 48:38

Yeah. Her passion, intensity, and love for neuropsychology is really inspiring. Which reminds me when talking to you about test development, Dean, and I wanted to just say thank you for all of your work and time and effort put into developing these tests that we as a field benefit from so greatly. I know it's been a lot, but we really appreciate it.

Dean Delis 49:01

That's awesome. Thank you.

Ryan Van Patten 49:03

So now we can transition. We just have a few bonus questions which are not specific to D-KEFS or CVLT, or even test development necessarily, just about the field of neuropsych in general. So go in whatever direction you want. The first question is, if you can improve one thing about the field of neuropsychology, what would it be?

Dean Delis 49:22

I think we can always improve our testing instruments because that's really the whole foundation of our field. I think also, a lot of people have talked about this, but one of the great things about our field is that we're constantly striving to draw conclusions on as rigorous an empirical basis as possible. That's the beauty of our field. But one of the areas probably that is in greatest need of improvement, even more so than test development, are taking the results of our cognitive tests and drawing conclusions about the implications of these findings for this individual's everyday functioning. As neuropsychologists we are the best experts to be able to address the question, "How does this person's cognitive strengths and weaknesses impact his or her ability to perform activities of daily living, to be able to return to their former job, to a different job?" There's no professional that's in a better position to be able to draw those conclusions than a neuropsychologist. But our ability to draw those conclusions still needs a tremendous amount of empirical research and data. Unfortunately, we still often rely on a subjective interpretation. "This person's switching score is a scaled score of 5, can this person drive?" And again, we are the best experts to draw that conclusion, but if there's one area that's probably most urgent now in research is developing empirically-based methods to help us draw those kinds of conclusions.

John Bellone 51:37

What is one bit of advice you wish someone had told you when you were in training, or that someone did tell you that really made a difference? Just an actionable step that trainees can take.

Dean Delis 51:48

In terms of becoming a neuropsychologist or practicing neuropsych?

John Bellone 51:51

Anything that would be helpful to a student.

Dean Delis 51:53

Well, I think, one, I think our training in general is very solid. I think, again, our field is so empirically based that our students come out very solid, very empirically based. I think one area where we come out unprepared out of graduate school, is in the forensic arena. We typically don't get training in that area. It's kind of like, you just sort of learn in a painful way sometimes. But I also think, I know the forensic arena is a controversial area, in some ways, but neuropsychologists play such a critical role because we offer a service that no other medical doctor or other expert can address - a person's higher level cognitive skills, how they've been affected, say, by an accident, and how it's going to affect their lives. And so, neuropsychologists really play a critical role in helping to address those questions. But we don't get really adequate training in how to deal with that world, and so it can be a painful process learning it. It would be nice if we had better training. On the other hand, organizations like the American Academy of Clinical Neuropsychology or NAN do offer a lot of workshops and trainings that can be invaluable.

John Bellone 53:43

Students can pursue that on their own until graduate schools start incorporating this into their curriculums. Students can go to the seminars, they can read books - there are several good books on forensic neuropsychology. They can consult with neuropsychologists who are already in the field. Yeah, good.

And then one last question for you. We covered trainees and advice for them, I want to just finish up by asking about early career professionals. And specifically, the healthcare landscape is changing rapidly, we want neuropsychology to remain relevant and useful for decades to come. Once we're established as

neuropsychologists, what are some steps that we can take to ensure we continue to provide cutting edge scientific and clinical services?

Dean Delis 54:27

I don't know if this answers your question. Let me know if it does. The recommendation I have for early career neuropsychologists is that I think it's always important to keep doing clinical neuropsychological exams because you learn so much. But if you have the opportunity, when you're early in your career, to do as much research as possible, I always tell early career neuropsychologists, maximize your research at that stage of your life. If you can make it clinically relevant research, that's even better. If you can incorporate your clinical neuropsych practice as part of your research, that's probably the best. But really put most of your focus on your research rather than clinical work early in your career. Once you go into clinical [work], it's almost impossible to go back to research. But if you do research for 5, 10, 15 years, it's actually very easy to transition into clinical [work]. That's an easy road. But once you leave research, usually it's gone. So I always suggest to early career neuropsychologists, do as much research as possible, write as many papers as you can. That actually builds up your resume so that it gives you more status when you want to do more research later in your career as well.

Ryan Van Patten 56:20

Good advice.

John Bellone 56:21

Well, Dean, thanks so much for all your time today. It's been a really good conversation.

Ryan Van Patten 56:26

Yeah.

Dean Delis 56:27

It was fun.

Ryan Van Patten 56:27

I appreciate it.

Dean Delis 56:28

Thanks for inviting me.

John Bellone 56:29
Of course.

🔊 **Transition Music** 56:29

Ryan Van Patten 56:34
Well, that does it for our conversation with Dean Delis. We hope you enjoyed it as much as we did. Before we end we'd like to share a bit more context about the D-KEFS 2.0 and CVLT-3, because unfortunately, we didn't get to grill Dean quite as much as we would have liked to. So I'll begin by re-emphasizing that the 2.0 uses a purely digital interface. In other words, there will not be an accompanying paper-pencil version. In lieu of that, the original D-KEFS 1.0 will continue to be made available. This fact that the 2.0 will be entirely digital is incredibly important because the test design is constrained whenever you have to make a computerized test compatible with a paper-pencil format. There's just so much flexibility in terms of stimulus presentation on a screen. It's really unfortunate when we lose all of that in order to maintain a companion paper-pencil version of a test. With a digital presentation, stimuli can appear and disappear, they can move around on the screen, you can add auditory distractors, and other things. By creating a fully electronic test, Dean will be opening up all of these options.

So now I'll mention a few of the specific goals of the 2.0 relative to the 1.0 and other neuropsych tests. First, it will increase efficiency by providing automatic scoring and norming which occurs immediately after test administration. This obviously saves time that would otherwise be spent hand-scoring, but it also allows clinicians to make better decisions on the fly and saves everyone the torment of continued failure on a test. For example, if the patient is really struggling and earns a scaled score of 3 or 4 on a low level item during Trails, you can just discontinue right there. Of course, this was possible before the 2.0 but it was more difficult because clinicians were not provided with norms immediately after the completion of a test so they had to make judgments based purely on raw scores and behavioral observations.

Second, the 2.0 will raise the ceiling of the tests, allowing for the assessment of high functioning people such as physicians and pilots, and allowing for the detection of very subtle cognitive inefficiencies. John and I can attest to some of the new conditions on tests such as Trails, which has a new distraction condition, and the Tower test, which will include a switching component. Finally, new measures of

processes, strategies and errors will be included. And the examiner's cognitive resources will be free from tasks such as keeping up with a patient during the Tower test, in order to allow for better behavioral observations.

John Bellone 59:31

I'll just briefly mention a few aspects of the CVLT-3 that distinguish it from the CVLT-2. I know that the 3 has been out since late 2017, but people are sometimes slow to adopt new versions and therefore might not be aware of the differences. Dean had mentioned that there are some new process scores to evaluate error types across trials. There are now T-scores reflecting education and sex based adjustments to the core and process scores. Although the word lists are unchanged between the 2nd and 3rd version, the 3rd version includes updated norms from a national standardization sample of 700 individuals. The 3rd version can be scored online using the Q-global platform. They also modified the recognition and forced choice tasks. And there are a few other minor changes relative to the 2nd version, which you can find in the manual or online.

Like we said in the intro, we don't have any conflicts of interest to disclose here. We don't get any compensation from Pearson. We know that the D-KEFS and CVLT are very common tools for many neuropsychologists and we just wanted to share some information about them here. So thanks again for listening and, as always, join us next time as we continue to navigate the brain and behavior.

🔊 **Exit Music** 1:00:57

John Bellone 1:01:21

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Ryan Van Patten 1:01:32

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