

**Lauren 00:11**

Welcome to The LDA Podcast, a series dedicated to improving the lives and education of all learners. This week, we sat down with Dr. Anneke Schreuder, the founder of Math and Dyscalculia Services, to learn more about dyscalculia, the importance of early detection, and more.

**Kristina Scott 00:35**

Hello, everyone, I'm here with Anneke Schreuder. She's the founder of Dyscalculia Services. This is an organization she founded in 2010, to raise awareness of dyscalculia and assists parents to support their child's learning. She is a Dutch medical doctor, pediatrician and neonatologist and earned her doctorate in the field of developmental epidemic epidemiology. Thank you for joining us, Dr. Schreuder.

**Dr. Anneke Schreuder 00:59**

Well, thank you so much for this opportunity. I really appreciate it. I also appreciate the LDA giving me the opportunity to speak about children who really need to help. Those who have dyscalculia do not always get the help yet.

**Kristina Scott 01:14**

So I there's I think we hear so much about dyslexia, not, really rarely anything about dyscalculia. Why is that? And what should we know?

**Dr. Anneke Schreuder 01:26**

Well, that's definitely a thing. And dyslexia is already around for, I think, 35, 40 years, everybody knows about it. Everybody picks up on the symptoms, if there is a child in the classroom that really struggles with learning the alphabet, learning the letters, learning the sound combinations, and doesn't have proper phonological awareness, or later on when he has learned to do the decoding is struggling with comprehension, then older people start thinking, hey, this might be dyslexia, let's get this child tested. And maybe we can help him. And there's a lot of dyslexia tutors around that do a fabulous job. It's a really research-based intervention. There are many schools and I personally come from Houston, we have the Nios Institute, and we have UT Texas, where teachers are being educated so we can reach out to those students and help them get proficient in reading, writing and spelling. Now, what you bring up is really a point that resonates with me very deeply. Because when I came here, I also worked as a dyslexia tutor. And I decided that it was more important to start learning about dyscalculia. And for two years, I didn't work, I was only in the library and online, and reading about the research. I really love research, you already mentioned my background. And I came to the conclusion that there are many, many students here that do not get help with dyscalculia. It's so unknown, yet that I actually did a talk once about the forgotten learning disability, obviously dyscalculia. So if nobody thinks about the necessity of testing or screening, then without the diagnosis, there is no help for those students to get help. And previously, there were not that many intervention strategies available, there is still not one big research-based intervention that everybody can use. But we have really made progress and that helps in that area. So it starts to be really useful to now test those children because there are options, we start to understand what we can do for them, how we can help them, which methods and materials are really useful, and what approaches we can give them.

**Kristina Scott** 04:24

So what are some of the approaches that you can give students?

**Dr. Anneke Schreuder** 04:28

One of the approaches...let me start, you mentioned the comparison between dyslexia and dyscalculia. Now, many states have a mandatory screening for dyslexia, kindergarten and first grade. And that is fabulous. That is really big progress made by the dyslexia lobby so to say now, we also need to have the same for dyscalculia. You can pick it up at this same age as dyslexia, the markers are already there actually, a lot earlier, we can see those students, those little babies at the age of six months will react more or less to a quantity to numerosity, that those who do not really react so much to different quantities and also small quantities, obviously, two dolls, three dolls, do they see the difference? You can already discriminate between the kids who will have problems in math later on, and those who will sail through the programs.

**Kristina Scott** 05:39

Are you doing that through fMRI or is that just a visual kind of thing?

**Dr. Anneke Schreuder** 05:43

This is a behavior screening, where you put the six month old baby in front of the screen, and babies at that age get bored very quickly. So what you need to do is you can use that novelty, then they start looking at it as a research tool. So you show them several times, say a dot pattern with a certain number of dots. And they get bored, they don't look at it anymore. And then on one side, you show a card with a few dots. And at the other side a card with a different number of dots. That's the novelty. And you immediately see because the researcher is behind the screen and looks through a little hole, sees the baby looking at that other screen because there are more or less dots than he was used to. So that's interesting. At that moment, we know that he did see the difference. Also, there is a very interesting test of this done by little puppets. And we have a screen in front of the puppets. And we kind of fool the kids and secretly take away a puppet. Or we put a hand in there. And we do as if we add an extra puppet, then the screen goes up, we remove the puppet again. And so he sees two puppets, well, he was expecting three. And those kids that really look with big eyes like 'what's going on here? That's not what I expected.' Though, then you see that they see the difference between two and three little puppets. So that's already at the age of six. And that tells us, and I think it's very important for both parents and teachers to hear this, that this is an innate biological issue. You can see it on an MRI machine and the best on functional MRI like you mentioned. So it's not a thing that goes, that comes on later because the parents didn't play enough math games at home or the teacher didn't give them the proper textbooks in school. It was already there before they entered school.

**Kristina Scott** 08:03

So it's neurologically based.

**Dr. Anneke Schreuder** 08:05

It's neurologically based. Yes, absolutely.

**Kristina Scott** 08:09

So is there, I know we know a lot about dyslexia in the neurological basis. Are the brainwaves similar in individuals with dyscalculia? Or is it different parts of the brain that light up or not light up?

**Dr. Anneke Schreuder** 08:23

Yes, different parts of the brain light up. One very important area is the intraparietal sulcus on both sides of the brain. It's above your ear, so to say. Then, obviously the language centers where you store your counting words, and the visual centers where you learn to read the numbers, the Arabic numerals, and also where you see a multiplication sign and addition sign and also the place where we write numbers. So these three centers are the specific centers, the number sense center here at the intraparietal sulcus, then the language center for the counting words, and the visual center to look at the math question that you are working on. These centers all need to work, and they need to work together. Now, unfortunately, that is not the whole story, because many more areas in the brain actually help to do math. Attention span is very important, memory comes to mind. Processing, not only processing speed, but temporal processing, what comes after the other, seeing the order of things. So these are brain based issues.

**Kristina Scott** 09:56

So we know that different areas of the brain light up or don't light up, and then we also know from some neuroscience that the brain has some plasticity. So, how do we kind of give our students strategies in order to help them?

**Dr. Anneke Schreuder** 10:16

Yeah, you mentioned brain waves. Sorry, I didn't mention anything of the sort. What we in this field, mostly use are the functional MRIs, where you see what area of the brain takes up the biggest blood flow, and by that gets the most oxygen and the most glucose, the most feed before your brain cells. And if both children and adults who are in this functional MRI machine doing some math problems, you can see what areas of the brain they mainly use. And yes, plasticity is a very interesting phenomenon. When I was in medical school way back when we learned that you're born with a certain number of neurons and connections, and that's what you have to live with. Now, luckily, that has been overturned. And we know now that the brain, the younger you are the more, but also for adults, you can change your brain, there is a big possibility for learning that comes later. If it's not inborn, then you can, with a lot of time and effort investment, but you can learn more strategies. You can even learn, one of the hallmarks of dyscalculia is not being able to subitize numbers. So we sit here at the table, imagine we have three or four people around the table, we immediately know there are four people. We're not counting them one by one, that's called subitizing. That's one of the skills abilities that students with dyscalculia are not so good at. I'm not saying they can't do it. But they can do it for smaller numbers, it takes a little bit longer. And often they make a little bit more mistakes. So it's a gradual difference. Also, they lack in approximate number sense. That's another of the number sensibilities here in your intraparietal sulcus. If we compare two groups of quantities, say, two plates of Oreo cookies, some kids immediately know which plate to choose, because they like the most Oreo cookies. But kids with dyscalculia do this a little bit slower, it's harder for them, or they sometimes pick the wrong plate. So these two things, you can also see that in an MRI machine, these two activities are less well developed. But by training, like you mentioned, the plasticity, you can train both these abilities. And that is obviously what we want to do as quickly as possible. And we see that some of those basic neurological problems

are still deficient, to help those kids as quickly as possible when the plasticity is really super, at a young age, to get that in place.

**Kristina Scott** 13:49

So it seems like a lot of the number sense skills that you just talked about are skill sets that students learn at an early age and then they build off of them as the curriculum becomes harder and harder and math. So it seems critical that students receive interventions or receive supports and strategies at a particular time period. When is the best time, and how do we diagnose and start the process early?

**Dr. Anneke Schreuder** 14:18

Well, you actually hit the nail on the head there. Math is a very sequential topic, one concept builds on the other. So if you lack in your basic skills, then the rest becomes a real big jump. So the earlier the better. And we do screenings, and there are several screenings available, one is free, one is not very costly but you need to pay for it. And you screen children in kindergarten. In kindergarten and first grade you already can weed out those kids who are in the lowest 10 percentile that you can predict that they are at risk for developing issues in math. It's a little bit difficult to at that age diagnose by behavior studies only, to see if they have dyscalculia or not, but you definitely find those who are at risk. And I feel you need to catch them as early as possible, nip the problem in the bud, because we cannot afford to let it slip. If you let it slip longer, those kids are further behind, and they lose their self confidence, they start not to like math, those kids actually need more practice in math, but because now they start to think they can't do it, they don't want to do it anymore. So instead of more practice, what they actually need, they wiggle themselves out of the practice. And then they fall behind further and further. It's a real downward spiral. And if you don't pick them up, say in third grade, you have a much longer intervention time to get them back on the rails than when you start to help them early on. And third, fourth grade is usually the time that those kids who have used strategies to work themselves around the real math concepts start to crumble. Then they cannot hang in there anymore just based on rote memory. And the third grade, beginning fourth grade, you really need to understand what you're doing, all the fractions come in play. I'm not even saying the decimals and the percent that come a year later, those things cannot be grasped by those students who have not had the help of the basics in first, second and third grade.

**Kristina Scott** 17:00

So you say we can screen this at the kindergarten level? What are the screeners that would be used and are you seeing districts use these?

**Dr. Anneke Schreuder** 17:08

I do not see districts use these. One that is very simple is the numeracy screener that's developed in the lab in Canada by Daniel Ansari and several of his students. It takes only two minutes to do.

**Kristina Scott** 17:29

And it could be part of the whole kindergarten screening process.

**Dr. Anneke Schreuder** 17:32

Absolutely. Then you have the early numeracy indicators from the University of Minnesota, that takes a little bit longer, and it's five minutes per child. And it is very well laid out, where you get all the materials from their website, so well done. And you can train parent volunteers to do it, because you need to do it meticulously, exactly according to the guidelines, and you need to time it exactly. Otherwise, obviously, you won't get the right data. And then you have the 10 Tests of Early Numeracy, they all go from kindergarten to second grade. 10 is at the AIMSweb. That's a thing you need to pay. And all of these, I feel, are really helpful. I have some private schools that I work with that have more leeway, more freedom to choose what they do, instead of a complete school district, which is obviously more organized top down and then before the whole decision process is finalized, and something comes into action that takes more time. Well, the lines are shorter in smaller private schools. So there are several private schools I work with that I suggest they can use these screening tools.

**Kristina Scott** 19:00

So you note that we're using a dyslexic screener, and pretty much lobbyists kind of mandated that. Is there legislation that this dyscalculia screener would be used nationally at some point or is that still in its infancy?

**Dr. Anneke Schreuder** 19:17

I'm afraid the rules to screen for dyscalculia are still in their infancy. If I remember correctly, West Virginia is currently talking about adding dyscalculia into the legislation that's already there for dyslexia, so well done West Virginia. I hope more states will follow. Obviously, it's mentioned in the DSM-5. So we have both the 504 plans and we have the IDEA where the diagnosis of learning disabilities has been described. And luckily, there are now two mentions that are about math or five about language. Two about math that specifically mentioned math calculations and math problem solving. Some can be diagnosed with a deficiency of one or the other. But I also see students that are diagnosed with both of them together. Now, what is an important difference in the IDEA of 2004 is that for the diagnosis of learning disability, the states do not need to use the severe discrepancy methods anymore. So previously, when a student was lucky enough to have a good mental development, and was able to find strategies around the issues in math, then that student would be eligible for help. But other students who might have the same problems in math, but might have been a little bit less lucky, in the score of their mental development, could not have that significant discrepancy between their overall mental development and their functioning in a specific area of education, and they were not eligible for help. Well, those kids also lack the flexibility to use strategies to compensate for it.

**Kristina Scott** 21:39

And back then really, it was a wait to fail model, you just have to keep going up in grades until the discrepancy was large enough to then qualify.

**Dr. Anneke Schreuder** 21:47

Exactly. You say that it was, but I wish it was because I still see it happening around Texas. There are still a lot of methods in school districts that say we need to wait till the student is failing. And by then we might do something.

**Kristina Scott** 22:12

And by then they can't even access the curriculum for math anymore. Because the basic number sense has then been moved on from and they're asking for higher level skills in math.

**Dr. Anneke Schreuder** 22:22

Absolutely. And then it's really, really hard to help those students. So there are some students, which obviously is a difficult thing in a school district, but some charter schools or private schools are more open to a flexible solution. Say, well, temporarily, we need to do another curriculum, either a one on one tutoring or an online program grant or combination till this student is at a level that he can benefit again from the regular classroom instruction, because now they are actually completely losing their time because it goes over their head and only sparks anxiety.

**Kristina Scott** 23:07

Yeah, and if they can't access the curriculum in Gen Ed, why be in Gen Ed where you could get the remedial instruction in order to...once it's developed, then actually access the curriculum.

**Dr. Anneke Schreuder** 23:19

Yes, yes.

**Kristina Scott** 23:20

So what are some resources for those individuals that want more information about this topic?

**Dr. Anneke Schreuder** 23:25

Well, we have dyscalculia headlines where we post on a daily basis everything that's in the news, and also some research. We do a weekly podcast about that. And on my website, I have a lot of information. I also have free resources that I keep building on. We do a weekly podcast, we have a series of five podcasts right now that take between three quarters of an hour and that gives you an overview. And we have a course, it's called Dyscalculia Awareness, which is geared to teachers, counselors in schools. And you need to fill in a few questions afterwards if you want to get certificates of participation for the continuing education hours, and then our really big project is after 10 years and now sharing what I have learned, I've picked up a lot of things in standardized programs. One of the programs that I definitely like to mention is The Dyscalculia Solution by Jane Emerson and Patricia Babbie in London, and they do a fantastic job. And they have written a guideline that also comes with an overview to weed out the specific gaps that a student has. But there are many other resources that I've pulled together, I'm really lucky, coming from a very small country where there's a lot of emphasis on learning languages, because nobody will ever learn Dutch because we are so small, we're a stamp on the on the earth, so if you want to do some trading and so on, then you need to learn other languages. So I also read French and German. And in Canada and in Germany, also in Austria, I can mention a lot of names that I can draw information from, there's a lot of very good instructional material coming from New Zealand. And I've tried to put it together and make an individual program for each student based on the needs they have. And after doing that for 10 years, I have made a lot of videos to share that with teachers who want to become independent dyscalculia tutors themselves. I can guarantee them, there's plenty of work.

**Dr. Anneke Schreuder** 23:25

Yeah, again, like, you hear so much about dyslexia and very little about dyscalculia. And we know that our students struggle in math and the struggles in math lead to math anxiety lead to shutting down, all of which,

**Dr. Anneke Schreuder** 26:23

Actually, there was a really large research in the UK, in 2008, where they figured out not only missing out in education, but later on missing out in job opportunities. So they compared average incomes for people who had dyslexia, and they were kind of missing out 84,000 pounds overall in their career. But the students and the people that they followed up later on who had dyscalculia, they missed out on 114,000 pounds. So it's even a bigger influence. Now, it might be that dyslexia is so much more known, there's so many more apps that read out websites for you to help with books and so on, that people with dyslexia are already better able to cope with their issues. Also, neurodiversity organizations who try to help people get a good job are all knowledgeable about dyslexia. There's a lot of employers who already know what to do. You have the spell checker and you've Grammarly and all types of things. There's more acceptance for it, if you know one of your colleagues has dyslexia and makes a strange spelling or error in a meeting report, then there is a lot of acceptance for that. But for dyscalculia, for some other learning disabilities also, because it's so unknown people are afraid to hire people who have dyscalculia. And also, if you mess up the finances, your own finances, or the finances of your department, that's kind of the end of your career. So career wise, it's not only education, but career wise, these people are really at a disadvantage. And I feel we need to help them. Also for the economy in general, we cannot...those are people who have skills, who are valuable for our society, we cannot leave them out.

**Kristina Scott** 28:51

And unless we start screening, and unless we start providing early intervention services, we're basically setting up a pathway to leave them out. So I love what you're doing and all the resources you provided, because you're giving teachers, parents, school administrators, the resources in order to start making a difference. And thank you for that. I really appreciate it.

**Dr. Anneke Schreuder** 29:13

Thank you for having me.

**Kristina Scott** 29:14

Yeah. Thank you for sharing this conversation Dr. Schreuder, I really enjoyed it.

**Dr. Anneke Schreuder** 29:19

Thank you so much.

**Lauren** 29:20

Thank you for listening to the LDA podcast. This series is made possible by The Learning Disabilities Foundation of America. Our theme music is little idea by Scott Holmes. For more resources from LDA visit [lda.org](http://lda.org).