

Brain Building: Supporting Children's Early Brain Development

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Dawson Nichols: Hello and welcome to "Research on the Go," a podcast where we explore some of the latest research in the field of child development, and then we talk about its implications and its practice applications. My name is Dawson Nichols, and I'm here with ...

Amelia Bachleda: Amelia Bachleda. Great to be here with you today, Dawson.

Dawson: Thank you for joining me. We are both from the National Center on Early Childhood Development, Teaching, and Learning, and we are both based at the University of Washington at I-LABS, the Institute for Learning and Brain Sciences. Today we want to talk about an aspect of development that supports all developmental domains, and that is brain development.

Amelia: Yes, one of my most favorite topics. I'm so excited to get into to it today.

Dawson: Well, me too, and it is so important in these first few years of a child's life. There is so much going on in there, so let's start with just sort of an overview of, what is happening with a child's brain in these first years?

Amelia: One of the things that I like to get out of the way, right off the bat, is that it's really important to say that we learn throughout our lives. We're always capable of learning new things, adapting to new situations. Even as adults, our brains our really incredible.

Dawson: And we like learning things even as adults, and we build the foundation for that later learning when we are children, which is another reason this is so important.

Amelia: Absolutely. Yes. Even though, yes, we can learn throughout our lives, we're all here to talk about children's brains, right, because they are amazing. They are particularly flexible and open to learning things from their experiences. To understand why this is the case, I think it would be helpful to think just a little bit more about the biology of the brain. We promise that it's not going to be too scary.

Dawson: Not too scary, but we can start with an interesting fact, and that is that when a child is born their brain is already about 25% of its adult size.

Amelia: That's pretty big.

Dawson: Which is large. If my body had been 25% of its adult size when I was born, I would have been a 40-pound baby.

Amelia: That's a large baby.

Dawson: Yes, and I'm glad I was not quite that size, and my mom was even more glad.

Amelia: I bet she is. Our brains when we're born are about 25% of their adult size, but they continue to grow and quickly. By the end of a child's first year of life, their brain has already grown to about 70% of its adult size. That is an incredible amount of growth in just that first year of life. And by the time a child is 5, their brain is about 90% of its adult size, and this is where I always like to make a little note that is very important. While the brain is 90% of its adult size, it doesn't mean that the brain is 90% done or 90% developed. There's still a lot of brain development to go.

Dawson: I think that's such an important point. That, yes, it has grown, but there's still a lot of development that's going to happen. Let's expand a little on what is happening in the brain during these early years.

Amelia: OK. One of the things that is happening is that the cells in a child's brain, or the neurons, they're making connections. When we're born and our brain is 25% of its adult size, it already has most of the brain cells or neurons that we'll ever have, about 86 billion.

Dawson: And, folks, that is billion with a "B."

Amelia: Billion with a "B," right. That's a lot of brain cells. And the neurons in our brains and also in our bodies, we have 86 billion neurons in our brains, but we also have neurons throughout our bodies as well. I think sometimes those get forgotten. We've got neurons in our brain and neurons in our body, and together, these neurons form a communication network, and they share information via those connections that we were talking about, and those connections are called synapses. You've got neurons in your brain, neurons in your bodies. They are sharing information through connections that are called synapses. You can think of this whole system as your body's very own communications team, which is pretty cool.

Dawson: I love that. Yeah. I like the idea that I have my own communications team. That's incredible. Let's talk about how this communications team makes connections and starts this communication.

Amelia: Right. This team is working for you all the time. The sensory neurons that we have all throughout bodies, in our eyes, in our nose, in our skin, they are taking in information about the world constantly and relaying that information to the brain, and then the neurons in our brain, they decide how to respond to any given situation.

Dawson: Right. This is where it gets kind of complicated, right? Let's talk about how these responses are made, how these connections are made in the brain.

Amelia: Right. We are born with some of those connections already in place, but not all of them, and this is the really cool thing about the brain. Every time you learn something new, if you're listening to this podcast, hopefully this is happening in your brain too. Every time you learn something new, your brain either makes new connections between the cells in your brain

or it strengthens the ones that you already have. And while we're born with most of those neurons, like talked about, do you remember the number, Dawson?

Dawson: 86 billion.

Amelia: 86 billion. We don't have all of those connections formed yet. And what this means, is that our brains, they are literally shaped by the experiences we have in our lives. Every experience we have, that helps to create a brain that is uniquely our own. If you think about a brain – your brain and my brain, Dawson – they probably, from the outside, look pretty similar, but at the microscopic level, the experiences that we've each had have shaped our brain. They've set this foundational architecture that has helped us each throughout our lives – has set up for a life of growing and developing and connecting. And it's incredible how these early experiences that we have set that foundation for the rest of our lives.

Dawson: Yeah. There's lots and lots connections being made during these early years.

Amelia: Absolutely. Right? Children have so much to learn in such a short period of time that their brains make these new neuronal connections at an incredible rate. The latest estimate is that between ages zero and 3, children's brains make about 1 million new connections each second.

Dawson: 86 billion neurons making 1 million new connections every second. My brain can't even comprehend numbers that large.

Amelia: It's incredible, and I think that's one of the things about studying the brain. We're using our brains to study the brain, and it can get pretty tricky sometimes.

Dawson: It's that hall of mirrors. How do I see this?

Yeah. But we're making these connections in response to experiences, and every time we have a new experience it helps the neuron either strengthen a connection that's already there or develop a new connection. And I understand how that happens with experiences that we have again and again and again. The neuron can learn to make those connections and strengthen them, but I would love to talk a little bit more or have you talk a little bit more about infrequent experiences, experiences that we don't have so often. How does the brain handle those?

Amelia: Right. Yeah. It's a great question. And interesting thing happens in brain development. We've been talking about our brains are making so many connections so quickly – 1 million new connections each second. That's a lot of connections – that our brains actually overproduce the number of connections. A 3-year-old's brain, they have about twice as many connections as are in an adult brain.

Dawson: Which is counterintuitive.

Amelia: Yeah. People are often surprised by that.

Dawson: Twice as many connections as an adult brain, which makes me think this child is developing all of these options. I was reminded of this the other day when I was looking at my phone, and it gave me nine different ways to get to the place I was trying to go. And it was too many, and it made me think of this exact situation, that the brain is developing these options, but that isn't necessarily the most efficient way of navigating the world. Is that a fair analogy?

Amelia: Yeah. I think as children, we're trying to figure out, fundamentally, who we are and our place in the world. When we're born, we don't know yet what language we're going to speak, what foods we're going to enjoy, who our family is, what our community is. Every experience we're sort of – our brain is sort of trying to grab, “Is this it? Is this it? Is this important?”

What is it that's going to sort of make that foundational architecture, the fundamental essence of who we are? Our brains are designed to pull in all that information. And the information that we use often, those experiences that happen over and over, those results in those stronger connections in the brain. And the experiences that we have infrequently or just every once in a while, we don't end up needing those. That makes for a brain that's less efficient, less defined. Our brains go through this process called pruning, where the connections that we don't use very often, those are removed, and this allows the neural connections that we do use to become stronger and more efficient. It would be like if your route setting app just gave you two choices instead of 10. But this also means that the experiences that we have when we're little, those are particularly influential.

Dawson: Absolutely. Absolutely. This reminds that I wanted to ask about negative experiences, which can be really – really important. How do those affect brain development?

Amelia: Right. We've been talking about how our experiences shape our brains, and our brains work to adapt and develop patterns of response that allow us to survive and hopefully thrive in whatever environment we're in. When a child is routinely exposed to something, like violence or neglect, they're going to develop neural connections and behaviors that allow them to survive in that environment, to adapt and develop behaviors that help us get through those really tough times.

For example, a child might learn that it's dangerous to communicate their feelings, so they might not share that information. Or they may learn to be very quiet and to try to stay out of the way. And those are the very same behaviors that make it more difficult for them to survive and thrive in a learning environment, right? We want children to be able to express their needs and their feelings, to feel safe. But those behaviors, even though they're not exactly adapted for that learning environment, they were adapted for that environment that they were in earlier. And this is why I like to say, and I think it's so important to talk about, that it's not that a child's brain is damaged, right? Instead, it was shaped by these early experiences to help keep the child as safe as possible.

Dawson: Yeah. I think that's so important to remember, that at its most basic essence, the brain is something that allows us to survive. It adapts us to whatever environment we're in, even if that environment is an unfortunate one.

Amelia: That's right.

Dawson: The brain was doing its job. It was making that child as safe and as adapted as possible. It's just that the environment itself wasn't ideal.

Amelia: Right. Absolutely.

Dawson: Yeah. It makes me wonder even more what adults can do to help children in these circumstances.

Amelia: Right, and that is really the key to supporting children and to supporting brain development. Having a loving and supporting adult in children's lives can really help buffer that stress. And they can also help that child learn new behaviors when they're coming out of that traumatic experience – out of that really difficult experience. With our adult support, children can learn from the new experiences that they're having. They can learn. They can rewire those connections in their brain, learn new behaviors that are going to help them learn to survive and thrive in those learning environments.

Dawson: I find that so hopeful. The brain is so flexible, and it can rewire itself, especially with the help of a loving, caring adult.

Amelia: Absolutely, and also, we all have hard time on our lives, right? From disappointments and frustrations, setbacks during a day, to longer periods of stress. Whether a child is struggling to build a tower and, in their frustration, has a tantrum, or they're really experiencing these longer, more stressful or traumatic events, having that adult there to support, to buffer, to help a child learn some of these new behaviors is really key.

Dawson: Yeah. I think that's a really important connection to make, that we all go through these periods of frustration and disappointment, and we all need help from time to time. And it's just unfortunate that some children are in a position where they really need trauma-informed care that's a little more comprehensive.

Amelia: Absolutely, and that's why it's so important to be able to recognize behaviors that are a specific result of trauma and not just those daily frustrations or short periods of stress that we all have. The tricky thing is, though, that the signs of trauma can be really varied, and so when we're thinking about trauma and we're thinking about trauma-informed care, it's important to keep a developmental lens in mind when we're assessing behaviors. For example, people who experience trauma, whether they're children or adults, they might have problems sleeping.

At the same time, sleep disruptions, they're super common and developmentally appropriate when we think about infants and toddlers. Of course, often the behaviors that children demonstrate when they're going through trauma can be really challenging for adults. But finding ways for children who've experienced trauma to feel safe in our care, that's our focus. It's important to help programs access professional development on trauma and trauma-informed care. We've really just barely scratched the surface here today.

Dawson: Yeah. That deserves its own podcast. But for now, what I would like to do is, to return to brain development, a little more generally for all children, and let's talk about how adults can help children who are building their brains.

Amelia: Yeah. I love to say that the secret to supporting brain development is that there is no secret, right? Supporting the development brain is really just providing high quality developmental support to the whole child. Two things that I think are super supportive for this are responsive care and predictable routines, as part of those high quality interactions that we know are so important for supporting the whole child. If we think about responsive care, right, when a child has access to responsive care, they learn that there is someone who understands and can meet their needs.

There's someone that's watching out for them and that can help them feel safe and loved when they feel afraid or nervous. Someone that they can depend on, expecting that there is someone there to meet their needs, keeping them safe, share in their delight – all of these things help children feel safe and comfortable and really able to explore their world and let their brains do all of that wonderful learning that we've been talking about in this environment where it feels safe and protected but also exciting. And having an adult – a supportive adult – there to enjoy and explore and wonder with them is really key.

Dawson: Yeah. When I hear you describe that, I like to remind people that it feels so good to be on that side of it too, to be able to provide that for some other human being. It's wonderful to give that kind of care. But I would also say that a caregiver is probably predictable too, and I can connect that to the predictable routines that also help provide the structure and support that are so important for a child's learning. When a child is very young, they don't know what they're supposed to be learning, and there's so much information coming in from all sides, all at once.

Amelia: You're right. It can be really overwhelming. If we think back to what we were talking about earlier in brain development, children are making so many connections so quickly because they're learning all the time. And that experience of being in that sort of super learning mode, where you're taking in so much and shaping the architecture of the brain, that can be really overwhelming and exhausting too. Children need to nap a lot. They need a lot of breaks, and so adding some of that predictability in can really support children in this period in their life when they're just constantly taking in information and learning from it all the time.

And home visitors who are working with families, they can help establish these routines, particularly it can be helpful for families who are experiencing challenging situations. It's important to help families incorporate predictability even when things are feeling unsettled. Keeping routines in place, like story time or nap time, maybe favorite songs for soothing, can help their child feel safe during those stressful periods.

Dawson: I'm sorry to say, I'm looking at our clock. We're about at the end. We need to start wrapping this up. I just want to summarize a little bit today. We've talked about children's brain development and a few of the many ways that adults can help support early brain

development. And I would encourage listeners in your work supporting programs, please consider helping them seek options for training around trauma, in particular, and trauma-informed care, including working with families who've experienced trauma and particularly for their home visiting staff.

Amelia: Yeah, really important. And the other thing that can be really helpful is linking responsive care and predictable routines to brain development. Helping programs understand why these aspects of care, in particular, are linked to supporting early brain development.

Dawson: Yes, and I think that's a wonderful wrap-up for this. We hope that you have enjoyed this podcast on the brain. For more information on supporting children's brain development, visit ECLKC, E-C-L-K-C, and search for brain development there. Thank you so much for listening.

Amelia: Take good care.

Announcer: Thank you for joining "Head Start Talks." For more information on what you heard today, visit the Early Childhood Learning and Knowledge Center, or ECLKC, at eclkc.ohs.acf.hhs.gov.