

Becoming Who We Are: The Importance of Individual Differences in Infant Temperament

ANDREA JIMENEZ: Welcome to our webinar, Becoming who we are: The importance of individual differences in infant temperament. My name is Andrea Jimenez. I am the program coordinator at Global Connections. Our presenter tonight is Dr. Maria-- or Masha-- Gartstein. She is the professor from the Department of Psychology at WSU. And so, the presentation will be around 45 minutes long.

We will have time for question and answers at the end. But you are free to write your questions at any point in the chat box. Again, if you have any technical difficulties, let me know. And thank you so much for coming on. I will now pass it on to Maria.

MARIA GARTSTEIN: Great. Thank you. Ordinarily, I would be doing this from my office, and you could see me a lot clearer. But it is what it is. I'm in my home office. And it's a little bit less conducive to these kinds of meetings. So the title of my talk is Becoming who we are: The importance of individual differences in infant temperament.

And I have been studying temperament, and I have been an infancy researcher for a little over 20 years now, which seems just unfathomable. I would have never guessed that I would have stuck with it for this long. But the reason why I have is that it's such a multifaceted construct. And its etiology of where it comes from is so complex.

It's related with brain activity. It's certainly related with parenting and parent-child interactions, in a bi-directional, reciprocal sort of way. It is itself a predictor of a variety of important outcomes for us to study. So it's kept me busy all this time for those reasons. So what I want to do today is, I want to run through some slides with you.

I'm going to talk about definitions of temperament. I'm going to talk about how we measure it. I'm also going to talk about some findings related to how temperament develops, how parenting is involved in that. I'll present some of my cross-cultural work on differences in temperament development around the world.

And my current work, actually, has to do with looking at underlying brain activity, also bringing parenting into that picture. So we'll probably finish off our chat with that. And I'll keep an eye on the time, so that I do leave some time for you to ask me questions. So in terms of defining temperament and understanding what it is, at least conceptually, the construct has been around for a really long time.

You're not seeing it full screen. I'm not sure if that's something I can fix. But I will-- I need to go into my presentation mode, I think. Hold on a second. Let's see if I can do this. Slide show. There we go. That should do it.

So it's been around for a long time as a construct. But so as my slide said, there's some thinking about it back in the Greco-Roman period. But in terms of thinking about temperament in childhood, this is a fairly recent endeavor. And initial observations were made in studies that were actually focused on motor development.

And researchers like Gessell and Shirley essentially sort of said, gosh, not only are these babies sort of growing in terms of their motor abilities, but look at the individual differences and how they react to situations and people and that sort of thing. Isn't that interesting? And so it is, in fact, interesting. And back in the 1960s, Thomas and Chess were really the first researchers to ask questions about temperament in childhood, and how it might be related to things that happen down the road.

And they began what is referred to as the New York longitudinal study. Their primary achievements with respect to this study-- well, first and foremost, they were the first to demonstrate that temperament as early as the first year of life actually translates into risk versus protection for symptoms, disorders, mental health related issues in adulthood. They followed these infants into their early adulthood, and so measured those outcomes.

And so they identified a temperament constellation they referred to as difficult temperament, which has to do with, basically, distress prone-ness and poor regulatory capacity. And so those were the children that, in their studies, were at greater risk compared, for example, to children they identified as being easy in terms of their temperament.

With respect to goodness of fit, this is this idea that, if you really want to understand how children will be at risk versus protected-- again, for these mental health related outcomes-- it's not enough just to ask questions about their temperament and measure their temperament-- you have to also understand their context from a standpoint of how they're being parented.

And so, the way that parents are able to approach their child in terms of their demands and expectations really matters. If they're able-- if you have a child who's really distress prone, but their parents kind of recognize this as their temperament and are able to work with it effectively-- they will not face as much risk down the road as a child who does not have that kind of goodness of fit going forward.

And I do want to tell you that, in all honesty, children who are easy-- it's far easier as a parent to achieve goodness of fit with them. It takes a lot more work for parents to provide this goodness of fit for kids who are on the fussy end of the spectrum. And there's also an eastern European tradition of temperament that doesn't get often-- get mentioned very often.

And I'm not going to talk about it in detail. But I do want to tell you that Pavlov-- who's always associated with classical conditioning and salivating dogs-- was actually a temperament researcher. And he was actually really interested in individual differences around this learning. So that was his primary area of research.

Well, the most cited temperament model today is the psychobiological temperament model, which is going to be at the heart of what we will be discussing. And it defines temperament as constitutionally based individual differences. And these differences encompass reactivity and self-regulation. So constitutionally based-- traditionally, people interpret this as genetically based.

But it's really just biologically based. And so some of that biology may, in fact, be your genetic predisposition-- what you inherit from your parents. But some of that biology is likely prenatal effects that are actually environmental effects, for example, stress the mom experiences when she's pregnant, because it is transmitted to the offspring sort of molecularly through, initially, changes in her physiology, then through the uterus and the placenta.

So that's the constitutional piece. Reactivity is emotional reactivity, activity level. And these differences are influenced over time. I already mentioned heredity. Also maturation and experience-- so brain development, of course, really shapes how temperament comes online. And experience is where parenting comes in.

Temperament is thought to be the core of the developing personality. And so when I started to do this work, one of the things that drew me to working with infants was research suggesting that, in fact, these individual differences in infancy were the foundation for who we were to become as adults. And I'm not saying to you that the way somebody is when they're six months or 12 months is exactly how they are in their 20s or their 40s.

That would be crazy. But somebody who's very reactive as an infant tends to be a reactive adult. Somebody who is behaviorally inhibited, and so is very cautious to approach new things-- that's a behavioral style. That's a temperament constellation that tends to persist into adulthood.

And temperament itself develops. And of course, one of the reasons why it develops is because the underlying brain structures themselves develop. That's that maturation piece. And also it develops based on the inputs from the environment-- the contextual factors. In the first year of life, those contextual factors are primarily parenting.

So how do we measure temperament? Well, another thing that really attracted me to working with infants is this added degree of difficulty. They can't tell us anything about themselves. So we have to be very clever in how we gather this information. So one thing we can do is we can ask parents questions. And we have to do this really carefully because parents of babies are tired.

And they're not super objective, because obviously, they're invested in the outcomes of their hard work as parents. And so you have to ask questions in a very particular and careful manner. You have to ask about very recently occurring things, like only the past week or two. You have to ask about very concrete behaviors, like in the past week, when you're bathing Johnny, how frequently did he smile or laugh?

And you have a little Likert scale-- a seven point scale for them to use. You can really minimize a lot of-- sort of response sets or biases by taking this approach. And so, Mary Rothbart, who was my postdoctoral advisor at the University of Oregon, invited me to revise her infant behavior questionnaire, which had been very widely used.

And I, of course, said yes. And so we wrote some additional items to create more scales. And then we evaluated these items and scales psychometrically, as the say, which really just means that we had to demonstrate that, in fact, these scales work the way that we anticipated they would, that they actually measure the constructs-- the attributes-- that they were designed to measure.

And so some of that work is achieved via a statistical approach called factor analysis. When we applied that approach to the data we had collected with the questionnaire, it lo and behold told us that our 14 scales formed these three overarching factors. And when we looked at the factors in their composition-- their content-- the first one was labeled as positive affectivity/surgency-- which is like the infant counterpart for what adult personality people call extroversion.

So it's baby extroversion. Negative emotionality-- which is what adult personality people refer to as neuroticism. It's essentially distress prone-ness. And then regulatory capacity or orienting, which is certainly not the same thing as conscientiousness. Again, that's from personality world, or what researchers who work with older kids will call effortful control.

Because effortful control is all-- really, entirely based just about on executive functions. Well, executive functions come online because of the maturation of the frontal lobes. That hasn't yet happened in the first year of life. It begins to happen towards the end. So it's a more primitive, attention based regulation, if you will.

It's based primarily in orienting attention. And also, you can see from the scales like suitability, that parents and the way that parents are able to help their infant calm down is also a part of this really regulatory capacity. Well, what else can we do? Well, we can also observe babies when they come to the lab. And so together with some colleagues, actually, at the University of Murcia in Spain, along with Mary Rothbart, we developed a set of procedures that are standardized procedures, which means that they're followed exactly the same every time.

There are very specific instructions. We time things in a very precise way. But the idea is that we create these situations in the lab that are designed to elicit different types of reactivity. So peek a boo, of course, is designed to elicit smile and laughter positive emotionality. We show masks because-- not because babies know they're scary. Because they haven't learned that yet.

They haven't been through that kind of associative learning. But masks are unusual. And so it's really measuring this sort of distress to novelty, which is, of course, the foundation for fearfulness. So we can present babies with these situations in the lab, and measure their

reactions by video recording them, and then applying, again, a very precise kind of coding scheme in which we have to show our research assistants are reliable.

And that means this is an inter-rater type of reliability, probably more than you ever wanted to know about reliability. It has to do with how much people agree. If I think that baby's smiling, but it's sort of ambiguous. And I'm like, OK, well, that's a one. Somebody else looking at the same video has to agree that that number is the same number, or it's not a good code.

And so that's what we do in the lab, is we present these situations. This is peek a boo. And what Mom does, is she actually peeks through each one of these little windows. And she opens it and looks at her baby, and says peek a boo. And babies really like it. So this is kind of, obviously-- this is just a snapshot in time. But you can see he's beginning to smile.

So that's how we observe temperament. Again, there's a very huge sort of quantification piece to it and a huge demand for measures to be consistent in the case of observations across observers and cross readers. So as [AUDIO OUT] masks, [INAUDIBLE] my research assistants generally really like peek a boo, because, well, it's nice. Babies smile. They like it.

Masks is one of the least favorites, because it ruins everyone's hair. But you can see Momma sitting off to the side. And we tell the mom not to intervene. But of course, if she needs to soothe the baby, that's-- we don't preclude moms from doing that. So how do these measures hold up?

Well, when we look at the questionnaire, it looks like-- I'm not going to go into details on these numbers. But what it looks like is the scales and the factors we've constructed actually tap these attributes in a consistent way. All of the items hang together, as they say, and appear to measure the construct we were trying to measure.

For the observation measures, people do agree in terms of the ratings that they provide. One of our interesting findings, with respect to looking at what we get in the lab versus what the parents report to us, was that the lack of agreement, actually, in this case, for fearfulness, is related to parents' own attributes. And this is consistent with the literature.

The literature is more about a depressed mom's kind of overrating distress for their kids. In our case, this is a community sample that we're not talking about clinical depression. But they rated themselves on negative emotionality, their own distress prone-ness, and moms who reported higher levels of negative emotionality overrated their babies on fearfulness relative to what we observed in the lab.

And we thought that was kind of interesting. So let's talk about development. I promised you we would. I'm going to show you some data showing that temperament, in fact, developed over time-- this older paper from 2010, and this new one from 2018. So what's interesting about growth modeling from the 2010 paper was that-- so we measure temperament from four to 12 months.

This is fearfulness. And what we find is that the levels-- so fearfulness increases across the first year of life. There is a big jump here, around 10 months. This is pretty consistent with the literature. What we find here-- what you can observe in this picture-- is that it tends to accelerate and ultimately be higher for girls than boys.

And this is one of the places where people find gender differences as early as the first year of life. There are far more gender differences with older kids. But in infancy, you do get them with fearfulness in this direction, and with activity in the opposite directions, with boys basically being rated as higher in activity.

In this slide, you can see that the difference in fearfulness is also related to maternal depression. And what's interesting here is that this is another community sample. So this is not a clinically depressed sample of moms. These are moms who are rating themselves on a depression scale. And we're using the depression cutoff score that comes with that instrument to separate them into minimal versus moderate to high symptom groups.

And so for those moms who rate themselves as moderate to high on depression, you can see how their babies increase in fearfulness earlier, and ultimately attain higher levels of fearfulness. So maternal characteristics really do appear to shape temperament development. Let's see.

So this next study is a more recent study that was conducted based on data here from-- collected here locally in Pullman. And what I'm going to show you first of all-- this particular graph has to do with how fearfulness is increasing from eight to 10 months. And this is based on that mask observation I was showing you earlier. So I will make a connection here to theories of development.

Some of them are stage-like, and others talk about more gradual developmental courses. This definitely is more reflective of sort of a stage increase, where you're qualitatively different in terms of your fearfulness here at 10 months, relative to eight. Now, there are multiple individual differences. This is what people call a spaghetti plot.

So you can see that when we look across our 150 infants individually, they have rather different trajectories. But on average, you get this jump from eight to 10 months. You don't get this jump when you look at parent report, and how parents rate their infants. This looks a lot more gradual.

The way that I explain this finding is that its-- parents are probably not the best rate judges of rapid growth for their children. So for example, with my daughter, I often have the experience of going to visit our grandparents, who don't live nearby. And they're like, oh, my goodness, she's grown so much. And I'm like, oh, really?

So I think it's sort of, in the parents' mind, it's a little bit more gradual. But when we observe them in the lab, we do get that significant increase from eight to 10 months. But again, even

with parent report, you get a lot of individual variability around this trajectory of growth and this pathway of growth.

Smiling and laughter also increases across the first year of life. But this is far more gradual. And there's again, a great deal of individual variation. And parents, again, see a much less rapid kind of increase in this attribute, compared to what we observe in the lab. So one of my conclusions, based on this particular study, was that-- because there's a big debate in the field, as what do we make-- how do we make sense of when the lab and the parent report don't agree?

Well, so one way, based on our data, is to understand it from the standpoint of parents' characteristics. Are these parents depressed? Are they high negative emotionality? Because if they are, they may be reporting more of that for their infants. But I think the other takeaway point is, using the lab versus parent report, probably that judgment call depends on what you're wanting to measure.

And if you really want to measure development, then the lab is probably better, because it's more sensitive to those processes-- at least our data suggests that those observations are. These are just some numbers that go along with that model testing that I'll spare you for the purposes of our conversation today.

So one of the reasons-- I'm shifting gears now to talk about why we study temperament. I hope I made a case that it develops over time, especially rapidly in the first year of life. One of the reasons we study temperament, as I mentioned in the context of the Thomas and Chess conversation, is that it predicts your mental health related outcomes.

Well, I haven't had the luxury of studying people from infancy into their 20s. But we did do this short term longitudinal study, where we measured temperament with my questionnaire-- the IBQ-R-- in the first year of life. And then we followed these kids up into the preschool period. So four and five, that's how old they were, when we asked parents questions about their symptoms.

And you'll see, slide 1 is for internalizing symptoms. Internalizing is a little jargon-y, so I'll [?] sort of [?] unpack that for you. Internalizing is depression, anxiety, somatic concerns, like tummy aches, headaches. And so you can see, if the question is who is at greatest risk for having high internalizing symptoms, it is the kids who are both high in negative emotionality and low in terms of their abilities to self regulate.

So this is what people in the field call temperament by temperament interaction. So it's not just being distress prone. It's being high negative emotionality of being distress prone, plus having deficits in terms of being able to regulate oneself that translate into higher internalizing problems later in childhood, and also higher externalizing problems-- very similar pattern here.

And externalizing problems are under-control problems. So aggression, impulsivity, inattention fall into this category. So again, negative emotionality and regulatory capacity together predict

these symptom and behavior problem oriented outcomes. So now, I'm going to shift gears into talking to you about my cross-cultural work.

And I'm not going to spend a lot of time on this slide sort of setting this up. I'll just say to you that-- I'll give you a very short background story on how I came to do this work. So I told you that I had developed this instrument with my postdoctoral mentor, Mary Rothbart. And because she has been a famous researcher and has really contributed to this field, it became really widely used.

I think it was more of her contribution there than mine. But I certainly benefited from it. And one of my collaborators, Sam Putnam-- who is in Bowdoin College in Maine-- was her postdoc after I left Eugene and University of Oregon. And he continued-- he actually followed up my babies, and studied them as toddlers and preschoolers, for which I'm really grateful.

And he continued to do this work. Also, we collaborate to this day. One of the things that he had done-- which is truly amazing-- is that he took charge of disseminating all of Mary's questionnaires, including the baby one. And so he has a website where researchers who are interested go and they ask-- they request the measure. They provide their information.

And then he shares the instruments with those who are qualified to use them. And so at one point-- and this has been some years ago. I think was right before my daughter was born, so 2007-- he shared the spreadsheet of these researchers with me. And I looked at it and I just had this total aha moment. Because I was-- it was researchers from around the world.

And I said to him, oh my god, Sam. We have to collaborate with these people. They wouldn't be requesting our questionnaires if they weren't studying things that-- if they didn't have similar interests that we do. And so that's how this program of research began. And it's really all a function of these instruments being widely used.

We were able to approach these collaborators and, of course, they were interested in running studies with us. And so, I'm showing you the slide. You're like, why is the slide of WSU campuses? What does this have to do with? So one of the things that's funny in cross-cultural work, is when I talk with my international colleagues, and they're like, well, where are you from?

And I'm like, oh, Washington State University. So first thing that they think is that I'm in Washington, D.C. This is time and time again. So then I'm like, no. State of Washington. So then, of course, they think that I'm from Seattle. So what I've started to do is, when I present these data, I show the slide.

And I say to people, WSU-- the primary campus-- is actually in Pullman, Washington. So here's Idaho, which is as far east as you can go. And I also show them some photos of the lovely Palouse, to just kind of ground them contextually in what it is to live here, to grow up here. And

I also show slides of places around the world where our data has been collected for the same reason-- to kind of ground people ecologically, with respect to where the data come from.

So my Russian data set comes from Novosibirsk in Russia, which is consequential, because Russia, just like China-- if you go to Moscow or St. Petersburg, those are very westernized places. And so they're going to be skewed in terms of the kinds of information that you get. Novosibirsk is very old school Russian to this day.

I'll come back to some of these data. But I'll just run through the places-- highlight some of the places where we've collected data. I have another great collaborator in the Netherlands, in Nijmegen. And so I've been fortunate to visit her and to work with her for a long time now.

We more recently collected data in Ethiopia, which is probably one of the more exotic locations for our work. And although there is kind of an urban center that's in our data collection site, most families there live more rurally in these kinds of settings. And we are very grateful for them taking part in this work. So let me backtrack and highlight some of the findings from at least some of these projects.

So in terms of the Russian data set, I think my favorite study is this one from-- I think it was 2009, in the European Journal of Developmental Psychology, where we basically showed that there's an interesting difference with respect to how infant temperament predicts this later self-regulation effortful control that I was talking to you about. And what this slide shows is that, if you're a child growing up in the United States, if you smile and laugh more as an infant, if you have more of this baby surgency, then you're going to end up with higher effortful control as a toddler.

But this doesn't make a difference for children who are growing up in Russia. And the way that we interpreted this finding is that smiling and laughter are so critical to moms in the US. And so there is something that they do to support regulation when their babies are able to approach them-- to interact with them-- with greater positive emotionality.

And you don't get that effect in Russia, presumably because there is less value placed on positive affectivity. I'm going to skip that. I'm going to tell you a little bit about Dutch babies. Dutch babies-- after this paper was published, I got a lot of, actually, media requests to talk about this data set. Because what it showed was that Dutch babies-- it was interpreted as Dutch babies are happier.

But really, what it is, is that Dutch babies are less distress prone, and they're better regulated. So the single biggest difference we get is on the suitability scale. So Dutch babies are far easier to sooth than babies in the US. And babies in the US come out higher on those dimensions-- those scales and attributes that have to do with negative emotionality.

So for example, distress to limitations, which is frustration, fear. And by the way, in this initial paper, this is all based on mom's report. But we have done a follow up study since then looking

at dad's report. And interestingly enough, it pretty much confirmed these original observations. So I feel good about reproducibility of these data.

When we looked at our Ethiopian sample, and how moms rated their babies here, we found quite a few differences. And it tended to be in the direction of higher distress related kinds of dimensions for babies in Africa. But not uniformly, because there were also higher on falling reactivity, which is babies' ability to lower their own level of distress.

So it was kind of an interesting mix. I'm going to skip this interaction effect in the interest of time. So what does this all mean? So kind of putting it all together, because we've now studied temperament differences across a variety of cultures-- and this particular graph that-- diagram that I'm going explain here in a minute comes from our recent book, *Toddlers, Parents, and Culture*, which is a data book.

So don't look at it if you're not interested in data. But it looks at temperament and parenting across 14 different cultures. So to kind of give you a brief summary, essentially what we find is, when we compare babies and toddlers and young children in the US to those from Asian countries or Russia, we tend to see that babies in the US generally get higher ratings on things that have to do with positive affect-- so again, that sort of baby extroversion-- smiling, laughter, and higher-- and lower ratings on distress prone-ness.

So babies from Russia, babies from Asia and Africa tend to get higher ratings with respect to distress related dimensions. However, when we look at northern Europe-- and I just showed you the Dutch data as an illustration of that-- kids from northern Europe tend to be lower in distress relative to the US. And they also tend to be viewed as having greater regulatory capacity. So how do we understand these cross-cultural differences?

What's really driving them? And so in this diagram, we kind of lay out our theory with respect to these factors that are behind-- that are sort of the causal factors here behind this effect. So culture drives things like socialization goals and parental ethnotheories. So socialization goals have to do with, what do you want for your kid?

What do you value for them as they're growing up? Is it important for you that they're respectful of adults-- that they obey authority? Is it important to you that they're a good leader? Parental ethnotheories are closely related concepts, that have to do with, what does a good parent do? Does a good parent set a lot of limits on their child?

Or does a good parent let their child sort of pursue their own interests to some extent? And that translates, in turn, into things-- so these are cognitive things. This is parental psychology. These things are in the parent's mind. They translate into what parents do.

They translate into daily activities. So if I value, for example, my kid growing up to be a leader, we're going-- and I think that parents should give their children an opportunity to pursue their interests-- we're going to have daily activities where my child can sort of practice those skills.

I'm going to let them decide, maybe, what game they're going to play or what they have for lunch.

And I'm going to give them that space to make those choices. Responses to temperament-- how do I respond when temperament displays are presented? In other words, when my kid is upset, when my kid is showing fear, what do I do? Do I cuddle them? Do I let them sort of cry it out and just sort of cope with it, and lower their own level of arousal?

This, of course, is now more proximately related to temperament. And behavior problems, because as I was saying to you earlier, we have a lot of data that suggests-- going back to Thomas and Chess-- that temperament is an important factor that plays into whether or not we're on a trajectory of having sort of mental health and adjustment versus struggling with things like depression, anxiety, aggression, and attention deficit hyperactivity.

That was a shameless plug for my book. So what else have we done with temperament? And I know I'm kind of getting close to the end of the didactic portion of our meeting today. So I started my life as a researcher in psychology, working with pediatric populations in graduate school. I spend most of my time in Children's Hospital in Cincinnati and looking at kids with chronic illness and their adjustment.

And so I've maintained some of that interest. And we've looked at temperament and kids with Down syndrome, and kids with Fragile X. And for Down syndrome, we found something that is actually pretty consistent with the literature, which is, these babies actually show lower levels of negative emotionality. And although that may seem like a sort of a temperament profile that's conducive to adjustment, in this case, it's interpreted as potentially limiting their cognitive development.

And I'll tell you why that is very briefly. So distress to limitations, recall is frustration. If I'm trying to solve a problem, if I'm working on a cognitive task, frustration is really important. Because when I feel frustrated, this is information that what I'm doing is not effective. So maybe I have to try a different solution.

Maybe I have to get some help. So if you don't feel that-- if that emotion isn't there-- you're not motivated to pursue these strategies that will lead to effective problem solving. So for kids with Fragile X, I will show you this table-- or this figure-- very quickly. What we find in typically developing kids-- now we're looking at negative emotionality, that sort of overall distress prone-ness-- what happens over time with matched controls, which are healthy typically developing children-- is over time, as they get older, as they become preschoolers, they show less distress prone-ness.

Why? Because they're better regulated. They develop that effortful control, that self-regulation that comes from maturation of the frontal lobes. This is compromised in kids with Fragile X. And what happens with them is that actually, as they get older, they present with higher levels of distress prone-ness. They're not able to regulate themselves effectively.

And of course, that does play into compromised development with respect to adjustment and mental health. So just briefly, current projects we're looking at, EEG-- electroencephalogram reportings-- as another data point, because, of course, temperament is very closely related to brain activity-- linked with brain activity. Our primary brain activity indicator is this EEG asymmetry.

And asymmetry is this-- so you already know, I'm sure, that brain is lateralized for a variety of functions. A lot of people don't realize that brain is also lateralized for emotion. And so, it's typically in the frontal area where you get this lateralization. What happens is, those who are more-- sort of have a greater tendency towards withdrawal, negative affect, and fearfulness-- tend to have greater activation on the right in the frontal lobes.

And those who are more approach oriented, who present with higher positive emotionality, tend to have greater activation on the left. And there's a huge literature in children, adults that really demonstrates that this is a pretty consistent and stable finding. So we look at this asymmetry. And our experimental paradigm is we don't just look at it sort of when babies are relatively calm and alert, which people call baseline.

We also look at it in the context of these manipulations, where we cause distress or that are mildly stressful. And we've been using the still face paradigm, which briefly has to do with the mom presenting with a still face. It was developed to sort of mimic maternal depression. So they're not communicating and they're not presenting with any facial affect.

So what we find-- and this is where parenting comes into play again-- is that for those babies whose moms are really intense and sort of overstimulating, they tend to have this shift towards a greater relative frontal activation-- so greater avoidance withdrawal emotion motivation, in the context of that still face manipulation.

And babies, if they are, in fact, themselves sort of lower on baby extroversion or surgency, as we call it-- so babies are sort of immune to the effects of maternal over-stimulation if they're higher on surgency. And surgency is that big factor that I was telling you about. If we unpack it a little bit and look at one of its component scales approach, what we find is that-- so babies who are low in approach-- approach has to do with really being into sort of going after things that are potentially rewarding or interesting.

So for babies who are low in approach, they have that shifting to the right towards withdrawal during still face, when their moms tend to be very intense and overstimulating in their interactions. With babies who are high in approach, actually-- and this is a kind of trend level. It's not, technically, statistically significant. But you can see the effect looks pretty meaningful in this graph.

They tend to actually go towards left frontal activation. So the way that we interpret this is, in the context of goodness of fit. So having these intense, potentially over stimulating interactions is not a problem-- does not cause this tendency to go into that sort of withdrawn negative

emotionality brain activity mode for babies who are themselves a really sort of sensation seeking-- sort of approach oriented.

For them, it's a good fit. And when we look at brain activity, it translates into actually movement towards left and positive affect, even under a mild stressor. So we've interpreted this from the standpoint of that goodness of fit idea, that how parents approach their infants, if it, in fact, is consistent in demands and expectations to what the baby or the child brings to the plate with respect to their temperament, that that's conducive to more positive outcomes.

I'll show you one more brain picture. And then we'll call it good. So in this slide-- this is a picture of the brain. That's what's called a topoplot. And you can see it illustrates brain activity. And you can see this hot spot in the frontal right region.

And you're seeing it-- this brain activation-- that context of that still face procedure I was just telling you about. So in still face, babies whose moms are more responsive tend to have a hot spot in brain activity on the right. What that actually means, because we're looking at alpha-- everything is very complicated with brain activity.

Alpha is cortical rhythm that is inhibitory in nature. So a hot spot here actually means that the right side of the brain is being inhibited. So these babies are actually activated here on the left, where you see the blue. So remember, activation on the left is like sort of happy approach. Things are good.

So babies whose moms are more responsive, when we present them with a mild stressor of mom's unavailability in still face, still are able to demonstrate this greater activation in the frontal left region that's associated with positive emotionality. So the punch line, I think, is that parenting really matters with respect to temperament. And it matters with respect to temperament whether we look at how it drives its development-- so I was showing you the difference in fear trajectories for babies of moms who are depressed versus non depressed.

When I was showing you those other graphs, I forgot to mention that when we look at mother infant interactions, more responsive moms tend to have babies who are lower in fearfulness. And moms who are more intense, or potentially overstimulating-- if we look at behavioral fear reactivity-- those babies tend to increase in their fearfulness across the first year of life.

So clearly, parenting is a key factor in how temperament develops. And we find differences in temperament cross culturally, which we think are ultimately a function of those contextual factors, primarily related to how parents interact and approach their children. And when we sort of say, well, does this still work on-- not at the behavioral level, but at the brain activity level? The answer is still yes.

That how parents parent and approach their infants-- interact with them-- still makes a big difference. And I think I'm going to end with that and see if you have questions.

ANDREA JIMENEZ: Thank you so much. So-- oh, we already have a question. So Celeste asks, when conducting international studies, did you encounter any challenges regarding cultural norms or other factors? She says, since I recently completed Psych 412, testing and assessment, I found your development of the IBQ-R very interesting.

MARIA GARTSTEIN: There are challenges at every corner. I mean, anything that you do, when you do it cross culturally with this international component, there's an added degree of difficulty. So of course, when you're translating your instruments, you have to be really, really careful.

And so you have to do what they call back translation, which means-- so for example, with the Russian version of the IBQ-R. It was originally translated into Russian by my collaborator. I happen to be a Russian speaking person myself, because I grew up there till I was 12 years old. So I was able to back translate it back into English.

And then we compared that English version to the original version, to see if it's close. I mean, and it should be. It should be identical. There are some items that don't work in all cultures. So when we were making the Ethiopian adaptation, in many ways, it was the hardest. Because, for example, for frustration, we have questions about what about-- does your baby get upset when their movement is confined in a crib or a car seat?

They don't have those things. So we had to eliminate a number of questions that just didn't fit. Of course, the way that you present the questionnaire-- so in Ethiopia, a lot of those moms can't read and write. So the items had to be read to them in their native language. How you recruit your samples-- you're going to do it in the way that works in that particular location.

So here, we do it through Facebook, through birth centers. That's not always the best approach. In Russia, my colleague approached day cares. In the Netherlands, my collaborator there recruits through midwives, because everyone gets free prenatal care and goes to midwives and gets a doula. So those are great resources for recruiting, of course, during pregnancy.

And then we collect the data from the infants once they're born. So going through numerous institutional review boards, because every place has their own and explaining the study to them in the way that makes sense. So it's challenging, but it's very rewarding. It's rewarding for one-- for one thing, working with these international collaborators is amazing. They're so devoted to their work. And they're so interested in these partnerships. And they just really make it worthwhile. And of course, visiting them is a lot of fun, too.

ANDREA JIMENEZ: I will ask, in terms of the cultural differences that you mentioned, do you think that is something that could change with time, or is it pretty much ingrained in terms of how parents parent their children? Do you think that's culturally ingrained, or do you think that it could change in time with different-- with more study?

MARIA GARTSTEIN: So that's a really interesting question. I'm going to answer it like this. It has to do with how dynamic the culture is. And so that's often not a uniform, kind of monolithic thing. Because different regions within different countries undergo change at different rates. I'll give you a very clear example of this.

So in China, the traditional finding-- and this is Jian Chen's research. He's now at University of Pennsylvania. The traditional finding is that Chinese children are rated as more behaviorally inhibited or shy, or fearful. But although that translates into mal-adjustment and internalizing problems here in the States-- and those kids are seen as less socially competent in the States-- they haven't found those negative kinds of outcomes in China.

And the interpretation has been, well, Chinese don't really value extroversion. In China, being shy and more timid is actually what's viewed as sort of the better alternative, in part, because of their collectivistic way of thinking. You have to fit into the group. What's best for the group comes first, which means that if you are timid or shy and you're not a great leader, that's actually not a problem.

So that's been the interpretation. But what has happened in the last, I'm going to say 10 years, is that urban centers in China-- they have become very westernized, of course, because the commercial ties, and lots of people come and study in the States. And so today, if you go to places like Shanghai or Beijing, and you measure these same attributes, what people find is that you don't get that sort of shyness bonus that we used to see back in the 80s and the 90s.

Now, Chen says that you still have-- that it still works the same in more rural areas, which are not as dynamic and have not changed in terms of their values as much as the urban centers. But in urban areas in China, there has been this really dramatic shift in terms of how these attributes are valued, and arguably, with a shift towards sort of viewing extroversion and leadership as a more positive set of traits. I hope I answered that.

ANDREA JIMENEZ: Thank you very much. Yeah. Let me see. OK. It looks like we don't have any more questions. I want to thank you all so much for coming, once again. And thank you, Dr. Gartstein, for presenting for us. This is very informative.

MARIA GARTSTEIN: You're so welcome. If you go to my website, it really-- it's pretty comprehensive and current in terms of presenting different work that's done in my lab. And if you think of questions later, that you're not asking right now, you're welcome to email me. And I will certainly respond.

ANDREA JIMENEZ: Thank you so much.

MARIA GARTSTEIN: You're very welcome. It was fun to do this. Thank you. Thanks for inviting me.

ANDREA JIMENEZ: Thank you.

MARIA GARTSTEIN: Bye bye.