

Talking with Dr. van den Heuvel: Part II

Meet Dr. Marion van den Heuvel, a developmental neuroscientist and Assistant Professor at Tilburg University, whose research is changing the way we understand the brain both before birth and beyond. In Part I of this series, Associate Web Editors Aislinn Sandre and Kaylin Hill had the opportunity to speak with Dr. van den Heuvel about the exiting research coming from her lab, as well as discuss her path and continued success in the emerging field of developmental neuroscience. We learned lessons about diving into this field, navigating social and technological change as a scientist, and how she has been communicating her research and expertise through her Youtube channel. Our lessons did not end there. In Part II of this series, Dr. van den Heuvel shares her experiences being at the frontlines of neuroscience research with infants and children. We dig into the day-to-day challenges of running a developmental neuroscience lab and discover practical “tips and tricks” on how to successfully collect psychophysiological data from young populations.

Aislinn: What most excites you about your work with fetus, infant, and child samples?

Dr. van den Heuvel: I really like figuring out how their tiny brains grow so fast. It fascinates me every time that they can do so much more than we think, and that they grow so fast. It’s especially interesting with longitudinal research where you see the babies again and again. I’m always like ‘Wow! That’s amazing. How does that work? They learn so fast.’ It’s also a really happy nice time for moms and they share a lot with you because you get very close over time. I like that you actually get really close with the moms and they want to share their stories. Especially with the longitudinal studies, you really get connected with the parents and you see them through this life transition, and see them grow as their babies grow. I think I like that most.

It might not be very scientific, but that’s what I really like about it. But then I do the scientific thing of wondering why things are not unfolding normatively, like when moms do not have an immediate connection with their children or are struggling. I’m always wondering how I can help. Why does this happen? What can we do? I get a lot of my research ideas from actually working with the parents. And that’s what I really like about this line of research – you can be an observer. For instance, I have another research line that is a collaboration with a friend who is a social psychologist. When we were doing our PhD’s together, we both were very interested in greed. In one study, I observed four-year-old children who had to pick a sticker, and if they had enough stickers by the end of the experiment, they could pick a present. Some kids were very stressed during the present picking, which was really weird. Why are they getting so stressed? It’s supposed to be something fun. Then we set-up a whole experiment about decision making in kids and greed. The greedy kids had a lot more trouble picking a present. Greedy kids also had more negative affectivity and they shared less with a plush animal. It’s just so interesting and so totally different. But that was completely because of observations in the lab where I was just like ‘Oh.... interesting’. So that’s what I really like – you get the freedom to just wonder, and then examine it.

Aislinn: That’s amazing. It seems like you have come to know the families in your cohort so well. It seems like observing these families over time has been a major opportunity to develop your research questions.

Dr. van den Heuvel: I do get interesting research ideas from my sample. I think it's a way of practicing science that more scientists should do as well. There is so much value to be in touch with your actual population.

Aislinn: The recruitment and collection of data from developmental populations, as you know, is often a major challenge. But I also suspect that the challenges in this type of research begin even before the data collection stage. For example, when you are building a developmental lab. Can you tell us a little bit about how you started to build a lab that was capable of collecting EEG data from infants and children?

Dr. van den Heuvel: When I worked as a PhD, our lab had a lot of contact with midwives. Because moms usually have appointments pretty early in pregnancy, we really tried to make the midwives our collaborators. Having them as collaborators helped us to recruit for studies, because the midwives would recruit their patients for us. So, that's a way of recruiting. We would try to connect with the midwives, answer their questions, and even share research articles with them because sometimes they couldn't reach them. We had a mutual agreement with them –we helped each other out and that worked really well. Moms really trust their midwife or their gynecologist – they just put a lot of trust in them and they build a relationship. When that person tells them, 'Hey, you should participate in this research', the moms trust them.

Facebook also helps. I have a Facebook page that's pretty active. The only problem is that the women are aging with the cohort. Most moms that are involved in my Facebook page have older children but they always have friends or friends of friends that they talk about our research too. So, having an active Facebook page is helpful – let the moms recruit for you. When moms have a really good experience with our study, they want to share that experience, and then before you know it, you've recruited a mom's friend or a learn that a mom talked about your study to a school. Now the whole school wants to come! So that can happen. Because of this, a lot of our participants end up knowing each other. So, it's really important that the mom and baby have a good experience in your study. I always make sure that the experience is fun as well. Obviously, it has to be reliable. But I always make it fun. So, your tasks have to be a little fun and your mom participants should be entertained. We also give a lot of compliments, like 'oh you're such a pretty baby or look how smart your baby is', or 'do you want to a picture of your baby with the EEG cap on? We try to be very helpful and make sure that the moms have something from the study that they can show to friends and family. We really try to make the moms or dads feel very comfortable in our studies.

Aislinn: We also take pictures of our mom participants with their babies in the EEG cap. The moms love that.

Dr. van den Heuvel: We also give out baby diplomas to our moms – they like that. Those types of things really help. With older kids – we have experience with four-year olds – we give them presents like stickers. We have a lot of four-year olds that ask us when they can come back to the lab.

Kaylin: In your YouTube videos, you talk a lot about positive reinforcement. For example, even if the EEG data that you recorded from the baby isn't the cleanest, it is really important to reassure

the moms that data was collected from them and that we (the experimenters) are really excited. I have found that conversations like this go such a long way.

Dr. van den Heuvel: Yes, that helps a lot. Even if you don't have any good EEG trials, you just need to be like 'Oh you worked so hard and we're very grateful'. Sometimes the moms worry that the data you recorded from their baby is bad. But we always make sure to tell these moms that everything is good, we have enough data. I try to make sure that there's always some data. For example, in our study with 4-year-olds, we collected their buccal cells. I would tell my students that it is no problem that the EEG data is really messy – the participant came and at least we have buccal cells. I always try to have something in my studies that is really low effort and always works so that at least you have something that you can tell participants with a straight face, 'No – don't worry about the data. Thank you so much. Having you participate has been so helpful – we have a lot of data'. And usually the participant does have some data. For this reason, I always spend a lot of time on the experiment's design and the design of the whole protocol. The study design can definitely change the experience for your moms and dads but also for the students that work with you. If the study is too long, everyone will get exhausted. The parents will also remember the last task where their baby cried because you did too much in the study. Your students also get stressed. Everyone gets stressed. It's definitely important not to overdo it. But that's always hard, especially if you work with someone above you. They always want more. The professor always wants more. There is no professor above me, so I can make the decisions.

Kaylin: You touched on how long your protocols are, and you've also talked a lot about how to get the children more involved in the task, and I am wondering if you could talk more about that. So what key considerations are you really looking at when you design a task for the kiddos?

Dr. van den Heuvel: Your tasks should not be too long. But it really depends on what the babies have to look at or what they have to do. Like I have an auditory paradigm, and the length of this task doesn't matter too much. If you have a task where the baby has to look at something, it should be no longer than 10 minutes, and make sure to cut the task into blocks. Blocks are helpful for making notes; for example, if you record when a block is not useable, then you can throw away the whole block. If the baby cries, you just let them ruin your one block, and then you can have them take a little break. I always report in papers how many trials I keep, and you have to think ahead, like how many trials are acceptable to keep. Usually about 75% of the data is okay, but you definitely lose 25% of the data at least, just because of movement or crying or whatever. It is kind of a balance between having enough trials, without having too many. Having breaks is really important.

Asking the parents to help you is also key. Moms and dads are super helpful. You really work together with them. For example, asking them what time of day it is best for their baby to come to the lab. The parents know their baby's 'good' hours. It is also important not to schedule a study appointment too far in advance, especially for the younger babies. Their sleep schedule changes so much when they are this young. I will also call the mom a few days before the study to make sure that they think that their appointment is still at a good time. If the mom rushes into the study, the baby will become fussy. You really have to work around the family's schedule. For example, we often have moms breastfeeding in our lab. We always tell them, 'no problem, go ahead if you think that will help'. Mom's know their baby best – we always tell them that if there is something

that they think could help calm their baby, then they should just go for it. If the mom is comfortable, feels like she is working with you, and you are working with her, and that you value her opinion, then that will really make a difference. The whole experience of testing babies is very different from testing any other participant. With the mom there, you really have to make use of that. A lot of students often forget that you actually have to work with the mom. And if the mom is stressed then the baby is stressed. Babies are also very sensitive, so if you have a really nervous student, let them make notes or something and not walk around the lab being nervous. I had some nervous students and it really affects the baby and the mom.

Kaylin: You're touching on a lot of points that we've seen in our lab, too. We have had breastfeeding going on while babies are in their EEG caps to soothe our little participants before the tasks start. The moms participating in our studies are superstars. We have found that another key piece to making it all work is making sure you have the right undergraduate research assistants. They play a big role in working with infants and families.

Dr. van den Heuvel: Yes, some people will give a lot of tips on how to apply the cap and with this or that, but the key things are actually the lab surroundings and managing the mom, managing the mood of the baby, making sure that it's the right time of day. If the baby is not having a good day, sometimes it is best to just reschedule. I've seen babies when they were acting very terribly one day and then the next day they were perfect.

Kaylin: With that in mind, time of day is something our lab has discussed a lot in scheduling participants, especially when we are planning cortisol assessments. When you are trying to strike that balance between the baby's prime hours and cortisol schedules, it seems you tend to lean towards what's best for baby's mood. Do you tend to control for anything afterwards, perhaps statistically or what other approaches have you considered?

Dr. van den Heuvel: No, we never really look at that. But that would be interesting. Usually we just schedule whenever; whatever works for mom best and is the least stressful for her, that's when we get the best data. Naturally, a consistency emerged where we tested babies mostly in the afternoon instead of early mornings. With the four year olds it did change -- four year olds are a whole different topic. They demand other considerations. For example, don't test them when it's Christmas --they're excited -- and don't test them if they just started school --they are super tired. For babies, I do recommend looking for changes like when they started going to daycare. The babies will be very tired for the first couple weeks, it takes time to adjust.

Kaylin: There seem to be many considerations to best prepare for assessment success, beyond simple scheduling availability. Fatigue will certainly be a factor in capturing constructs of interest, such as attention. Once you have accounted for as much as possible in research assistant training and scheduling the family in a way best suited to their needs, what considerations or policies do you focus on while participants are in the lab? For example, with attention, how much do you worry about engagement with a task? Do you tend to pause the task if the baby is not gazing at the screen or elicit attention again in some way?

Dr. van den Heuvel: For the looking task that we use, we used a spacebar. You can touch the spacebar, and on the screen lots of colors and shapes would move forward, similar to an old

screensaver. The babies really liked it, so that made them look at the screen again. Once they looked at the screen again, I would touch the spacebar again and they were back to attending. I would just do that in between trials.

Kaylin: That is a great example of the content on your YouTube channel, a sort of behind-the-scenes look at what it takes to collect data from infants and children. Your videos show a lot of these technical details.

Kaylin: We have a few more questions for you before we wrap up. As you know, there is wide variability in how EEG data is processed and quantified across the field. This seems to be particularly true of infant research, as you alluded to earlier. Can you talk a little bit about how you make decisions about data processing in your lab?

Dr. van den Heuvel: Yes, that is a tough one sometimes! Definitely, I want to stick to what I've been doing, so that my data is comparable with my previous work. You always have to be careful that it doesn't look like you did whatever worked best for a particular dataset. Consistency is very important... although, obviously, if something is really better than what you have done previously, you learn something new and use what is better. However, overall there should be some kind of consistency in your career. I think consistency is really important.

Secondly, I really noticed that older babies need stricter artifact rejection because they move more. This is different with different age ranges, because at some point it is true the artifact rejection needs for a sleeping baby are different than for moving babies of nine months. So, there is also a lot of decision making. This is especially difficult when you compare two groups, for example two-month-olds and nine-month-olds. Then it becomes difficult. Usually, I select my criterion based on the group that is the most difficult. It requires a lot of visual inspection, looking through the data. I always have lots of undergrads helping to do the first check. They just skim through the data and make notes on a 1 to 5 scale for how good the data is. It always helps me to have undergrads scroll through the data and make the first impression, but still it's a lot of work. There are some automatic processes now that I am interested in. So if these work, it would be really great, but there will probably be some problems related to it as well. Usually, it is like 'oh that is really great, but not with my data.' I have to check it out, but it's always a lot of time and effort to learn a new program.

Aislinn: It seems like standardization is particularly difficult with developmental samples because you really need to save each individual data point. With our adults, like you were talking about, you can even get them to stop blinking if you need to and it is a lot easier to drop a participant if they don't work with the standardized setup. Compare this with babies where you just really need to use every single precious data point you collect.

Dr. van den Heuvel: Yes, I think it is very important to just be very transparent and very open to the reviewers about the unique needs of child assessment. For example, one time I got a question about an EEG-based connectivity study. I didn't end up publishing the study because I did not trust the data in the end. But for this study, all the back channels in the head, the occipital channels, were not that great and I removed a lot of channels. When I went through the submission process, I was just honest about it, 'Yes, it's because the caps do not fit all of our babies, who have flat

heads, and so it was not great at capturing the occipital channels.’ I think you just need to describe every step in your paper and to the reviewers. If it makes sense, then usually it is okay. As another example, I have one paper where I wanted to completely replicate a paper that used IAPS pictures. But then there was one picture that was supposed to be scary with a tornado, and I realized this would not work because Dutch kids don't know what a tornado is. So I replaced the picture and just added a note to the manuscript and then no one said anything about it. So generally, if it makes sense why you do things you will be fine, as long as it doesn't look like you used some properties because it was better for your data. Reviewers are really good at spotting that. They may notice that you are doing things differently and get suspicious and that's really bad. You don't want to be known for that. So, always be consistent.

Like you said, you have to work with what you have. That's true. Yes, sometimes, some of the electrodes just didn't work. Or half of your sample fell asleep. You have to just work with it. We have had that happen as well. If it happens, just describe it. It's okay that it's different.

Kaylin: How often do you find yourself describing those methodological considerations versus trying to control for them statistically?

Dr. van den Heuvel: It depends on how many considerations there are, because there's only so much data that you can forfeit. If it is half of your sample then maybe you should just write a paper on sleep. So, sometimes it works to your advantage. When collecting data, sometimes you just have to go with the flow. When I had 4 year olds in the lab, they just didn't like the eye electrodes. I thought ‘No, I really need eye electrodes! And I really need to control for blinking! Oh my god!’ I was really stressed about it. And then at some point, I just realized I would have to figure it out without the eye electrodes. It is better to have just a normal session without eye electrodes than insist the eye electrodes and have no session at all. You have to make those kinds of decisions and then decide what you will do for the rest of the participants; I didn't even stick eye electrodes on them. This is actually how I started using Independent Component Analysis in EEG lab to just remove the eye blinks. I was really nervous in the beginning because everyone uses eye electrodes and I thought the reviewers probably wouldn't like it. And I did have a reviewer comment about it, but I just explained that the children did not tolerate the eye electrodes, and it was okay in the end.

Kaylin: That's a big teaching moment. A perfect example of how to be as consistent as possible, but also adjust to participants' needs, and explain these differences for reviewers and readers.

Dr. van den Heuvel: Yeah, I was just honest like ‘we tried and they didn't like it, and I wanted to keep as much data as possible, so...’ I also didn't want to use different methods within the same study, like use eye electrode correction for some people and for other people do the Independent Components Analysis. Now, I learned we don't really need to use eye electrodes. Another example is that adult researchers will always tell you, ‘No, you really need eye control. You need this and you need that.’ They are really stuck in their own paradigm. But as a developmental scientist, you have to be a little more open to creativity and understand that you don't need perfect data. You need good enough data.

Kaylin: Speaking of creativity, what new developmental techniques or methods are you most excited about?

Dr. van den Heuvel: Definitely hyperscanning. And also eye tracking glasses. I'm looking into that, too, having baby eye tracker glasses. So cute. I saw it at a conference and I was really excited about it. They have eye tracker glasses so babies can just lay in their crib and look around and we can analyze it! It would be a lot of hand-coding like 'looks at this, looks at that, looks at this,' but I'm really interested in having mom and baby both wear it and then look at each other and then you can really see their eye contact. It's really interesting. There are all these new techniques; I'm definitely excited about new technology. But, I still like some of the old stuff like the classic developmental things like the still face paradigm. It still interests me.

I was writing this grant, and then I realized that it was not good. I called it the Gadget Grant. It had all the cool new technology that I wanted to use. I realized though that we should be driven by research questions and not by the technology that we think is cool. Some researchers do have a tool like fetal fMRI, for example, and ask themselves 'What research questions can I answer with this tool?' But that's not how I want to start a new project. I want to have some experiences or observe something in real life, and then come up with a research question, and then look at the best techniques that are available and not the other way around. I think the first way is not necessarily wrong, but I do think we answer research questions better if we start with the research question. So yes, I am excited about technology, but I still want to be guided by research questions that I have. And then use the technology, if it's helpful.

We hope you enjoyed reading our conversations with Dr. van den Heuvel as much as we enjoyed talking with her. We would like to thank Dr. van den Heuvel for sharing her immensely helpful expertise and experiences collecting psychophysiological data from infants and children. You can learn more about Dr. van den Heuvel's research [here](#). Also, check out her Youtube channel [here](#) to continue to learn more about the wonderful world of developmental neuroscience