

## Capturing developmental brain dynamics

15-18 April 2019 @ Oort

1. A concise version of the **description and aims** of the workshop, including what were the most important scientific questions motivating the workshop (about 5 lines).

Understanding how children develop and learn is of tremendous importance not only for preventing and remediating disorders, but also for optimizing education and parenting practices. However, capturing developmental and learning-induced dynamics is extremely challenging since changes occur interactively across multiple levels: (social) environmental, biological, behavioral, structural and functional brain changes. Therefore, the aim of this workshop was to learn about different approaches to integrate data across the different levels and across time points. Additionally, we aimed to form a strong interdisciplinary network between researchers and to develop a common research agenda.

2. Is a tangible outcome of the workshop expected? If so, please mention – even if it is, as yet, at the level of intention.

We have been able to bring together researchers from different disciplines, with geneticists, educational scientists, biologists, cognitive neuroscientists, statisticians and computational neuroscientists being present at the workshop. In addition, the interactive nature of the workshop helped to establish an interdisciplinary network. Furthermore, the idea was raised to develop a digital forum where researchers with common interests could more easily meet (“scientific Tinder”), though we have currently not yet implemented such a forum. The Open Space Event was important to set a common research agenda, which was presented to all participants at the end of the workshop. Finally, a special issue will be organized in Science of Learning (Nature Partner journal), for which speakers with different background will be asked to contribute. As scientific organizers, we will write the editorial for this special issue, in which we will highlight the research agenda that was developed during the workshop.

3. Where there any developments which could, already, be termed a (beginning) **scientific breakthrough**? If yes, please tell about it shortly.

In current studies, the integration of data across-time and across-level is very limited. Acknowledging this gap, even with no tangible outcomes as yet, was an eye-opener to participants. We need to start building theoretical models of multi-directional influences across levels including genes, brain, behavior, cognition and environment, and if possible and necessary take them into account. During the workshop, we discussed novel methods and techniques that could be applied to examine individual differences across the different levels and time and, crucially to integrate data acquired at multiple research centers (big data studies). Because in order to come to a comprehensive theory of development we need to move to a more inclusive scientific approach, both in terms of open and transparent collaboration and in terms of investigations across children groups with more various socio-economic and cultural backgrounds.

4. Did you, or to your knowledge any of the participants, experience notable **“Aha” moments** (for instance, separate scientific communities realizing that they have significantly more in common than they had thought)?

The discussions made clear that there was surprisingly large agreement between researchers from different disciplines about the need for big data studies as well as agreement about how to obtain this,

namely by using pre-registration of studies and standardization of analyses. New consortia for data sharing were also set during the workshop.

**Organization/Format:**

5. How did you experience the **format of the workshop** (the structure of the program, lectures vs discussion time etc.)? Did you try something new (different kind of discussions for instance)? If so, how did it work out? Would you do it again or advise it to others?

In our workshop, we had morning sessions with invited talks followed by a one hour discussion between the speakers and the audience. In these discussions participants could orally ask their questions, or alternatively, type their questions (anonymous) via Mentimeter (interactive polling). In the afternoons, we had on the first day an Open Space Event and on the other days methodological demonstrations which were followed by one hour of discussion in small groups and one hour of plenary discussion.

Based on the feedback from the participants, the format (with plenty of time for discussions and interactions) was experienced very positively. Especially the Open Space event was by many considered as an ideal start of the workshop to interact with researchers with whom they shared research interests (despite sometimes being from different backgrounds). This Open Space event also helped to set a common research agenda. We heard from several participants that they would use the Open Space format in future meetings/conferences. In addition, the feedback on the methodological demonstrations was also very positive. In contrast to typical conferences where the focus lies on the results and not on the methodology of a study, the demonstration sessions and the discussions afterwards allowed for exchange on the methodological possibilities and their potential applications in typical and atypical development. Finally, the feedback regarding the use of interactive polling during the discussions was more mixed. Some (more early stage) researchers appreciated this accessible way of asking questions whereas other (more senior) researchers felt that this reduced the interactive character of the discussion.

**Nienke van Atteveldt** (Amsterdam, Netherlands)

**Milene Bonte** (Maastricht, Netherlands)

**Maike Vandermosten** (Leuven, Belgium)

**Wouter Weeda** (Leiden, Netherlands)