Neuronal intra-individual variability masks response selection differences between ADHD subtypes - a need to change perspectives

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Due to the high intra-individual variability in ADHD, there may be considerable bias in knowledge about altered neurophysiological processes underlying executive dysfunctions in patients with different ADHD subtypes. When aiming to establish dimensional cognitive-neurophysiological constructs representing symptoms of ADHD as suggested by the initiative for Research Domain Criteria, it is crucial to consider such processes independent of variability. We examined patients with the predominantly inattentive subtype (ADD) and the combined subtype of ADHD (ADHD-C) in a flanker task measuring conflict control. Groups were matched for task performance. Besides using classic event-related potential (ERP) techniques and source localization, neurophysiological data was also analyzed using residue iteration decomposition (RIDE) to statistically account for intra-individual variability and S-LORETA to estimate the sources of the activations. The analysis of classic ERPs related to conflict monitoring revealed no differences between patients with ADD and ADHD-C. When individual variability was accounted for, clear differences became apparent in the RIDE C-cluster (analog to the P3 ERP-component). While patients with ADD distinguished between compatible and incompatible flanker trials early on, patients with ADHD-C seemed to employ more cognitive resources overall. These differences are reflected in inferior parietal areas. The study demonstrates differences in neuronal mechanisms related to response selection processes between ADD and ADHD-C which, according to source localization, arise from the inferior parietal cortex. Importantly, these differences could only be detected when accounting for intra-individual variability. The results imply that it is very likely that differences in neurophysiological processes between ADHD subtypes are underestimated and have not been recognized because intra-individual variability in neurophysiological data has not sufficiently been taken into account.