Maastricht University

Project title: Differentiating between the core neuropsychological deficit(s) underlying ADHD symptoms: Implications for diagnostics and treatment

Project leader: Dr. Petra Hurks

Function: Assistant professor

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Proposal (250 words):

Attention Deficit Hyperactivity Disorder (ADHD) is the most common neurobiological developmental disorder worldwide. It is characterised by inattention and/or hyperactivity-impulsivity, which negatively impact the child's development, functioning, and quality of life. According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-5, APA, 2013) an individual has to present 12 out of 18 behavioural symptoms, such as 'often fails to finish shores or schoolwork', in order to diagnose ADHD. These symptom criteria are generally checked by administering a questionnaire or structured interview asking parents/ teachers whether these symptoms are present. However, these instruments do not clarify the core deficit in individuals causing these ADHD symptoms. According to the triple pathway model (Sonuga-Barke et al., 2010), the expression of an ADHD symptom as provided above could be caused by deficits in cognition[1], motivation, and/or timing[2]. Therefore, ADHD is a very heterogeneous disorder in which different neuropsychological deficits and different neurological dysfunctions can underlie the behavioural symptoms. Differentiating between these underlying neuropsychological deficits within the ADHD population is essential to determine the most effective treatment for each individual, i.e., a child with a motivation deficit benefits from another approach than a child with a cognitive deficit. However, the validity of this triple pathway model for diagnosis and treatment has only been studied limitedly. Therefore, this project focuses on the following 2 related aims: 1) To develop a psychometric sound ADHD screening questionnaire that identifies children at risk for ADHD as well as providing insight into the underlying neuropsychological deficits; 2) To develop multiple interventions for ADHD, which specifically address one of the 3 (or a combination of) underlying core deficits. The effectiveness of such personalized interventions will be evaluated to determine the validity of the above-mentioned triple pathway model. Study design aim 1: A pilot version of a screening questionnaire examining ADHD symptoms and underlying causes has recently been developed by our lab. Psychometric properties (i.e., reliability, validity) for this questionnaire will be determined and norms will be established, in line with criteria set by the European and Dutch test reviewing committees (EFPA and COTAN, Evers et al., 2011)[3]. The questionnaire will be studied in both a general population of children aged 4-12 years and in children with ADHD. Also, to study concurrent and divergent validity, neuropsychological tests measuring cognition, motivation, and timing will be administered in parallel to the new questionnaire. Study design aim 2: Of the samples included in study 1 children with (a risk on) ADHD with either (a) primarily cognitive deficits, (b) primarily motivational deficits, (c) primarily timing deficits, or (d) a combination of these deficits are selected. Per target group (cognitive deficits, motivational deficits, timing deficits or a combination), half of the selected children will receive an intervention of which the exact type depends on their underlying neuropsychological deficit(s), e.g., a child with cognitive deficits will receive a 6 week protocollized cognition enhancing training. Training dose will be comparable among different intervention types. Intervention effectiveness is evaluated[4] in terms of parent- and teacher-reports on the child's daily functioning and cognitive testing of the child. The interaction of intervention type by ADHD cause (cognition, motivation and/or timing) as well as the role of potential moderating factors, e.g., age, are studied. Techniques: This project uses behavioural measures by means of questionnaires and neuropsychological tests. Advanced statistical methodology will be applied to investigate the psychometric properties of the new ADHD questionnaire. Norm data for this questionnaire will be determined, based on advanced multiple regression

methods5. Also, treatment protocols designed for cognitive and motivational enhancement are an essential element of the study.

Requirements candidate: Highly motivated student with excellent English communication skills (verbal and writing) and proactive and resolute attitude.

Keywords: ADHD, children, intervention, neuropsychological deficits, test construction.

Top 5 selected publications:

1) Hurks, P.P.M., et al. (2004). Verbal fluency over time as a measure of automatic and controlled processing in children with ADHD. Brain cogn, 55(3), 535-544. (IF=2.4, 44 times cited, Web of Science);
2) Hurks, P.P.M., & Hendriksen, J.G. (2010). Retrospective and prospective time deficits in childhood ADHD: The effects of task modality, duration, and symptom dimensions. Child Neuropsychology, 17(1), 34-50. (IF=2.7, 12 times cited, Web of Science);
3) Hurks, P.P.M., et al., (2013). Normal variability of children's scaled scores on subtests of the Dutch Wechsler Preschool and Primary scale of Intelligence - third edition. Clin Neuropsychol, 27(6), 988-1003. (IF=1.6, 4 times cited, Web of Science);
4) Keulers, E.H.H., et al. (2007). Methylphenidate improves reading performance in children with attention deficit hyperactivity disorder and comorbid dyslexia: An unblinded clinical trial. Eur J of Paediatric Neurol, 11, 21-28. (IF=2.0, 30 times cited, Web of Science);
5) Van der Elst, W., Van Boxtel, M.P.J., Van Breukelen, G.J.P., & Jolles, J. (2006). The stroop color-word test - Influence of age, sex, and education; and normative data for a large sample across the adult age range. Assessment, 13(1), 62-79. (IF=2.3, 213 times cited, Web of Science).