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The diagnostic potential of continuous movement measurement in children with ADHD in a classroom

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Hyperactivity represents the central symptom of attention deficit hyperactivity disorder (ADHD), the most common behavioural disorder in children and adolescents (Halperin et al., 1992; Renner et al., 2008; Romanos et al., 2008). Children with ADHD are said to become conspicuous at a young age due to increased activity, motor restlessness and altered perception of time (Barkley et al., 2006). It is estimated that from three to four years old, hyperkinetic symptoms can be reliably distinguished from the variance of normal child behaviour (Von Klitzing et al., 2015). ADHD is usually diagnosed in children during the primary school years, between the ages of 7 and 10 (Faraone et al., 2021; Scahill et al., 2000; Schlack et al., 2007). Boys are affected more often than girls (Bennett, 2020; Dekkers et al., 2021; Faraone et al., 2021; Göbel et al., 2018; Schlack et al., 2007). The current diagnosis of ADHD in younger children is made exclusively through external assessment and behavioural observations (Wolraich, 2019). Therefore, the common diagnostic processes of ADHD in children and adolescents have some potential sources of error, such as heuristics (Bruchmüller & Schneider, 2012a). Insufficient or one-sided diagnostics can quickly lead to overdiagnosis and misdiagnosis (Bruchmüller & Schneider, 2012a; Bruchmüller et al., 2012b). Since a delayed or incorrect diagnosis of ADHD can have numerous negative effects on the further development of the affected children, it makes sense to exhaust all possibilities that are conducive to an early and reliable diagnosis (Renner et al., 2008). Already at kindergarten age or before the age of six, children with ADHD are said to be characterised by motor abnormalities, an increased urge to move and an increased level of activity (Berger & Goldzweig, 2010; Romanos et al., 2008). Therefore, it is surprising that no objective instruments exist that examine or make us of these parameters, such as increased movement, frequency, and type of movement patterns of children with ADHD (Hall et al., 2016). The question arises whether the hyperactivity observed in children with ADHD can be objectively recorded by using various parameters and indices of spatial movement and, if necessary, be applied reliably, objectively, and validly for the diagnosis in children at kindergarten age.

The main objectives of this dissertation are (1) to test whether children with ADHD move more frequently compared to children without ADHD. In addition, it is to be determined - depending on the results from the first study - (2) whether there are significant correlations between recorded continuous movement data of

the affected children in educational institutions and the ADHD symptoms reported by parents as well as the medical diagnoses of ADHD and (3) whether the recorded continuous movement data of children with ADHD are stable over time.

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