

# Web-Based Screening Tools for the Early Detection of Concentration and Hyperactivity Disorders

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**ABSTRACT:** This study aims to identify the characteristics of children detected as having Concentration and Attention and Hyperactivity Disorders. The methodology of the research was a questionnaire survey with a sample of 200 children. The data collection was conducted with web-based screening tools. The results of the study showed that there were 120 children (60%) who were confirmed to have impaired concentration and hyperactivity, and the remaining 80 children (40%) had no symptoms. In more detail, among the 120 children mentioned, there were 92 children (46%) who were likely to have ADHD, 12 children (6%) with moderate ADHD and 16 children (8%) with ADHD since childhood.

**Keyword:** *Web-Based Screening Tools, Concentration and Hyperactivity Disorders, ADHD Children*

## I. Introduction

Attention-Deficit/Hyperactivity Disorder (ADHD) is the diagnostic category currently used to describe individuals who have the clinically significant problems of inattention and/or hyperactivity and impulsivity (APA, 2013). Ozonoff (2012) has argued that while studies across sites agreed on scores using standardized instruments, there was significant variation in clinical diagnoses, depending on the site. By using dimensions with cut-offs, it was hoped to avert this problem (Ozonoff, 2012).

Attention-deficit/hyperactivity disorder (ADHD) is a common neurodevelopmental disorder (Faraone et al., 2015). The worldwide prevalence rate has been estimated to be 5% in children and between 2.5 and 4.9% in adults (Polanczyk & Rohde, 2007). ADHD is characterized by age-inappropriate levels of inattention and/or hyperactivity and impulsivity (Frances, 2000), but the clinical phenotype is heterogeneous (APA, 2013; Frances, 2000).

The etiology of ADHD is strongly influenced by genetic factors, as demonstrated by twin and adoption studies (Burt, 2009; Faraone & Mick, 2010; Thapar, Cooper, Eyre, & Langley, 2013). Heritability estimates range between 70 and 90% (Faraone & Mick, 2010; Larsson, Chang, D'onofrio, & Lichtenstein, 2013). Despite this substantial level of heritability, the identification of ADHD risk genes has presented a considerable challenge (Franke, Neale, & Faraone, 2009; Gizer, Ficks, & Waldman, 2009). Furthermore, both conditions have overlapping characteristics and etiological factors (Rommelse, Geurts, Franke, Buitelaar, & Hartman, 2011). However, most of these research projects were conducted in middle childhood and early adolescence. To what extent ADHD overlaps or differs at the level of overt characteristics, brain mechanisms and etiology in infancy and preschool age is less well understood.

Large numbers of children with symptoms of attentional, emotional, behavioral or developmental problems are placed in public elementary schools without early screening. These children are "at risk" for school failure, emotional difficulties, and significant negative adult outcomes compared to their peers (Eisenberg, Fabes, Guthrie, & Reiser, 2000). Detection efforts are particularly critical during the early educational years when students are most amenable to change in behavioral, social, and academic arenas and before students with emotional and behavioral disorders (EBD), Learning Disabilities (LD) and Autistic Spectrum Disorder (ASD), experience negative outcomes within and beyond the school setting (Landrum, Tankersley, & Kauffman, 2003; Lane, 2003; Volkmar, Lord, Bailey, Schultz, & Klin, 2004; Wagner, Kutash, Duchnowski, Epstein, & Sumi, 2005).

Attention-Deficit Hyperactivity Disorder (ADHD) is characterized by inattention, lack of concentration, and learning difficulties in addition to some degree of hyperactivity and impulsivity (APA, 2000). The disorder affects approximately five percent of school-aged children (Johnson & Rosen, 2000), who have experienced difficulties in behavior crucial to academic success, such as maintaining attention, modulating activity levels, inhibiting impulsive responses, and persisting with academic tasks (DuPaul, G. & Stoner, 2003). Students with ADHD experience persistent and extreme distractibility (Hutchison, 2004), cannot screen out irrelevant stimuli to concentrate on tasks long enough to complete them and do not sustain thought processes for long enough periods to do school work (Bennett, Dworet, & Weber, 2008). The DSM-IV criteria for ADHD (APA, 2000), include several items that are related to motor characteristics, including fidgeting, running about or excessive climbing (possibly linked to subjective feelings of restlessness), difficulties in playing, and acting as if 'driven by a motor'. During physical activity, children with ADHD exhibit age-inappropriate features of hyperactivity, excessive impulsivity, problems in lateralization, and are often lefthanded (Reid & Norvilitis, 2000). In addition, general coordination difficulties and soft neurological signs are frequently reported (Denckla, 2003; Sadock, B. J. & Sadock, 2003).

The web-based application tool used in this study called [Screening Tool for Early Detection of Concentration and Hyperactivity Disorders](#) represents an important step beyond desktop-based applications and can be used in education or as screening tools for various problems of attention control hyperactivity disorder. However, their principle function is semi-quantitative, implying that manual input of various parameters for calculation is necessary to obtain quantitative scores.

Screening for attention problems using self-report questionnaires in well-child visits is one way to enhance the detection of child mental health problems in primary care, (Bingham, Plante, & Bronson, 1990; Brown & Wissow, 2010; Brugman, Reijneveld, Verhulst, & Verloove-Vanhorick, 2010; Cress et al., 2018; Fein, Pailler, & Barg, FK, 2010; Ford & Kamerow, 1990; Kemper, 1992; Murphy, Arnett, & Bishop, 1992), but numerous barriers have limited its widespread use. Many popular instruments are condition-specific, and thus comprehensive assessment of a child's problems would require the use of a variety of tools and therefore be difficult to administer, score, and interpret (Diamond, Levy, & Bevans, 2010). With less than 20 minutes typically allotted to a pediatric well-child visit, screening during the visit limits the time for discussion considerably (Hacker, Myagmarjav, & Harris, 2006; Halfon, Stevens, Larson, & Olson, 2012; Olson, Kelleher, & Kemper, 2001; Weitzman & Leventhal. JM, 2008). Finally,

the use of an attention health screening tool may not be viewed as a primary care priority when it is competing with screening for developmental issues, safety, and nutrition, which are central to pediatric practice (Gans-Epner, Levenberg, & Schoeny, 1998).

Previsit screening has been proposed as a way to increase efficiency by reducing in-visit time spent on assessment and allowing more time to discuss concerns (Connor, 2013; Gadowski, Bennett, Young, & Wissow, 2003; Klein, Allan, & Elster, 2001; Schubiner, Tzelepis, Wright, & Podany, 1994; Zuckerbrot, Maxon, & Pagar, D, 2007). Web-based previsit screening tools have the potential to further improve efficiency by eliminating some administrative tasks, reducing response burden with the use of skip patterns, and automating scoring (Diamond et al., 2010). Studies in which adolescents have used computerized or web-based screens in a variety of medical settings have found increased disclosure and improved agenda setting (Brown & Wissow, 2010; Fein et al., 2010; Kurth, Martin, & Golden, 2004; Olson, Gaffney, Hedberg, & Gladstone, 2009). Moreover, teens have provided favorable feedback regarding the impact on communication and quality of care (Chisolm, Gardner, Julian, & Kelleher, 2008; Olson, Gaffney, & Hedberg, 2005; Olson et al., 2009).

The impact of computerized or web-based screening tools on disclosure or engagement in visits with younger children is significant. A comprehensive electronic previsit screening tool is an acceptable and practical strategy to facilitate well-child visits. It may help problem identification as well as setting agendas, engaging the family, and balancing attention between somatic and psychosocial concerns (Fothergill et al., 2013). This study aims to identify the characteristics of children detected as having concentration problems and Attention Deficit and Hyperactivity Disorders.

## **2. Research Method**

A quantitative descriptive statistical approach was used in this study. The study was conducted in the area of DKI Jakarta, West Java, and Prov. Banten Sunday School. The participants in this study were 28 children with ADHD. The subjects were aged between 7-8 years. Participants were recruited by e-mail to respond to an online survey on Google Forms® every 30 days. If the responses were not returned, an e-mail reminder was sent to the participant. The first reminder was 2 days after the survey due date. If another 2 days passed without any response, a second reminder was sent to encourage completion. If the survey was still not completed after 3 additional days, it was considered as “non response” data. Patients who did not respond to reminders for 3 consecutive months were withdrawn from the study.

## **3. Result and Discussion**

There were no sex or age differences between participants. Using the theoretical cut-off point (Z1), 120 children (60%) showed impaired concentration and hyperactivity, and 80 children (40%) did not have such symptoms. In more detail, among the 120 children studied, there were 92 children (46%) who were likely to have ADHD, 12 children (6%) with moderate ADHD and 16 children (8%) with ADHD since childhood.

Based on the survey results, the positive predictive value (PPV) of ADHD since childhood was only 0.08 or 8%. However, this instrument was useful for removing ADHD out of a negative predictive value (NPV) of 0.4 or 40%. As a reference, hypothetical predictive values were calculated using the prevalence of ADHD in the general and clinical populations. These results were similar to the previous studies of both online and short traditional descriptive questionnaire surveys for anxiety or depression (Donker, VanStraten, Marks, & Cuijpers, 2011; Mackenzie et al., 2014; Mitchell, AJ, 2007). The authors of these studies suggested that these short screening tools increased sensitivity at the expense of specificity. Our results showed that our survey method had moderate accuracy, similar to that explained by the authors of the web-based scale when compared to CIDI (Donker, van Straten, Marks, & Cuijpers, 2009). In addition, it was demonstrated that our method had high sensitivity and specificity with PPV 0.08 and NPV 0.4. To our knowledge, this was the first study that provided data on the optimal cutoff value in screening ADHD. By using the web-based screening method we would be able to identify the largest number of potential cases, sensitivity and specificity appeared to be appropriate, considering that the consequences of incorrect ADHD detection were minimal. Quick and early diagnosis of ADHD symptoms allows reference of the "positive" individuals to deeper evaluations that confirm or refute the diagnosis. Therefore, we consider that the accuracy of web-based screening is acceptable because it is a screening tool and not a confirmation test.

Finally, the high number of false positives could be explained by the diagnostic standard used (SCID-I), as it assesses ADHD (if patients meet all diagnostic criteria), whereas the web-based tool also picked up individuals with limited-symptoms. Therefore, this web-based instrument is valid to identify individuals who do not necessarily meet all the diagnostic criteria of ADHD, but who suffer symptoms which can generate distress and possibly lead to ADHD thereafter.

#### **4. Conclusion**

Screening tools for early detection of attention deficit and hyperactive disorders are useful for detecting symptoms of attention disorders and hyperactivity in ADHD children. By checking through with this tool, we acquire early information about the existence of disturbances in children so that the disorder can be quickly overcome through treatment or game-based learning media. The screening tool is very effective in giving awareness of the initial disturbance that occurs in our children through the Google application form.

Screening-based tools are very effective in detecting early disorders of early childhood. This tool is very helpful to ascertain the initial disturbance of early childhood. It needs to be promoted so parents are aware of its existence.

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