

Attention to Testing and Testing of Attention

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The prevalence of attention deficit hyperactivity disorder is estimated to range from 1% to 17% in school-age children. The commonly reported average estimate is 5%. In recent years however, clinicians have noticed an increase in children presenting with ADHD-like symptoms. To date the diagnosis of ADHD relies mainly on children's, parents' and teachers' questionnaires. The reliability and validity of these questionnaires have been reviewed [1,2]. Other possible neurocognitive, physical and psychiatric disorders should be considered [3,4]. ADHD is often associated with other disorders such as learning disability, conduct disorder, oppositional defiant disorder, and mood disorders including anxiety, depression, or a bipolar illness [5-7]. Diagnostic accuracy therefore becomes more critical. The overlap between the clinical manifestations of the different behavioral disorders and classical ADHD as well as typical children is considerable. In addition, because of the atypical or confusing manifestations and the fact that the condition is often context dependent, clinicians and parents may fail to recognize symptoms observed at school, an objective measure of attention is therefore appealing.

Previous attempts to establish a laboratory test with appropriate diagnostic

accuracy have been based on research focusing on vigilance. Indeed it is generally recognized that maintaining attention on a single source of information over an extended period is relatively unchallenging if the task is interesting. If the task is dull, and prolonged, however, maintaining attention is much more difficult. It is also recognized that *attention* is not a unitary phenomenon but is constituted of arousal, expectancy, habituation, motivation, and inhibition. This is the very reason why such a complex process can be impaired in a variety of disorders other than ADHD. In fact, personality type and age, as well as environment and time of the day, not surprisingly have a significant effect on task performance. Intrinsic variables such as stimulus duration, number and sequence as well as the presenting modality (visual vs. auditory) and ongoing knowledge of the test results by the child also influence task performance. Studies so far have failed to demonstrate a consistent validation of a sustained attention deficit as assessed by the continuous performance test in children with ADHD [8-10]. Furthermore, the added value of such tests above and beyond the commonly employed interview and questionnaires has been questioned [11]. A typical test like the Go/No Go, using some of the approaches suggested by Berger and Goldzweig in their paper appearing in the present issue of *IMAJ* [12], highlights the predicament of the lack of accurate discrimination between the different types of ADHD [13].

Their research [12] aims to address the reliability and validity of a new continuous performance function test. There are limitations to their study, some of which are recognized by the authors. In their attempt, the researchers considered attri-

butes of arousal and activation, but effort analysis reflected by the performance over time is still to be developed. A multi-dimensional test might ultimately reliably tap different cognitive resources and be suitable for the characterization of a heterogeneous rather than a falsely assumed unitary disorder such as ADHD.

Over the years, medical guidelines across medical disciplines – namely, pediatrics and psychiatry – while recognizing the limited value of laboratory tests for attention, do not include such tests as part of the assessment, or as part of the follow-up examination of diagnosed cases [3,14,15]. Neuropsychological tests are recommended only if a general low cognitive ability and low scholastic achievements relative to the patient's intellectual ability are evident. Computerized testing of attention may be indicated following an appropriate psychological assessment in selected cases but not routinely [14].

The clinic-based tests most commonly used for the evaluation of attention have been reviewed [16]. The authors of that review also emphasize that the ecological validity, namely the correlation between the test results and behavior in the “real world,” is limited. To date, only limited data pertaining to the reliability and validity of the different tests have been published. False positive and negative rates were unacceptably high (8–30%) [17], i.e., the predictive values were not sufficiently high.

Diagnostic measures should be subject to reliability and validity evaluation. The hallmark of reliability refers to test-retest consistency (repeatability). In their research Berger and Goldzweig [12] did not report such data. Validity is the extent to which the instrument/test measures the appropriate attribute. Different aspects

ADHD = attention deficit hyperactivity disorder

of validity are commonly assessed. Face and content validity are well addressed; they also report discriminative validity, and unfortunately the pass-fail criterion used is not specified. Concurrent validity, employing another acceptable measure administered simultaneously should also be analyzed. In the present research no single test (criterion) was administered to either the study group (different tests were employed for different participants) or the control group, which was not exposed to such testing at all. The timing of both tests and between-test intervals was not provided. Ideally, to achieve such validation, a large sample of children representing a wide age range from both the community and clinics, allowing for the analysis of age and gender distribution, would be required. This test could then be administered to a variety of subjects manifesting attention deficit but with different primary conditions [18]

In summary, by virtue of the definition of ADHD [19] one should acknowledge that currently no single laboratory test can be used for the diagnosis (gold standard) of ADHD. Misuse of the tests could increase misdiagnosis, fail to identify associated disorders and possibly result in inappropriate management. It should also be noted that the objective of ADHD management is to assure the children's emotional and social well-being and not only their neurocognitive functioning. Therefore, it is other measures reflecting these outcomes that will determine treatment approach. At present, with the instruments at our disposal the contribution of a neurocognitive test may be of value only in selected situations. The work of the aforementioned

authors [12] provides a starting point for studying the characteristics of the continuous performance test as a new system. Future studies should meticulously explore their specificity, sensitivity, and positive and negative predictive values. This instrument, if validated, might be useful as an addition to the comprehensive assessment of a child suspected of having ADHD. Ultimately, such a measure could also serve in the process of individualized medication tailoring as drug research continues. At the present time physicians should still be encouraged to recognize that a single method for the diagnosis of ADHD has not yet been sufficiently refined and validated, and that multisource data acquisition and interpretation are mandatory.

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“I have always found that mercy bears richer fruits than strict justice”

Abraham Lincoln (1809-1865), 16th U.S. President

“There is a great deal of difference between an eager man who wants to read a book and the tired man who wants a book to read”

G.K. Chesterton (1874-1936), English writer, known as the "prince of paradox." His prolific and diverse output included philosophy, ontology, poetry, play writing, journalism, public lecturing and debating, biography, Christian apologetics, fantasy and detective fiction.