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Brief Report: Assessing the accuracy of the WISC-IV seven subtest short form and the Child and Adolescent Intellectual Disability Screening Questionnaire in identifying intellectual disability in children

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Abstract

Little research has been conducted into the accuracy of abbreviated assessments in identifying children and young people with an intellectual disability (ID). The present study compared two such methods in a clinical population of individuals with (n= 106) and without (n= 170) ID: a seven subtest short form of the *Wechsler Adult Intelligence Scales for Children - fourth edition (WISC IV)* proposed by Crawford and colleagues, and the *Child and Adolescent Intellectual Disability Screening Questionnaire (CAIDS-Q)*. Both the *CAIDS-Q* and the *WISC IV* short form had high and comparable levels of predicting group classification (88% and 91% correct classification respectively). Both methods would appear to offer clinicians and researchers an efficient and accurate means of identifying those who are likely to have ID. The *WISC IV* short form was slightly more accurate, but the *CAIDS-Q* may offer the advantages of being shorter to administer and having no requirement for the user to have a particular qualification or training.

Keywords: Intellectual disability; short form intellectual assessment; screening tool

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Introduction

Intellectual disability (ID) is diagnosed by three criteria: a significant impairment in intellectual functioning; significant impairment in adaptive functioning; and childhood onset (American Psychiatric Association [APA], 2000; British Psychological Society [BPS], 2001).

The early identification of ID is important to ensure access to appropriate support and to optimise outcomes for the individual with ID (e.g. Guralnick, 2005). The full diagnostic assessment for ID is, however, time consuming (Ryan, Glass, & Brown, 2007) and may place considerable burden on the patient. It is, therefore, desirable to be able to screen for potential 'at risk' individuals before referral for a full diagnostic assessment. Two solutions to this issue have arisen: the use of short form intellectual assessments and the use of screening tools.

Clinicians may use short forms of intellectual assessments for pragmatic reasons (BPS, 2003) such as heavy case loads (Crawford, Allan, & Jack, 1992), to reduce the time required for administration; to reduce patient tiredness (Crawford, Anderson, Rankin, & MacDonald, 2010); for research purposes (Charman et al., 2007); for screening prior to full administration of a test, or in situations where an approximation of cognitive functioning is sufficient (Sattler, 2004).

Intellectual assessments are concerned with the diagnostic criterion of 'significant impairment in intellectual functioning', however, they show substantial correlations with the domains of adaptive functioning (Murray & McKenzie, submitted) suggesting that they could be used as a general screen for ID if made sufficiently brief, without loss of diagnostic power. Assessment of intellectual functioning in both adults and children is commonly carried out using the Wechsler Scales of Intelligence (Georgas, Weiss, van de Vijver, & Saklofske, 2003) and short form intellectual assessments are also most commonly derived from the

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Wechsler scales (Thompson, LoBello, Atkinson, Chisholm, & Ryan, 2004). The child version, the *Wechsler Intelligence Scales for Children- Fourth Edition (WISC-IV)*: Wechsler, 2003) has undergone a number of validation tests in the general population (e.g. Chen & Zhu, 2008; Keith, Fine, Taub, Reynolds, & Kranzler, 2006) and in clinical or referred populations (Bodin, Pardini, Burns, & Stevens 2009; Chen & Zhu, 2012). There are, however, some limitations with the use of short forms of the Wechsler scales. Many different versions exist (Thomson et al., 2004), which may have been developed using different methodologies (Crawford et al., 2010) requiring busy practitioners and researchers to identify the short form that best fits their needs from a wide range (Garland, 2005). In the majority of cases, no independent norms for the short forms are calculated and reference needs to be made to the available norms for the comprehensive battery (Garland, 2005). As the extent to which a short form shares the psychometric properties of the full assessment, and, therefore, the extent to which it is valid to use these norms is generally unknown, this represents a significant limitation. Crawford and colleagues (2010), however, outline the development of a seven subtest short form of the *WISC IV*, which addresses this limitation by using a method which provides composite scores which represent a stand-alone measure of intellectual functioning.

Crawford et al. (2010) selected subtests such that scores for all four indexes of the full length instrument (*Verbal Comprehension, Perceptual Reasoning, Working Memory and Processing Speed*) and short-form full scale IQ (FSIQ) scores could be derived. Subtests were chosen within each of these domains that had the best measurement and clinical properties. The resulting short form included Similarities and Vocabulary from the *Verbal Comprehension* index, Block Design and Matrix Reasoning from the *Perceptual Reasoning* index, Digit Span from the *Working Memory* index and Coding and Symbol Search from the

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Processing Speed Index. As the most reliable subtests were selected, the amount of information lost between the full scale and short form scale is minimised.

The brevity and minimal attenuation of reliability of the seven subtest short form FSIQ relative to the full assessment makes it a potential candidate measure for screening for ID. The scores from the scale are transformed to have a mean and standard deviation equal to those of the full instrument, therefore, using the scale, a FSIQ score under 70 would identify an individual as at risk of ID. Clinicians and researchers can use the online calculator provided by Crawford et al. (2010) to compute an individual's FSIQ from the seven subtests.

ID screening tools also represent an attempt to address the potential issues of under-diagnosis and over-assessment, being developed as brief measures which indicate whether an individual is likely to be at risk for ID and should, therefore, undergo full diagnostic assessment. One practical advantage of these tools over short form intellectual assessments for screening for ID is that they do not necessarily require the administrator to have particular professional qualifications or training (e.g. McKenzie & Paxton, 2006). A screening tool available for use with children is the *Child and Adolescent Intellectual Disability Screening Questionnaire (CAIDS-Q)*: McKenzie, Paxton, Murray, Milanesi, & Murray, 2012). This is a brief seven item inventory capturing functioning in the academic, self-care and social domains. The psychometric properties of the scale have been evaluated in a series of studies which supported the inter-rater reliability and face, construct, convergent and discriminative validity in clinical populations, as judged against diagnosis of ID, based on all three diagnostic criteria (McKenzie et al., 2012). The *CAIDS-Q*, therefore, provides a good comparison against which the performance of the short form intellectual assessments for identifying potential ID can be judged. It was the aim of the present study to assess the performance of the seven subtest short form of the *WISC-IV*, proposed by Crawford et al. (2010), and the *CAIDS-Q* in correctly identifying individuals with an ID diagnosis.

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Methods

The study used pre-existing data which had been gathered for the initial validation studies of the *CAIDS-Q* for which Caldicott Guardian approval and approval from the appropriate clinicians in the participating health boards had been obtained to access pre-existing case note information (See McKenzie et al., 2012 for details).

The short form measure used in the study was the *WISC IV* short form proposed by Crawford et al. (2010) and the screening tool was the *CAIDS-Q* (McKenzie et al., 2012). The data, which had been collected and recorded anonymously from case-notes of children and adolescents who had been referred to four National Health service (NHS) community child and adolescent/ ID services in Scotland included: scores on *CAIDS-Q* items, gender, age and full scale IQ, index and subscale scores of the *WISC IV*. The latter provided scaled scores on the subtests required for the *WISC IV* short form: Block Design, Similarities, Digit Span, Coding, Vocabulary, Matrix Reasoning and Symbol Search. Data were excluded if there were missing data for the relevant subtests. Diagnosis of ID was determined by the independent clinician, as recorded in the case notes.

Data from 276 participants were analysed. Of these, 106 were diagnosed as having ID (66 males, 40 females) with a mean age of 135.7 months (SD=36.9) and 170 were not (120 males, 49 females, 1 missing) with a mean age of 131.7 months (SD=39.4). The mean FSIQ for those with ID was 57.1 (SD= 8.1) and for those without ID was 86.7

Short form FSIQ scores were obtained by applying the transformation outlined by Crawford et al. (2010) to the seven subtest scores identified above:

$$X_{new} = \frac{SD_{new}}{SD_{old}} (X_{old} - \bar{X}_{old}) + \bar{X}_{new}$$

where X_{new} is the transformed score for an individual, X_{old} is the sum of an individual's scores on the seven short form subtests, SD_{old} is the standard deviation of the seven subtest

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total in the population and \bar{X}_{new} and SD_{new} are the mean and standard deviation for FSIQ in the population i.e 100 and 15 respectively.

As the short form of the *WISC IV* could only provide information about intellectual functioning, determination of whether the individual would be likely to have an ID or not was based on whether the transformed FSIQ fell below 70 or not, with a score under 70 being classified as ID and a score of 70 and above as non-ID. Similarly individuals were assigned as having ID or not according to their *CAIDS-Q* score for their age category. These classifications were used in chi-square tests to assess the ability of the *WISC-IV* short form and *CAIDS-Q* to correctly classify individuals according to whether they had ID or not.

Results and discussion

There was a strong and statistically significant association between the *WISC-IV* short form derived classification of ID or non-ID and actual diagnosis [$\chi^2(1) = 181.71, n = 276, p < 0.001$]. Overall the short form correctly classified 91% of individuals in the sample. Individuals with a diagnosis of ID were correctly classified 92% of the time and individuals with no diagnosis of ID were correctly classified 91% of the time.

There was also a strong and statistically significant association between *CAIDS-Q* classification of ID or non-ID and actual diagnosis [$\chi^2(1) = 109.09, n = 191, p < 0.001$]. Overall, the *CAIDS-Q* correctly classified 88% of individuals in the sample. Individuals with a diagnosis of ID were correctly classified 89% of the time and individuals with no diagnosis of ID were correctly classified 88% of the time.

The results show that both the *CAIDS-Q* and the *WISC IV* short form showed high levels of accuracy in terms of correctly predicting group membership. The *WISC IV* short form performed marginally better than the screening tool (91% and 88% overall correct classification respectively). These results both meet the classification standards recommended

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for screening tools designed for use with those with developmental disabilities (Glascoe, 2005).

One reason that the *WISC IV* and any derived short forms cannot perfectly predict ID is that, as intellectual assessments, they are designed to measure only one of the diagnostic criteria for ID. This means that, in the present study, some individuals may have been incorrectly classified as having ID on the basis of the transformed FSIQ alone, when they may not have been classified as such if all three diagnostic criteria were taken into account. On the other hand, the *CAIDS-Q* does attempt to capture the ID construct as a whole, but it is unlikely to perfectly predict ID because of its brevity.

The results of the study suggest that researchers and clinicians who wish to identify children and adolescents who are likely to have ID could utilise either the *CAIDS-Q* or seven subtest *WISC IV* short form with some confidence. Users of the *WISC IV* do however, need to be appropriately qualified professionals, normally applied psychologists (BPS, 2001), and even short forms of intellectual assessments take some time to administer. The *CAIDS-Q*, which was designed to be an ID screening tool, rather than a short form intellectual assessment, does not require the user to have a particular level of training or qualification, and can be completed in 5-10 minutes. As such it may offer some advantages over the short form, particularly to non-psychologists.

It should, however, be borne in mind that while the data used in the study were from a clinical population, which is arguably representative of those who would be likely to undergo cognitive assessment, it is unclear to what extent they would be representative of the wider population. As Facon, Magis, Nuchadee, and De Boeck (2011) caution, it should not be assumed that assessments perform in the same way across different samples.

These limitations notwithstanding, the study suggests that both the *CAIDS-Q* and the seven subtest short-form of the *WISC IV* proposed by Crawford and colleagues (2010) appear to offer researchers and clinicians an efficient and accurate means of identifying those who are likely to have ID.

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