Development and psychometric validation of the Brief Intellectual Disability Scale for use in low−health resource, high-burden countries

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Abstract

Objective: To develop and validate a concise, parent-completed Brief Intellectual Disability Scale (BIDS) for children in low−disability resource and high−disability care burden countries.

Study Design and Setting: In this prospective cross-sectional study of 124 children recruited from a facility for intellectual disability (ID), the newly developed BIDS as the measure for validation as well as for the gold standard and convergent and divergent validities was administered by independent raters. Tests for diagnostic accuracy, reproducibility, and validity were conducted at the item and scale levels.

Results: The BIDS scores of ≥ 5 (sensitivity [Sn] = 71.43%, specificity [Sp] = 80.95%) and ≥ 11 (Sn = 4.29%, Sp = 100%), with area under the curve of 0.79, are suggested, respectively, for screening and diagnostic use in Indian populations. The inter-rater reliability (intraclass correlation coefficient [ICC] = 0.96) and test−retest reliability at 4 weeks (ICC = 0.95) for BIDS are strong. Besides the adequate face and content validities, BIDS demonstrates good internal consistency (Cronbach $\alpha = 0.80$) and item-total correlation. There is moderate convergent validity with Binet−Kamat Test of Intelligence or Gesell's Developmental Schedule ($r = -0.66$, $P = 0.001$) as well as with adaptive behavior measure of Vineland Social Maturity Scale ($r = -0.52$, $P = 0.001$) and low divergent validity with the subscales of Attention Deficit Disorder with Hyperactivity: Comprehensive Teacher Rating Scale ($r = -0.11$, $P = 0.7$; $r = 0.18$, $P = 0.5$; $r = 0.13$, $P = 0.6$; $r = 0.08$, $P = 0.7$). An exploratory factor analysis demonstrated a three-factor structure, explaining 60% of variance.

Conclusion: The BIDS shows promise as a psychometrically adequate, yet brief measure for identifying ID in countries with low disability care resources and high disability-related burden. © 2013 Elsevier Inc. All rights reserved.

Keywords: Disability; Diagnostic test; Diagnostic accuracy; India; Validity; Reliability

1. Introduction

Despite the higher mortality rate among children with disabilities in low-income countries, childhood disabilities are more common in low-income countries than in wealthier countries [1]. Yet, clinical care, research, and progress in the area of childhood disabilities have been seriously lagging in these countries [2]. The World Health Organization has identified intellectual disability (ID) as a priority disability [3]. However, paucity of measures to identify childhood disabilities has been acknowledged as one of the main reasons for this deplorable situation in India and other low-income countries with scant disability-associated resources but high disability-related burden [4].

One way to resolve this crisis is to develop and validate measures that are brief and can be rated by the primary caregiver or respondent from instruments that are widely and often routinely used across different settings and people as diverse as teachers, parents, and health care professionals. Developing such an ad hoc measure will save time and resources, improve the ability to extrapolate information from the parent instrument, and enhance comparability with other studies.

A measure that fits the bill is the Child Behavior Checklist (CBCL), a questionnaire on childhood psychopathology, which is extensively used by teachers, parents, and clinicians in more than 30 countries [5]. It has 113 items describing nine subscales that identify somatic complaints, withdrawn, anxious/depressed symptoms, social problems, thought problems, attention problems, delinquent behaviors, aggressive behaviors, and sex problems

What is new?

- Lack of brief measures to identify intellectual disability (ID) in countries with low–disability care resources but high–disability burden results in poor case identification.

- A theory-driven, qualitatively derived, statistically determined, and field-tested measure is needed in India for high-quality epidemiological and clinical data.

- Brief Intellectual Disability Scale (BIDS), thus developed, has adequate psychometric properties of face, content, convergent, divergent, and construct validities as well as high test–retest and inter-rater reliability.

- The BIDS scores of ≥5 (sensitivity [Sn] = 71.43%, specificity [Sp] = 80.95%) and ≥11 (Sn = 4.29%, Sp = 100%) are suggested for screening and diagnostic use, respectively, in Indian populations.

- A brief psychometrically adequate measure to identify ID is available for research and clinical use in India as well as in other low- and middle-income countries.

in individuals aged 4–16 years. Post hoc measures based on CBCL have been developed to enhance the diagnostic use of CBCL and identify other psychopathologies that are not part of the original set of problems, such as attention deficit hyperactivity disorder (ADHD) and posttraumatic stress disorder [6,7]. CBCL has been used to successfully assess the psychopathologies in children with ID [8]. However, post hoc measures based on CBCL have not been developed for identifying ID itself, when many of the items in the measure have the inherent ability to identify ID if compiled to form a specific measure. Therefore, the aim of this study was to cull items from the widely used CBCL and develop a brief screening measure with adequate psychometric properties for identifying ID in various clinical settings, namely, the Brief Intellectual Disability Scale (BIDS).

2. Method

2.1. Sample and setting

A cross-sectional design was used. All children who attended the facility for children with ID, in a tertiary care teaching hospital, from November 2006 to November 2008 were included as the study sample if they fulfilled the selection criteria. Participants were the primary caregivers of children being assessed for suspected compromised intelligence, with a working knowledge of Tamil or English, who consented for the study. Participants were excluded if they had suspected mental illness or refused consent for the study.

2.2. Instrument development

Item selection for the measure was done by a team of 12 members, which included psychologists, special educators, specialist nurses, a speech therapist, occupational therapists, and psychiatrists. Their experience of working with children with ID was a mean (standard deviation [SD]) of 12.67 (8.2) years, with a range of 2–27 years. The 113 items of CBCL were reduced in the first step to 23 most relevant items (leading edge items) that had the potential to identify ID by rank ordering and consensus, and the rest of the 90 items were dropped (trailing edge items), and thus a concept-retention approach was followed as the initial procedure [9]. To further reduce the items, the endorsement rate approach was used [10]; those items with clarity (how easy they were to understand by the expert team), importance (how often the item was labeled as a problem by the team), and high frequency (how often the item was used by the expert team) were analyzed, and items with an endorsement rate of less than 95% were dropped in the second and third versions of the BIDS, reducing the number of items further to 13 and later to 10. Item sequencing and item paneling were not done as the items were selected as such from the existing tool. Response category format and endorsement pattern were in the form of a three-point Likert as given in the original scale, presented as "not true (0)," "sometimes true (1)," and "often true (2)." The final scoring of the BIDS was based on raw scores without standardization, calculated from the simple addition of the total item scores. Higher BIDS scores indicated higher level of ID. The threshold for "caseness" of the final version of the measure was decided from the receiver operating characteristic (ROC) curve cutoffs.

In the cross-cultural adaptation process that followed, these 10 items were translated forward (from English to Tamil) and backward (from Tamil to English) by two teams with two independent bilingual translators each to achieve the proximity between the source and target versions. During the translation procedures, conceptual, content, semantic, operational measurement, and functional equivalence of the items were maintained. Finally, reconciliation of problematic items was based on voting by a third independent team with content and language experts [11].

The first psychometric field testing, as recommended, was done with 20 children and their primary caregivers for the translated version of the measure [12]. Items with poor clarity in translation were revised before the final version was administered. The second psychometric field testing for BIDS was done with more than 100 participants, as has been recommended for an exploratory factor analysis (EFA) [12].