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Deviation scores: An innovative approach to interpreting cognitive test results for individuals with intellectual disabilities

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Abstract

Background: Students with Intellectual Disability undergo frequent cognitive testing. Testing with this population is limited by insensitivity to relative strengths and weaknesses due to floor effects.

Aim: The study explored the utility of deviation scores via four case studies as a supplement to educational decision-making.

Methods: Four students with Intellectual Disability completed cognitive testing. Deviation scores were calculated using age dependent raw z-score transformations to determine deviation from the standardization sample norms.

Results: The application of deviation scores highlighted true relative strengths and weaknesses for students with Intellectual Disability rather than documenting previously known deficits. The four cases studies illustrated where deviation scores could, or could not, add value above and beyond traditional scoring.

Discussion: Deviation scores can supplement placement and service decisions for students. Practical and psychometric considerations are reviewed.

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The authors declare no conflict of interest.

Conclusion: The findings highlight the usefulness of deviation scores in providing meaningful information to school- and clinic-based practitioners.

Keywords

cognitive testing; deviation score; intellectual disability

1 | INTRODUCTION

Within the United States, cognitive testing plays an important role for children with Intellectual Disabilities in special education placement, determination of services, and goal development. However, intelligence testing is often associated with a flat profile for individuals whose intellectual ability falls at the very bottom of the bell curve, due to insufficient items at the 'floor' of commonly used tests. Due to these 'floor effects', test results for students with Intellectual Disability are often insensitive to personal cognitive strengths (Toffalini et al., 2019). Consequently, score interpretations are often deficit-based and fail to provide educational teams and families with meaningful information for educational planning and intervention development that leverage the strengths of the student. In response to these challenges, deviation scores have been utilised by researchers to improve valid measurement of the assets, needs, and development of individuals with Intellectual Disability participating in clinical trials (e.g., Budimirovic et al., 2017; Hessl et al., 2016; Sansone et al., 2014; Schworer et al., 2021). This paper posits that deviation scores may offer an alternative method of test interpretation for educational and clinical teams engaged in educational planning in collaboration with students with Intellectual Disability and their families.

2 | INDIVIDUALS WITH INTELLECTUAL DISABILITY

Within schools in the United States, the Individuals with Disabilities Education Act (IDEA, 2004) provides four key guidelines for identification of Intellectual Disability: (1) students must have 'significantly sub-average general intellectual functioning'; (2) concurrent 'deficits in adaptive behavior'; (3) these delays must 'manifest… during the developmental period'; and (4) in order to qualify for a disability within school-based settings, these factors must 'adversely affect a child's educational performance' [34 CFR §300.8(c)(6)]. Similar to guidelines for diagnosing Intellectual Disability within medical settings, school-based eligibility under this category depends on several factors that include multi-source clinical assessment via observations, rating scales, and standardised testing, with standardised scores of intelligence and adaptive behaviour following at or below two standard deviations below the mean.

The term 'intellectual disability' includes a diverse group of individuals with specific genetic or chromosomal abnormalities (e.g., fragile X syndrome, Down syndrome, Prader–Willi syndrome), developmental delays due to environmental factors (e.g., abuse, neglect, teratogens), or metabolic conditions (e.g., phenylketonuria, Tay-Sachs disease) that occur early in life. Regardless of aetiology or the presence of associated disorders, the criteria required to identify Intellectual Disability is generally consistent.

2.1 | Prevalence

Intellectual disability is believed to occur in between 0.05% and 1.55% of the international general population (Maulik et al., 2011; McKenzie et al., 2016). The 2009/2010 National Survey of Children with Special Health Care Needs revealed that approximately 5.8% of children aged 2–17 years in the United States met the criteria for Intellectual Disability (Bramlett et al., 2014). As noted above, Intellectual Disability under Individuals with Disabilities Education Act (2004) is a broad definition, and students may be served under several of the other 13 disability categories, including Autism Spectrum Disorder, Developmental Delay, or Multiple Disabilities. Of those students who qualify for special education services in the United States, 9% are categorised under Intellectual Disability, 2% of students categorised under Multiple Disabilities (which includes students who have Intellectual Disability *and* other sensory or physical impairments), and 9% of students are categorised under Autism Spectrum Disorder, a developmental disability with 32% co-morbidity with Intellectual Disability (National Center for Educational Statistics, 2017).

Despite students with Intellectual Disability and associated developmental disabilities accounting for a significant portion of students receiving special education services, professionals have faltered in meeting calls to improve their techniques regarding sensitivity and social validity for this population (Wolf-Schein, 1998). Given the nuances of Intellectual Disability and its comorbidities, it is critical that children are identified with the appropriate disability category and that planning for their education, vocational, and community involvement future is intentionally implemented to ensure successful long-term outcomes. Consideration of novel approaches to test interpretation, such as deviation scores, can support improved educational planning and collaborative relationships between students with Intellectual Disability, their families, and their educators.

2.2 | Current outcomes

Educational planning persistently falls short of supporting positive long-term outcomes for students with Intellectual Disabilities. In comparison to their peers with other disabilities and their peers without disabilities, individuals with Intellectual Disability are less likely to participate in post-secondary education, sustained employment, independent living, recreation, and other college, career, and community experiences (Lipscomb et al., 2017), despite research documenting their employability (Butterworth et al., 2014) and desire for personal and professional engagement (Pallisera et al., 2015). Unfortunately, school-based goal development for this marginalised population continues to be poorly aligned with long-term outcomes most frequently identified by students with Intellectual Disability and their families (Cameto et al., 2004; Grigal et al., 2012).

Psychosocially, students with Intellectual Disability are at least 2.2 times more likely to experience a traumatic event than their neurotypical peers, experience less resiliency to trauma, and subsequently display higher lifetime rates of mental illness (Hatton & Emerson, 2004; Martorell et al., 2009; Simonoff et al., 2008). Despite these elevated rates of psychosocial need, they are significantly less likely to access mental health care throughout their lifetime (Matson & Williams, 2014; Smith et al., 2012). Current test interpretation for individuals with Intellectual Disability does not allow for the subtlety of interpreting behaviours arising from adverse conditions; this contributes to under-identification of mental illness and persistent diagnostic overshadowing in clinical decision making (Manohar et al., 2016).

Consistently poor life outcomes for this population suggest that current methods of applying test results for futures planning are broken and harkens for an improved and targeted method of interpreting this type of data.

3 | COGNITIVE TESTS IN EDUCATIONAL PLANNING

In comparison to their typically developing peers, students with Intellectual Disability participate more frequently in standardised cognitive testing. In the United States, all students with Intellectual Disability, regardless of eligibility category, are frequently referred for evaluation for educational diagnosis, (re)eligibility for special education, and planning related to transition and other related services.

3.1 | Frequency of testing

Individuals with Intellectual Disability engage in testing and assessment at several points across the lifespan (Talapatra et al., 2023). During infancy and toddlerhood, specific developmental disabilities are typically identified by a paediatrician or a multi-disciplinary Child Find team. Within the United States, when disabilities are identified prior to preschool, the child receives early intervention from local providers funded by Part C of Individuals with Disabilities Education Act (2004) and has an Individualised *Family Service Plan*. Once a child with disabilities reaches the age of three, they transition from Individuals with Disabilities Education Act (2004) Part C to Part B (i.e., preschool special education). This shift requires an assessment process to determine eligibility, placement, and programme supports and services (e.g., speech-language, occupational, and behavioural therapy), which are documented within school-based *Individualized Education Program* plans. In elementary school (ages 5–6), special education evaluation, including cognitive tests, determines placement (e.g., full inclusion general education classrooms, self-contained settings, pull-out supports), service plan goals (e.g., self-help skills, functional academic skills, exposure to the general academic curriculum), and current levels of performance. By law, comprehensive testing is repeated every 3 years until graduation from high school.

Entering middle and high school, Individuals with Disabilities Education Act (2004) mandates that students with disabilities, including Intellectual Disability, participate in individualised transition planning for post-school life that accounts for areas of interest, strength, and need before they turn 16 years old. Typically, community living skills, career interests, and college readiness are areas of focus during transition planning for students with Intellectual Disability (Gargiulo, 2015; Grigal et al., 2012). Finally, upon exiting the public school system, cognitive tests are utilised to determine whether individuals with Intellectual Disability qualify for federally funded independent-living, medical services, academic accommodations at higher education intuitions, social security disability insurance, and vocational rehabilitation resources (Rizzolo et al., 2013).

In ideal practice, cognitive and other standardised tests should provide diagnostic clarity, a better understanding of which areas should be addressed in service plans, and how to individualise goal development (Crane et al., 2016). Short-term objectives and long-term student goals should arise from interpreting data from student, family, and educator interviews and individualised testing. However, despite the pivotal role standardised tests play in determining the future of individuals with Intellectual Disability, planning for the unique needs and abilities of students with Intellectual Disability are often overlooked in assessment practices (Carter et al., 2015). Given the long-lasting, high-stakes nature of assessment decisions, educational psychologists and other team members must balance interpretation of cut scores for service access with nuanced interpretation of strengths and needs for educational planning.

3.2 | Test validity

With regard to psychometric validity, floor effects, which limit the ability to measure low cognitive abilities with sensitivity, contribute to psychometric challenges when testing students with Intellectual Disability (Bagnato & Neisworth, 1994; Tager-Flusberg & Kasari, 2013; Thompson et al., 2018; Whitaker & Gordon, 2012). Floor effects may also be exacerbated by limited numbers of individuals with Intellectual Disability in the test's norm-reference group, making measures less effective at detecting differences in index-level abilities or growth over time (Thompson et al., 2018). The utility of a test for this population often lies less in its ability to provide a number, but rather in its ability to provide understanding of a child's relative strengths and areas of improvements, likes and dislikes of tasks, and behavioural support needs.

Additionally, there are several behaviours and non-cognitive skill deficits (e.g., slow processing speed, articulation difficulties, expressive or receptive language delays, differences in executive functioning) that are associated with Intellectual Disability that complicate the validity of cognitive testing with this population (Gargiulo & Bouck, 2018). Termed 'access skills' (Roid, 2003), these behavioural, communicative, and sensory characteristics often make it difficult to accurately assess the degree to which tests being used measure the intended constructs or abilities (e.g., intelligence) versus capturing behaviours or skill deficits associated with Intellectual Disability (American Educational Research Association, 2014). Furthermore, several idiopathic behavioural characteristics of individuals with Intellectual Disability (e.g., off-task or non-compliant behaviour, low motivation, language difficulties) significantly interfere with standardised approach to administration, resulting in invalid results and children being characterised as 'untestable' (Bagnato & Neisworth, 1994; Roid, 2003; Wolf-Schein, 1998).

While cognitive tests are often required and subsequently invaluable for service access, they perform less well in measuring the degree of impairment and providing a profile of relative strengths and weaknesses for individuals with Intellectual Disability (Hessl et al., 2016; Sansone et al., 2014). Cognitive tests have long been criticised for contributing to insufficient understanding of the profiles, developmental trajectories, and contribution to goal planning for individuals with Intellectual Disability (Tager-Flusberg & Kasari, 2013). For example, many students with fragile X syndrome or Down syndrome score below the 1st percentile on standardised cognitive assessments. The floor effects of cognitive tests essentially mask variations and patterns in performance and therefore provide limited information on a profile that could lead to functional planning for intervention. These clinical and psychometric difficulties contribute to the belief that a ‘flat profile’ is a key indicator of Intellectual Disability. Conversely, research indicates that individuals with Intellectual Disability often present with unique relative strengths and weaknesses and disability-specific profiles on cognitive and other test batteries, particularly when their abilities are compared to other individuals with Intellectual Disability (Nunn et al., 2000; Ralston et al., 2003; Taylor et al., 2013).

Reflecting this, practitioners, scholars, and family members have expressed longstanding concern regarding the clinical utility of standardised tests. Insufficient items at the floor of available tests and test access skills rendering invalid measurements of intelligence are the most frequent concerns identified in surveys of practitioners with expertise in testing individuals with Intellectual Disability and associated developmental disabilities (Bagnato & Neisworth, 1994; Snider, 2020). Scholars note that using standardised tests of cognition or achievement with students with Intellectual Disability is at best clinically difficult, and at worst a reflection of construct-irrelevant variance rather than true ability (Armstrong et al., 2012; Crepeau-Hobson & Vujeva, 2012; Thompson et al., 2018; Wolf-Schein, 1998). Low scores and flat profiles, exacerbated by poor item sensitivity for individuals who perform in the low extreme of the bell curve, do not provide information that is helpful and applicable for family-school partners desiring functional and meaningful educational plans. Consequently, families and advocates often object to standardised testing on the grounds that standardised cognitive tests in particular fail to identify the unique strengths of students with Intellectual Disability and contributes to lowered expectations for this population (Langerman, 2012; Simmons, 2010; Upland Unified School District v. Parent, 2017).

4 | DEVIATION SCORES FOR INDIVIDUALS WITH INTELLECTUAL DISABILITY

For decades, practitioners have reported that the utility of standardised measurements of intelligence is confounded by unique student traits associated with Intellectual Disability, rendering standardised tests insufficient in guiding overall decision making for this population (Bagnato & Neisworth, 1994). Despite concerns regarding the utility of cognitive measures, they have largely been unaddressed within research, leaving families, clinicians, and educators without guidance to better serve this population. Given that these tests are mainstays mandated for the purposes of securing access to services, it is apparent that a more sensitive assessment approach is needed to facilitate service delivery, futures planning, and accurate tracking of levels of performance, strengths, and weaknesses. This paper seeks to translate these procedures, which are frequently used in research settings with individuals with Intellectual Disability, to educational and clinically-based practices for test scoring and interpretation. Field examples will be used to demonstrate how deviation scores from the *Stanford Binet Intelligence Scales, Fifth Edition* (SBV; Roid, 2003) may be used to better identify authentic strengths and needs of students with Intellectual Disability and inform educational decision-making.

4.1 | Sample and data interpretation

The following four field examples illustrate the use of deviation scores for students with Intellectual Disability. Data for these examples were obtained from four students with Intellectual Disability who had completed the SB5 for a previous study (Hessl et al., 2016) and were all facing a point of transition. Data were completely de-identified for this study and, therefore, the original consent to participate was deemed adequate. Three examples have identical standardised score profiles, with full-scale IQs (FSIQs) of 40 and subtest scores of 1. However, deviation scores indicate meaningful differences in each student's cognitive profile. A fourth example, wherein the student obtained subtest Scaled scores above the floor, is offered to illustrate an instance where this approach may not add value to educational or clinical planning.

Deviation scores are calculated using age dependent raw *z*-score transformations to determine a student's actual deviation from the standardisation sample norms. These *z*-scores represent the number of standard deviations from the normative population mean. For example, a *z*-score for a student s within the tth age band is as follows:

$$Z_{st} = r_{st} - \mu_t / \sigma_t$$

where r_{st} is a student's raw score, μ_t is the mean, and σ_t is the standard deviation of a specific subtest for a specific age band in a norming sample. Application of this method appears to capture and represent true relative strengths and weaknesses for students with Intellectual Disability rather than merely documenting previously known deficits.

4.1.1 | Field example 1: Charles, age 6 years, 4 months—Charles is a 6-year-old boy with Fragile X syndrome transitioning from an inclusive preschool programme to his local elementary school kindergarten class. His parents and the early childhood team decided to keep him in preschool for an additional year to develop his social–emotional skills and behaviour regulation. The transition team requested a cognitive test to help inform placement decisions and to develop a plan for support. Figure 1 depicts Charles' cognitive profile as measured by both deviation scores and scaled scores. His standard score was an FSIQ of 40 with a flat, low subtest profile. Traditionally, this would suggest his cognitive abilities are evenly developed across all domains of the SB5. However, deviation score results indicate Charles has a unique pattern of cognitive strengths and weaknesses with significant splits between his verbal and nonverbal subtests. Specifically, he appears to have personal strengths in verbal knowledge and nonverbal visual spatial ability as well as deficits in both nonverbal and verbal quantitative reasoning.

Using the standard flat profile, Charles would likely be placed in a moderate to severe self-contained classroom setting with service plan goals similar to his classmates, with a focus on functional communication with peers and activities of daily living (ADL). The deviation scores allow educators and clinicians to continue focusing on these skills, but with a more refined approach. Considering his relative personal strengths in verbal knowledge and nonverbal visio-spatial skills, instruction may have a heavier reliance on spoken language paired with picture cards. Functional mathematics may be addressed with task analysis, with a stronger emphasis on narrative than numbers and manipulatives with a visual point of reference. Relying on a simultaneous approach with verbal and visual reinforcement will likely be more successful converting instruction to memory than a single-mode approach to learning. Additionally, as both these personal strengths incorporate part-to-whole understanding, activities such as matching, pattern finding, and if-then activities may be appropriate. In the long-term, it will be important for Charles and his planning team to recognise that mathematical concepts such as providing correct change, understanding how to plan for shopping trips may be difficult. Visual supports, repeated instructions, peer-mediated strategies, and a targeted and concrete steps-wise approach to remembering may be necessary.

4.1.2 | Field example 2: Sarah, age 13 years, 6 months—Sarah is a 13-year-old eighth-grade girl with Down syndrome transitioning to high school in the fall. Her special education team requested updated cognitive testing to help plan the level of supports she will require in her new school. Figure 2 depicts Sarah's cognitive profile as measured by both deviation scores and scaled scores. Her standard score was an FSIQ of 40 with a flat, low subtest profile across all domains on the SB5. Deviation scores revealed significant variability in Sarah's profile, with strengths in her nonverbal quantitative reasoning and working memory, as well as her verbal visual spatial skills. Further, her verbal working memory score indicated a significant individual weakness.

Sarah's deviation scores indicate significant challenges with attending to verbal cues, auditory attention, and discriminating essential and non-essential information. For example, the simple task of repeating a two-word phrase was a major challenge in the testing situation. Additional challenges include inference and planning. However, Sarah shows relative personal strengths in attention and concentration with the use of manipulatives and visual cues, understanding of basic number sense, impulse control, and visual retention. Her classroom accommodations should include a strong visual component, such as visual schedules, visual checklists, tangible products, and other visual prompts. Since word retrieval and language memory may be difficult, Sarah should be encouraged to incorporate adaptive technology to assist with spoken directions, multi-step instruction, and complex tasks. She should be encouraged to restate information in a stepwise fashion using a visual method that is both comfortable and sustainable as she will soon transition to high school and this will assist with planning skills.

4.1.3 | Field example 3: Tim, age 17 years, 10 months—Tim is a 17-year-old student with Intellectual Disability and autism spectrum disorder completing his last year of high school. He will be attending a district-led transition programme in the fall where he will learn pre-vocational skills and skills for independent living. His team requested updated cognitive testing to help plan for his programming. Figure 3 depicts Tim's cognitive profile as measured by both deviation scores and scaled scores. Standard scores indicate his FSIQ is 40 with a flat subtest profile across all domains. Deviation scores revealed a personal strength in his nonverbal visual spatial skills and a significant personal weakness in verbal working memory.

Tim's deviation scores, similar to Sarah's, show a notable personal weakness in verbal cues, auditory attention, and discriminating essential and non-essential information. He has a significant personal strength in visual matching, visual discrimination, graphomotor coordination, and spatial organisation. Considering Tim's age, his service plan should focus on the attainment of ADL and vocational skills, which will allow him to either attain employment or matriculate to a post-secondary institution. Structured work sessions that emphasise concrete tasks with visual components may be beneficial. These might include sorting, matching, organising, or categorising. Associating vocabulary with visual cues will help Tim make associations and increase his retention of information. Also, like Sarah, Tim should be encouraged to use adaptive technology that will help him create visual schedules, reminders of tasks, and assist with notetaking, all of which are necessary for a vocational setting. This type of analysis used in combination with interests and passions can help inform both job placement and vocational accommodations.

4.1.4 | Field example 4: Peter, age 6 years, 10 months (comparison to non-floored IQ)—Peter is a 6-year-old boy with Intellectual Disability and Autism Spectrum Disorder transitioning to kindergarten from his self-contained preschool programme for students with autism spectrum disorder. He completed a cognitive test to help the team determine programming for the following year. Figure 4 depicts Peter's cognitive profile as measured by both deviation scores and scaled scores. Standard scores indicate his FSIQ is 71 with a personal strength in nonverbal fluid reasoning and a personal weakness in verbal fluid reasoning. It is interesting to note that when the FSIQ is well above floor (40), the deviation scores follow a similar pattern trajectory with peaks and valleys in relatively similar subtests. In these cases, where the profile displays a pattern of strengths and weaknesses, deviation scores may not add value above and beyond traditional scoring.

5 | APPLICATION FOR SCHOOL-BASED PRACTICE

Limited representation in the norming samples of many standardised cognitive tests, significant flooring effects, and a lack of sensitivity and precision have led to low, flat cognitive profiles of individuals with Intellectual Disability that fail to represent a student's true abilities (Sansone et al., 2014; Thompson et al., 2018). For example, a significant majority of the subtest scores for individuals with intelligence quotients (IQs) in the 40s–50s will receive a standard score of 1 ($M = 10$, $SD = 3$) despite the fact that their true performance may be varied below this level (Sansone et al., 2014). Thus, while cognitive scores can document the cognitive deficits of a student with Intellectual Disability and help make binary decisions about service eligibility, they fail to measure unique patterns of cognitive strengths and weaknesses that may be useful for educational planning. The neurodevelopmental research community has begun to address these limitations with the use of deviation scores (e.g., Budimirovic et al., 2017; Hessl et al., 2016; Sansone et al., 2014; Schworer et al., 2021).

Deviation scores have been shown to reveal meaningful differences in subtest scores for individuals with a variety of developmental disorders associated with Intellectual Disability such as Fragile X syndrome and idiopathic Autism Spectrum Disorder (Hessl et al., 2016; Sansone et al., 2014). Furthermore, deviation scores have demonstrated better distribution and are more strongly associated with specific genetic markers (Hessl et al., 2016) as well as measures of adaptive behaviour, vocabulary, and nonverbal reasoning than standard scores (Sansone et al., 2014). The field examples above demonstrate that the addition of deviation score data may improve a team's understanding of a student's cognitive abilities. Subsequently, the deviation scores may influence the team's ability to conceptualise students' strengths and needs so that informed decisions are made for appropriate service delivery and intervention development.

Although the use of deviation scores has previously been recommended for school-based clinicians who work closely with students with Intellectual Disability (Crepeau-Hobson & Vujeva, 2012; Thompson et al., 2018), the practical utility of the method has yet to be clarified. Calculating deviation scores by hand is cumbersome and requires obtaining descriptive statistics (means and standard deviations) of raw subtest data from the publishers of test instruments as well as conducting statistical transformations to student's raw scores. Given high school-based case-loads and the diverse roles held by professionals who assess students with Intellectual Disability, it is unlikely that most practitioners will have the time or resources to conduct such a complicated process on their own. However, researchers, collaborating with publishers of the SB5, have developed an automated process for deviation score calculation that can be of use to school psychologists, educational psychologists, and other clinicians who regularly assess individuals with Intellectual Disability. Evaluators administering the SB5 to students with Intellectual Disability can utilise an online scoring system to calculate deviation scores in addition to the standard scores. To date, only the publishers of the SB5 (Roid, 2003), have made deviation scores readily available to practitioners. By providing both standard and deviation scores, school-based clinicians can supplement traditional test scores required for placement and services with a more nuanced profile of strengths and weaknesses that can be used for robust educational planning.

5.1 | Educational planning

The deviation scoring method aims to reduce the floor effects that plague cognitive measures and could allow for an increase in sensitivity to student development. This is important for both field-based and scholarly practice.

5.1.1 | Goal development—Deviation scores can provide guidance for service plan goal writing including both short-term and long-term objectives in a strengths-based manner. Children with Intellectual Disability have complex needs that require a collaborative team-based approach for instructional and social–emotional/behavioural planning. In best practice, school psychologists, special educators, general education teachers, and special service providers collaborate with the families to develop meaningful plans that build on the strengths of the students (McLesky et al., 2017). *Assessment*, the key to understanding students' strengths and areas of need, and *collaboration* has been identified as two 'high-leverage practices in special education' that lead to student success (McLesky et al., 2017). The use of deviation scores is a critical piece of evidence that is essential to guide school professionals and families to create programmes for students with complex learning and behavioural needs by building on their individualised strengths and needs based on *each child's relative areas of strengths and weaknesses*. In contrast to normative strengths and weaknesses (i.e., interindividual), which provide minimal information due to low floor effects, relative strengths and weaknesses (i.e., intraindividual) gathered from deviation *z*-scores can more sensitively capture the cognitive abilities of individuals with Intellectual Disabilities. For example, data might show patterns to help school-based personnel determine if verbal or visual modalities are preferred for tasks, if inductive or deductive reasoning is stronger, or if auditory or spatial memory is utilised more consistently. These cognitive aspects can then be used to tailor goals that leverage abilities that may not be apparent through traditional test scores.

5.1.2 | Intervention—Historically, researchers in molecular biology, developmental psychology, and other fields have focused on symptomology rather than aetiology of Intellectual Disability, but are increasingly interested in identifying targeted pharmaceutical interventions to alleviate the impact of behavioural traits associated with Intellectual Disability (Lee et al., 2018). Measuring change is paramount in developing and implementing these treatments. Within school-based research with individuals with Intellectual Disability, deviation scores represent an opportunity to explore outcomes of skill-focused behaviour or executive functioning interventions with increased sensitivity to the needs of this population. Consideration of deviation scores has the potential to alleviate the methodological difficulties that applied and translational researchers interested in the outcomes of individuals with Intellectual Disability have previously encountered when investigating interventions in school-, medical-, or community-based settings.

In regard to practice, advances in educational interventions have also become increasingly sophisticated, with a focus on learning patterns and student outcomes. Much like the benefits to targeted psychopharmacological treatments, educational and psychological interventions require measures that are sensitive to small levels of change for refinement and for eventual validation. The deviation scoring approach provides additional information regarding the educational profiles for individuals with Intellectual Disability, and this information can and should be used to increase the effectiveness of interventions across domains. For example, some children with Intellectual Disability struggle with communication. The method for addressing these challenges should use strengths and interests to address needs. By using deviation scores to investigate student profiles, clinicians can integrate student strengths into intervention approaches.

5.1.3 | Cautions for practice—For individuals who present with a 'flat' profile with all or many floored scores and FSIQ in the 40s and 50s, the inclusion of deviation scores as a component of school-based assessment presents special education teams with the opportunity to more accurately plan services and develop goals. However, while there are significant advantages to using this method, there are also some disadvantages to consider for practice.

5.1.4 | Feedback—One caution is related to providing and framing feedback. Just as deviation scores may highlight significant relative strengths, they also may highlight areas of need, and deviation IQ scores may be below the floor of the usual test score distribution. In such cases, deviation scores may be distressing for families and require explanations that are more detailed or feedback procedures that intentionally utilise supportive, family-focused practices (Snider et al., 2020). A focus on educational planning and long-term outcomes should be the goal, and deviation scores should be utilised as a component of a multi-source, multi-method evaluation rather than the only source of student data.

5.1.5 | Interpretation—Another caution lies in the use of profile analysis. While scholars argue that analysis of the primary index scores is critical (i.e., normative strengths and weaknesses) for decision-making related to eligibility, there is still disagreement regarding the utility of analysing personal strengths and weaknesses (i.e., relative scores; Flanagan & Alfonso, 2017). Over emphasising *cognitive* scores, strengths, and areas for improvement may deprioritize factors such as skills of daily living and adaptive behaviours that are critical for life success in this population (Duckworth et al., 2011).

5.1.6 | Assessment choice—Practitioners should note that at present, only the test publishers for the SB5 have made *z*-scores publicly available for conversion to deviation scores. Clinicians should always utilise their professional judgement when selecting a test battery and considering all available data for individuals with Intellectual Disability. For instance, cultural loading, verbal communication demands, test samples, and test publication date all play a role in selecting test batteries for this population. Thompson et al. (2018) and Snider et al. (2020) offer additional clinical tools to guide this type of decision-making.

5.1.7 | Cultural sensitivity—Cognitive tests should always be used with caution due to unique potential for cultural bias. The expansion of cognitive test use in order to sort students on the basis of racial, class, and developmental differences and reduce ‘moral contagion’ to typically-developing, White, upper-middle class students is well documented (Chapman, 1988; Terman, 1916). The stability of intelligence (i.e., the reporting a static score) and the overemphasis of cognitive scores (i.e., the use of a number as the sole indicator of an individual’s ability and skills) should be questioned and considered so that students from marginalised populations are not inappropriately identified due to implicit biases (Gargiulo & Bouck, 2018; Wolf-Schein, 1998).

While Intellectual Disability is frequently associated with differences in language, sensory, or social development, concerns that children with Intellectual Disability may have different cultural experiences as a result of these developmental differences continue to be unaddressed (Wolf-Schein, 1998). Thus, practitioners must select norm-referenced measures for students with Intellectual Disability based on the sample population(s) in which the test was normed. Specifically, it is important to consider that when students with Intellectual Disability are excluded from the norm referenced groups of cognitive tests, those tests subsequently overestimate the average level of intelligence for a population (Salvia et al., 2013), and test administrators must utilise clinical judgement when deciding whether it is appropriate to compare students with Intellectual Disability to a group of peers with different social and communicative experiences (Wolf-Schein, 1998). See Hays (2016), Jimerson et al. (2004), Jones (2014), Lopez and Snyder (2003), and Talapatra et al. (2023) for recommendations in culturally responsive and strengths-based assessment practices.

6 | CONCLUSION

Individuals with Intellectual Disability represent one of our most vulnerable populations. They are highly dependent on accurate information to access government services, school-based supports, and community agencies. If we are to ensure long-term success for this population, it is incumbent upon all professionals in the field to then use the most appropriate and sensitive tools when gathering and analysing data. Traditionally, assessments have emphasised a deficit-approach when developing goals and implementing interventions. We hope this paper offers an alternative assessment interpretation, deviation scores, that highlights strengths and cognitive preferences in students with Intellectual Disability *and* serves as a call to publishers and clinicians. Currently, the SB5 is the only tool accessible to clinicians who wish to frame individuals with Intellectual Disabilities from a strengths-based perspective. It is imperative for publishers of cognitive and other standardised tests to consider inclusion of deviation score methods or other methods to improve sensitivity of measurement in individuals with Intellectual Disability in their manuals. Only when clinicians have accurate and granular information can they more quickly develop goals and treatment plans that are likely to prove effective and better serve children with Intellectual Disabilities and their families.

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DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

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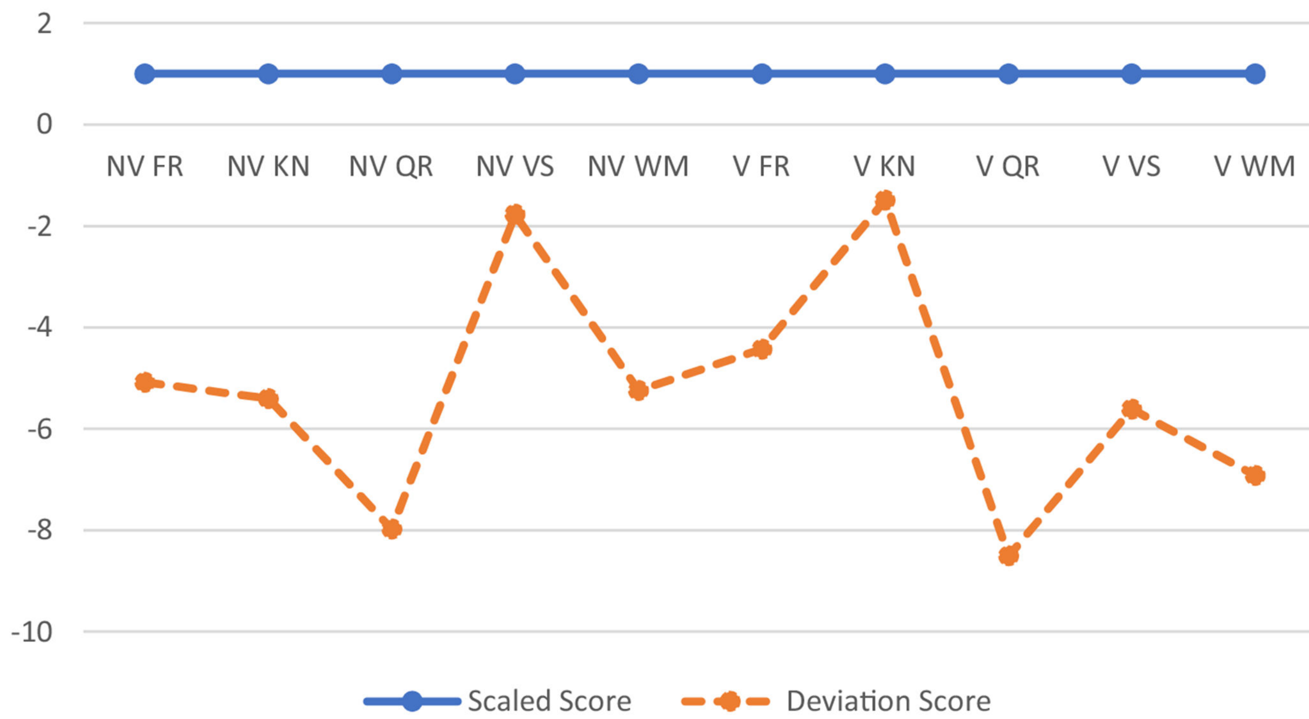

FIGURE 1.

Field example 1: Case study of Charles, age 6 years, 4 months, with fragile X syndrome. This figure illustrates Charles' Subtest Profile in both Scaled and Deviation Scores across all SB5 domains. SB5 subtests include Nonverbal Fluid Reasoning (NV FR), Nonverbal Knowledge (NV KN), Nonverbal Quantitative Reasoning (NV QR), Nonverbal Visual Spatial (NV VS), Nonverbal Working Memory (NV WM), Verbal Fluid Reasoning (V FR), Verbal Knowledge (V KN), Verbal Quantitative Reasoning (V QR), Verbal Visual Spatial (V VS), and Verbal Working Memory (V WM).

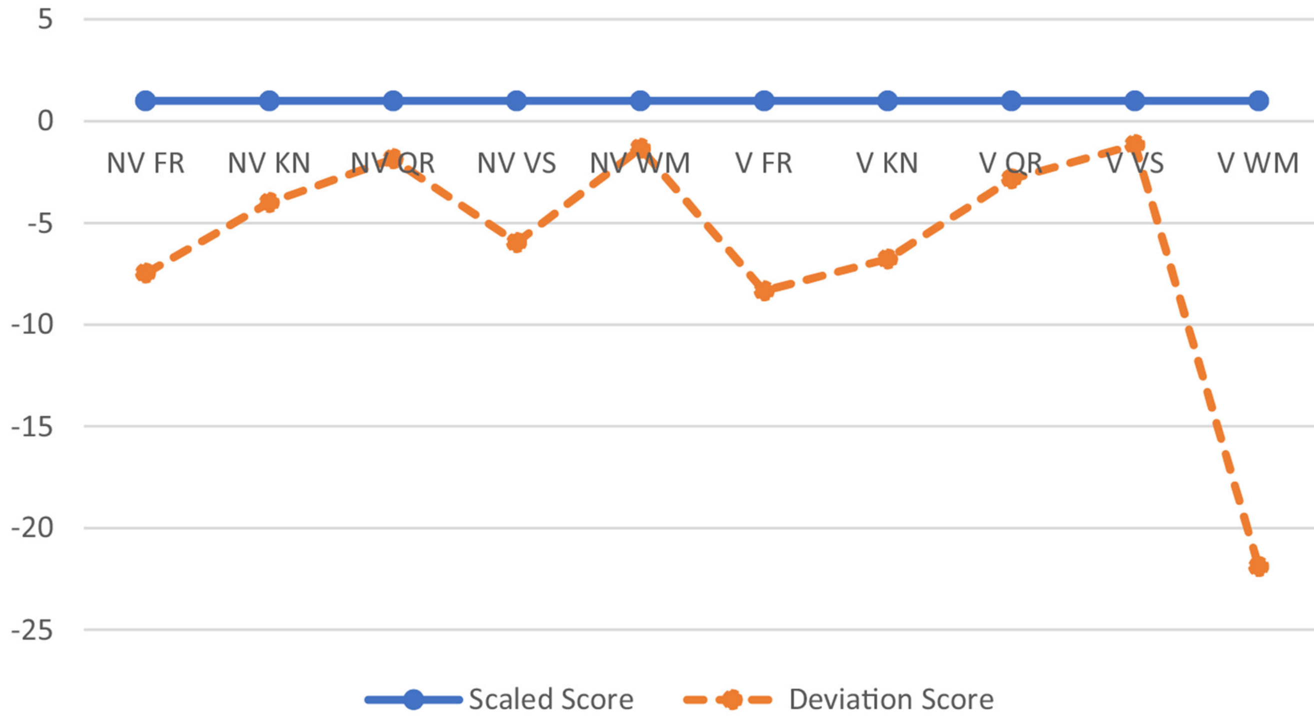

FIGURE 2.

Field example 2: Case study of Sarah, age 13 years, 6 months, with Down syndrome. This figure illustrates Sarah's Subtest Profile in both Scaled and Deviation Scores across all SB5 domains (i.e., NV FR, NV KN, NV QR, NV VS, NV WM, V FR, V KN, V QR, V VS, and V WM).

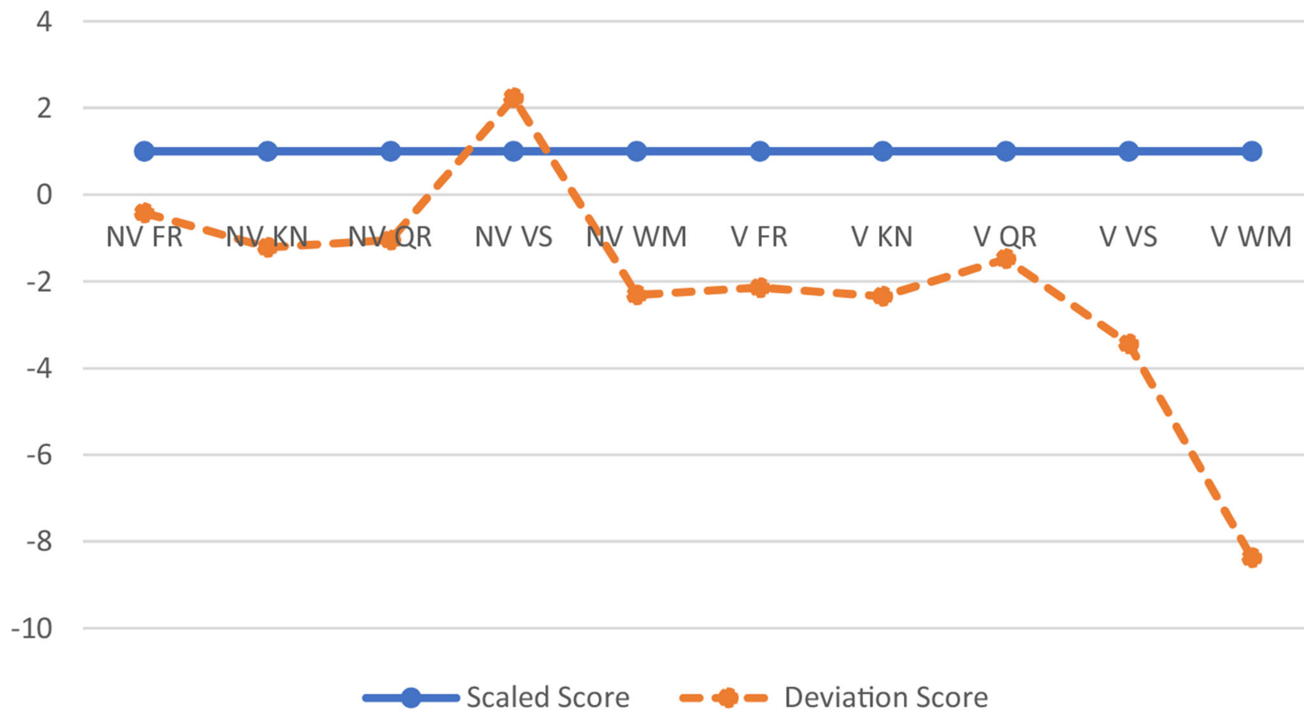

FIGURE 3.

Field example 3: Case study of Tim, age 17 years, 10 months, with Intellectual Disability and Autism Spectrum Disorder. This figure illustrates Tim's Subtest Profile in both Scaled and Deviation Scores across all SB5 domains (i.e., NV FR, NV KN, NV QR, NV VS, NV WM, V FR, V KN, V QR, V VS, and V WM).

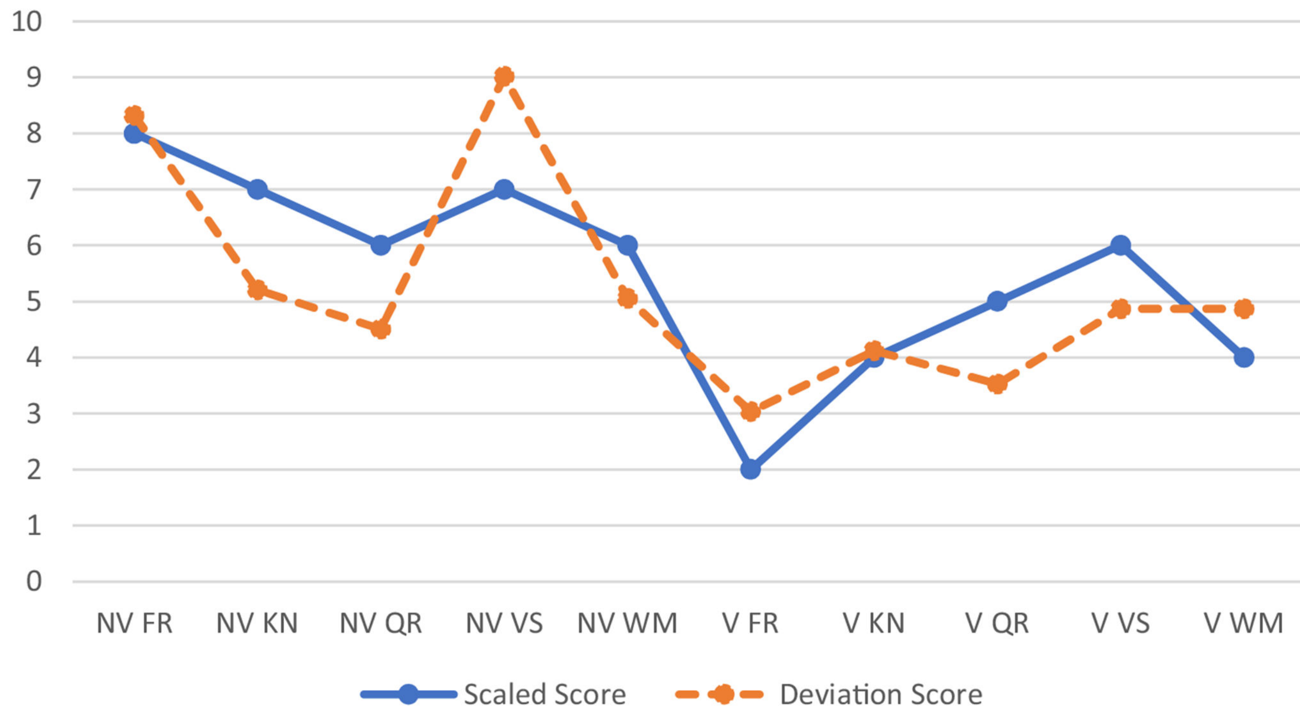

FIGURE 4.

Field example 4: Case study of Peter, age 6 years, 10 months, with Intellectual Disability and Autism Spectrum Disorder (comparison to non-floored IQ). This figure illustrates Peter's Subtest Profile in both Scaled and Deviation Scores across all SB5 domains (i.e., NV FR, NV KN, NV QR, NV VS, NV WM, V FR, V KN, V QR, V VS, and V WM).