

Evaluating Coordination and Balance Capacities of Youth With Intellectual Disabilities

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Abstract. The Bruininks-Oseretsky Test of Motor Proficiency (BOT-2) was established as a reliable test in evaluating balance and coordination in children without disabilities but has demonstrated poor to moderate reliability in children with intellectual disabilities (ID). Recently a manual has been developed for the BOT-2 specifically for children with ID (revBOT-2). The purpose of this study was to compare reliability and concordance scores of BOT-2 to rev-BOT-2. Forty-eight youths (age = 13.6 ± 3.6 ; 31 males, 17 females) with ID performed eight evaluations on two different days with 3-4 weeks between evaluations. Significant ($p < 0.05$) Intraclass Correlation Coefficients (ICC) were seen for 7 of the 8 tests and Cronbach's Alpha indicated 5 tests to be acceptable to excellent (>0.6), 1 test poor (0.51), and 2 tests unacceptable (<0.5) for reliability of test scores. The rev-BOT-2 improved reproducibility and reliability in evaluating these outcome measures for children with ID.

1. Introduction

The Bruininks-Oseretsky Test of Motor Proficiency (BOT-2) [1] is widely used for evaluating motor deficits in children and adolescents with disabilities. Recent work in this laboratory, using test methodology established by the BOT-2, demonstrated unacceptable to fair reliability and concordance between tests [2]. Accordingly, a manual was developed (rev-BOT-2) using methodological testing techniques (e.g., prompting) to improve test reproducibility for youth with intellectual disabilities (ID). The purpose of this study was to determine if the rev-BOT-2 methodologies would improve the reliability and concordance of test scores.

2. Methods

Forty-eight youths (age = 13.6 ± 3.6 ; 31 males, 17 females) with ID performed eight evaluations on two different days with 3-4 weeks between evaluations. Eleven participants had Down syndrome. Evaluations involved three bilateral coordination tests (touching nose with index finger, 4 touches; jumping in place with opposite sides synchronized, 5 jumps; tapping feet and fingers with same side synchronized, 10 taps), three balance tests (standing with feet tandem on a line and eyes closed for time in seconds; standing with one leg on a balance beam and eyes open for time in seconds; walking forward heel-to-toe on a line, six steps), and two upper limb coordination tests (dropping and catching a tennis ball with both hands, 5 times; dribbling a tennis ball with one hand, 10 times). The advisor developed and supervised the procedural process for examiners and proctored all evaluations to insure proper measurements. Four different examiners administered evaluations according to the BOT-2 training video and manual [1]. These evaluations were amalgamated with prompting techniques of two demonstrations and two practices before actual tests (rev-BOT-2) were administered. Participants were allowed two attempts at performing each assessment, with the best score/time of the attempts used for data analysis. Cronbach's Alpha was performed to determine reliability of test scores (internal consistency) and Intraclass Correlation Coefficient (ICC) (Table 1) was used to assess reproducibility of measures made by different observers.

3. Results

Reliability was shown to be excellent (Test 2), good (Tests 5 and 8), acceptable (Tests 4 and 7), poor (Test 6), and unacceptable (Test 1) (Table 1) as determined by established guidelines [3]. ICC scores indicated excellent (Test 2), good (Test 5), fair-good (Test 8), fair (Tests 4 and 7), and poor (Tests 3 and 6) concordance (Table 1) according to suggested benchmarks [4].

4. Discussion

Barnes et al. [2] administered the BOT-2 tests according to the BOT-2 training video and manual [1], which consisted of one demonstration by examiner and one practice by the participant. For this study, two demonstrations were given by examiners followed by a prompting strategy that allowed two-three practices before administering the tests. The prompting strategy involved the examiners manually guiding the participants through the first practice trial; then participants were allowed one-two practice trials without prompting to insure the participant attempted the test correctly.

When compared to the present study, Barnes et al. [2] reported similar reliability. However, lower ICC scores were reported by Barnes et al. [2] for Test 1 (0.25 vs. -0.06), Test 2 (0.84 vs. 0.57), Test 3 (0.09 vs. 0.08), Test 4 (0.51 vs. 0.47), Test 5 (0.74 vs. 0.12), and Test 6 (0.34 vs. 0.16). Tests 7 and 8 were not performed by Barnes et al. [2]. In addition, Power of Analysis of the present study was improved in that 48 youth participated in the study, as opposed to the 25 youth participants in the study by Barnes et al. [2].

5. Conclusion

The purpose of the BOT-2 is to allow health professionals to evaluate the balance and coordination of children and adolescents, with or without ID. Therefore, the issue of concordance or reproducibility of measures by different therapists becomes especially important. The results of this study suggest that prompting techniques improves concordance between therapists when measuring coordination and balance of youth with ID.

Table 1: Statistical Analysis for Tests 1-8

Test Name	Test 1	Test 2	Data Analysis
Test 1 (Nose Touching) (n = 48)	3.8 ± 0.7	3.8 ± 0.7	0.401 (Unacceptable)* ; 0.250 (-0.03-0.050) (p<0.05) (Poor)**
Test 2 (Jumping in Place) (n = 47)	4.1 ± 1.6	4.1 ± 1.7	0.911 (Excellent)* ; 0.836 (0.72-0.91) (p<0.01) (Excellent)**
Test 3 (Finger and Foot Tapping) (n = 48)	9.1 ± 2.0	9.5 ± 1.7	0.170 (Unacceptable)* ; 0.093 (-0.194-0.365) (NS) (Poor) **
Test 4 (Standing on Line – Eyes Closed) (n = 46)	7.0 ± 3.2	6.2 ± 3.3	0.675 (Acceptable)* ; 0.510 (0.25-0.70) (p<0.01) (Fair)**
Test 5 (Walking Heel-to-Toe) (n = 48)	4.1 ± 2.2	3.9 ± 2.2	0.847 (Good)* ; 0.734 (0.57-0.84) (p<0.01) (Good)**
Test 6 (Standing on Balance Beam) (n = 39)	4.7 ± 2.6	5.6 ± 7.1	0.509 (Poor)* ; 0.342 (ICC) (0.03-0.59) (p<0.02) (Poor)**
Test 7 (Drop and Catch – Two Hands) (n = 46)	4.2 ± 1.4	3.7 ± 1.5	0.609 (Acceptable)* ; 0.437 (0.17-0.64) (p<0.01) (Fair)**
Test 8 (Dribbling – Alternate Hands) (n = 48)	8.1 ± 2.8	8.8 ± 2.6	0.754 (Good)* ; 0.605 (0.39-0.765) (p<0.01) (Fair-Good)**

* Cronbach's Alpha (reliability of scores of examinees)

** Intraclass Correlation Coefficient (ICC) (95% CL)

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7. References

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