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ORIGINAL ARTICLE

The Validity and Reliability of the Bruininks–Oseretsky Test of Motor Proficiency, 2nd Edition Brief Form, in Preschool Children

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ABSTRACT

Background. Evaluating motor skills and using an appropriate tool for the diagnosis and evaluation of motor proficiency in preschool-aged children seems critical. **Objectives**. The purpose of this study was to evaluate the validity, reliability, and sensitivity of the Bruininks–Oseretsky Test of Motor Proficiency, Second Edition Brief Form (BOT-2 BF), in preschool children. **Methods.** A total of 306 preschool children (aged four to seven years) participated in this study. To evaluate the validity of the test, the canonical correlation statistic method was used to calculate the correlation between the subscales of this test and the Movement Assessment Battery for Children (MABC) test. To evaluate the reliability by the time reliability method, 50 subjects were retested after an interval of two weeks. The sensitivity analysis and receiver operating characteristic curve (ROC curve) tests were used to determine the ability to diagnose a developmental coordination disorder (DCD). **Results.** The results of the canonical correlation analysis showed that there is a significant linear relationship ($p<0.001$) between the BOT-2 and the MABC tests. The intra-class correlation coefficient (ICC=0.80) was high for time reliability. The appropriate cutoff point was 13. At this point, the area under the ROC curve was 0.91 for sensitivity and 0.93 for the characteristic, and in general, the area under the curve was 0.97. **Conclusion.** According to the results of this study, it seems that the BOT-2 has an appropriate validity and reliability as well as a high sensitivity and characteristic in preschool children, and can be used to evaluate motor skills and diagnose children with DCD.

KEY WORDS: ***Bruininks-Oseretsky Test of Motor Proficiency, Second Edition (BOT-2), Movement Assessment Battery for Children (MABC), Sensitivity and Characteristic, Developmental Coordination Disorder (DCD), Preschool Children.***

INTRODUCTION

Inactive lifestyles and the decreasing frequency of motor activities in childhood have increased the incidence of obesity among children around the world; therefore, ignoring motor growth, especially the motor skills of children in early ages, leads to increased obesity and future motor problems (1). All these are evidence that motor proficiency in childhood is related to obesity. Many studies have shown that children with problems in motor skills are more prone to being overweight (2). They also have a higher negative self-assessment (3), higher levels of depression and anxiety (3, 4), lower physical activity levels (2, 5), and lower self-efficacy (6), besides being weaker than their peers in terms of educational success (2). The ability to evaluate

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motor skills in childhood is critical and important. In order to carry out motor programs and support children with specific needs in a large community, the importance of collecting information about skill levels and recognizing the strengths and weaknesses of these programs is felt now more than ever. As reported by the Disease Control Centers in the United States, due to the decreased motor activities in the United States, Europe, Latin America, Asia, and other countries, 6% of children between the ages of four and 12 years are obese. Therefore, ignoring the motor development and motor skills of children in early age could lead to increased obesity and future motor skill problems (1). All this is evidence that motor proficiency in childhood is associated with obesity.

One of the most important measures in examining the development of motor skills in children is the precise evaluation of these skills. Evaluating motor skills in childhood, especially during preschool age, seems necessary for several reasons (7, 8). First, motion is an integral part of life in infancy and childhood during which children seek to discover their surroundings (8). Besides, studying motor development in childhood is an essential prerequisite for understanding their overall growth (7). In addition, designing and planning for the development of appropriate motor skills depends on the diagnosis and correct evaluation as well as the child's level of development in these skills (8). To this end, several tests are designed in different fields. Some examples are: Movement Assessment Battery for Children (MABC); Peabody Development Scales (PDMS); Korper Coordination test fur Kinder (KTK); Test of Gross Motor Development (TGMD); Maastrichtse Motoriek Test (MMT); Bruininks–Oseretsky Test of Motor Proficiency, Second Edition (BOT-2); and McCarron Assessment of Neuromuscular Development (MAND). These are used to diagnose children with DCD as well as to evaluate the children's motor development. Among these tests, the American Psychiatric Association (APA) has addressed the BOT-2, MABC, and MAND tests as important tests for diagnosing children with DCD (9).

Some studies have shown that the Bruininks–Oseretsky test of motor proficiency—Short Form (BOTMP-SF) has an appropriate reliability and validity for evaluating motor skills in childhood; but the use of this test is rejected in some other studies dealing with different cultures (10, 11). Only a few studies have used this test to evaluate the motor skills of preschool children, and their findings are not sufficient evidence for use in preschool children and children with motor disorders.

The BOT-2 test is a norm-referenced test whose most important reason for implementation is to evaluate motor proficiency in children and adolescents, as well as to use it in the screening process (9). This test is applicable and purpose-oriented, and is used to measure motor skills in individuals aged four to 21 years. It is often used by therapists and pediatricians specializing in motor disorders, as well as by sports teachers, to evaluate the motor development and diagnose DCD in childhood in different countries (2, 12-15).

Many studies focus on the validity and reliability of this test in evaluating children's motor skills and diagnosing children with DCD. However, there is a discrepancy between studies in using this test. Schulz et al. (2011) showed on 379 subjects aged 8–17 years that the correlation between the MABC and BOT-2 tests was moderate to high (r=0.61) (9). Moreover, Croce, Horvat, and McCarthy (2001), in their study on the age group of 5–12 years, reported the correlation between MABC and BOT-2 as 0.6–0.9 (16). Another study showed that the correlation between MABC and BOT-2 in the age group of 4–10 years is 0.84. These results indicate that not only does the correlation between these tests result in their use in clinical conditions, but that the convergence validity of these tests is also confirmed for evaluating motor proficiency and abilities (9). Research on five-year-old children has shown that a number of BOTMP brief form items are not very reliable (17). In another study, the brief form of BOTMP was compared with its long form. The study included 114 five-year-old children. Their results showed that the BOTMP-SF test has a low sensitivity and low negative predictive value compared to its long form (BOTMP-LF). So it is not suitable for five-year-olds or for the diagnosis of children with a motor coordination disorder (18). This is while Beitel and Mead (1982) support the ability of this test to evaluate the motor proficiency of three- to five-year-old children (19). Venetsanou et al. (2009), in their evaluation of 380 children aged four to six years, showed that the BOT-2 test has a high validity (15). Spironello et al. (2010), in their study on 340 children aged 11

years, showed that the correlation between the two tests of BOTMP-SF and MABC is moderate to low. Their results showed that the children who were diagnosed with DCD by the BOTMP-SF test, had lower physical activity levels and higher BMI, and were more overweight. In this study, MABC was reported to be more suitable for screening (20). Cairney et al. (2009) compared BOT-2 and MABC tests in the diagnosis of children with DCD. They concluded that the BOTMP-SF is not a good alternative to MABC in diagnosing children with DCD, and further research is needed on the sensitivity and characteristic of this test (2). McIntyre et al. (2017) compared the McCarron Assessment of Neuromuscular Development (MAND) and BOT-2 in 91 youth aged 21 years. They concluded that there is a difference between the two tests in diagnosing adults with motor weakness and DCD. They considered a standard deviation below the mean as a motor weakness. The results showed that there is a low correlation between the two tests (r=0.37). The percentage of agreement between the two tests was 85% in identifying healthy subjects. This was while the percentage of agreement for identifying people with motor weakness was reported at 44%. Their results showed that the BOT-2 test doubled the subjects with motor weakness compared to the McCarron test (13.2% vs. 6.6%) (21). Wuang and Su (2009) evaluated the reliability and responsiveness of the BOT-2 test, and their results showed that this test has good reliability with a high characteristic and low sensitivity (22). Lucas et al. (2013) showed that the BOT-2 test has a high reliability in children with alcoholic fetal syndrome and can be used for people with a motor disorder or weakness (23). Finally, they stated that evaluating the sensitivity and characteristic of these tests was critical to further ensure the ability of these two tools to evaluate motor proficiency and diagnose DCD (23). Lam (2011) evaluated the validity of the BOT-2 test's major skills and finally concluded that the five major skills of the tests (running speed and agility, balance, bilateral coordination, strength, and coordination of the upper body) has a high validity in preschool children (24).

Therefore, considering the importance of human motor development at preschool age, the need for a valid and appropriate test for evaluating motor skills in this age range, and the existence of cultural and environmental differences, one of the largest challenges for the researchers is that the validity and reliability of these tests differs from country to country. The validity and reliability of a test is not inherent; thus, it cannot be applied in different cultures and environments (25). Since the tests used to evaluate the motor skills are influenced by these factors (26, 27), and given that the mother tongue can also influence the major motor skills in preschool children; the need for a highly reliable, valid, sensitive, and characteristic test is necessary for the evaluation of motor skills and diagnosis of children with DCD in the country.

Previous studies compared the BOT-2 test with other motor developmental tests, and used each of the various forms of this test (BOT-2, BOTMP-SF, and BOTMP-LF) for validity and reliability. But there are still differences in the validity and reliability, as well as the sensitivity and characteristics of the test. Furthermore, due to the effect of cultural and environmental conditions on determining the validity of the test, many questions about the correct use of these tests have remained unanswered among researchers and further studies are required. Since the reliability and validity of a specific test in a community with specific environmental and cultural characteristics cannot guarantee its use in other communities, the purpose of this study was to examine the validity and reliability of the BOT-2 test in preschool children of Tehran.

MATERIALS AND METHODS

Participants. This research was descriptive. The statistical population of this study comprised all preschool children in Tehran (aged four to seven years) enrolled in kindergartens and preschools in 22 areas of Tehran. A random selection of 306 healthy children aged four to seven years (164 girls and 142 boys) was carried out. The sampling was a random cluster class. All the participants took part in the study by obtaining consent from their parents. The MABC and BOT-2 brief form tests were used to evaluate the motor skills of the children.

Apparatus and task. The BOT-2 test is appropriate for measuring a wide range of motor skills in individuals aged four to 21 years. The simultaneous validity of this test with the BOTMP-SF test was 0.88, and its reliability in the three age domains of four to 21 years was reported as 0.81 to 0.90 (27). The BOT-2 included 12 items that measure eight subscales. The subscales of this test measure fine motor precision, fine motor integrity,

hand agility, bilateral coordination, balance, speed and agility, upper limb coordination, and strength. In general, these eight measured subscales include the four motor domains of manipulation control, hand coordination, body coordination, and strength and agility (27).

The MABC test was designed by Henderson and Sugden (1992) with the goal of studying the motor developmental efficiency and delay in children and adolescents. The children's motor evaluation test has a high validity and time reliability, and the reliability of the evaluators was 0.77 and 0.98, respectively. The full set of this test consists of 32 tasks divided into four groups. Each group contains eight items that come from three subscales: manipulation skills (three items), ball skills (two items), and balance skills (three items), wherein each item is adjusted with regard to the age group (28). This test was standardized in Iran in 2015 by Badami et al. (29).

Procedure. At first, five areas of Tehran were determined from the north, west, east, south, and center of the city. Then two kindergartens and two preschool centers were randomly selected from each area. Finally from the 20 kindergartens and preschool centers, 306 children were randomly selected. After selecting the subjects, parental consent was taken to examine the subjects. Then all the test items of MABC and BOT-2 were performed on all participants and their scores were recorded in the notebook for each test. Every item that was not understandable to a child was explained and performed by the examiner, for as long as it took for the item to be understood by the child. Each test performance lasted 15 minutes for each subject. Each child first performed the BOT-2 test and then the MABC test after 30 minutes. The items for both the tests were performed by all the children.

To evaluate the sensitivity and characteristic of the BOT-2 test, 30 children whose scores in the MABC test were below the 15th percentile were selected as children with a potential to have DCD; and 30 subjects who had high scores were placed in the other group (as healthy individuals) (3). Then, the BOT-2 test was performed again on the 30 subjects who gained high and low scores in the MABC test, and their scores were recorded. Given the instructions for each test, the examiner provided the required guidelines so as to familiarize the subject with the manner of performing the task. To evaluate the simultaneous validity of the two MABC and BOT-2 tests, 30 subjects were selected who were evaluated by both tests. To evaluate the time reliability, 50 subjects were tested with a BOT-2 test two weeks later.

Data analysis. The reliability of the BOT-2 test was calculated using time reliability with an interval of two weeks. To calculate the validity of BOT-2 by the convergence method, the canonical correlation between BOT-2 and MABC was calculated (9). An effective and well-known method for evaluating a laboratory test, whose results are variable in a ranking or quantitative scale, is to use a ROC curve. The ROC curve is a graph that is obtained by dividing the sensitivity (real positive value) by the false positive value. In this method, the area under the graph represents the diagnosis power of a test. Hence, the more a curve tends to the left of the graph, the greater will be its accuracy and it will be closer to the ideal (area of one) (30); therefore, in order to evaluate the sensitivity and characteristic of the BOT-2 test in agreement with the MABC test, this study used the ROC curve. Recently, it has been found that these curves have remarkable uses in medical decision-making. The SPSS.21 software was used to analyze the data.

RESULTS

In investigating the convergence validity of the BOT-2 test, the statistic test of canonical correlation was used, so as to calculate the score correlation of the subscales of this test and the MABC test. The results of the correlation analysis showed that there is a significant linear relationship for the correlation between these two sets of variables (Table 1).

The crossing factor loads of the BOT-2 test subscales and the MABC test were high factor loads with their counterpart test linear relationship, which indicates a high correlation between these two tests (Table 2 and 3).

Table 1. Canonical correlations between BOT-2 and MABC tests.

Linear relationship	Correlation	Special value	Wilkes statistics	F	Num D.F	Denom D.F	Significance
1	0.885	3.62	0.191	3.56	24	110.81	<0.001
2	0.297	0.097	0.882	0.36	14	78.00	0.982
3	0.179	0.033	0.968	0.221	6	40.00	0.968

Table 2. Counterpart factor loads of the test subscales of the BOT-2 brief form

variable	First Linear Relationship
fine motor precision	0.832
fine motor integrity	0.826
hand agility	0.769
upper limb coordination	0.642
bilateral coordination	0.613
balance	0.526
speed and agility	0.611
strength	0.627

Table 3. Crossing factor loads of the MABC tests subscales

variable	First Linear Relationship
manipulation skills	-0.732
ball skills	-0.662
balance skills	-0.791

To investigate the reliability of the brief form of the BOT-2 test, the intra-class correlation coefficient was used, where the results showed that the intra-class correlation factor is 0.80 for the time reliability (Table 4).

Table 4. Class correlation coefficient of the BOT-2 test

Intra-class correlation	95% confidence interval		F Test			Significance
	Lower bound	Upper bound	Value of F	Degree of freedom 1	Degree of freedom 2	
0.809	0.685	0.888	9.49	48	48	<0.001

For the diagnosis ability of this test, the sensitivity and characteristic of the BOT-2 test and the MABC test was dealt with. In Fig. 1, the ROC curves of these two tests are given. The results show that the best cutoff point at 13 was obtained with the best balance between sensitivity and characteristic as 0.91 and 0.93, respectively. The area under the curve (AUC=0.97) was 0.97 and, as expected, the BOT-2 test has an appropriate sensitivity and characteristic (Fig. 1).

DISCUSSION

The purpose of this study was to evaluate the validity and reliability of the BOT-2 test in preschool children. In order to use this test in the screening process, the sensitivity and characteristics of the test were evaluated as well. To evaluate validity, the BOT-2 test was compared with the MABC test. In summary, the results of this study in the context of the simultaneous validity of the BOT-2 test showed that this test is approved to evaluate the motor proficiency of preschool children. The results regarding the sensitivity and characteristics of the test support the screening for preschool children. The reliability results of this tool showed that the scores of this test have a high reliability for children aged four to seven years.

Regarding the simultaneous validity, the result of this study supported the simultaneous validity of the BOT-2 and MABC tests for children aged four to seven years in Tehran. The results are consistent with the results of the studies by Lam (2011), Vinçon et al. (2017), Venetsanou et al. (2009), Schulz et al. (2011), Crawford et al. (2001), and Lucas et al. (2013) also obtained a high correlation between the MABC and BOT-2 tests (9, 14, 15, 23, 24, 31). The results of this study contradicted the results of McIntyre et al. (2017), Spironello et al. (2010), and Cairney et al. (2009) which showed that the consistency (r=0.50) between the BOT-2 and MABC tests was low (2, 20, 21). A possible

reason for the difference in results in this study vis-à-vis the previous studies may be the type of test used, methodology differences, and the methods used in the studies. Previous studies have suggested that a suitable statistical method is an important factor for evaluating the validity of a tool (20). However, the MABC test has been compared for the long form of BOTMP (28). But in this study, the comparison of the brief form of BOT-2 with the MABC test was considered. While a number of studies reported low to moderate correlation between the two tests (28, 31) and stated that, as both tests evaluate different aspects of motor skills, at best, the correlation between these two tests can be moderate (28); but in this study, a high correlation was found between the subscales of both tests. One of the advantages of the MABC and BOT-2 test in clinical observations is that before evaluating motor skills, all items are generalized for the children to ensure that they have properly understood the correct implementation of the item (2). In some items, such as taking a sandbag in the MABC test and taking the ball in the BOT-2 test, children did not perform well. However, studies have shown that children perform well in the ball and taking skills in European countries. The results obtained support the influence of cultural differences in developmental tests (32). Venetsanou et al. (2009) compared age groups and showed that differences between age groups were significant, and these supported the validity of this test (15). Their findings are also consistent with the results of Lam et al. (2003) who with a larger age range that showed that BOTMP-SF has a good validity in the age range of four to six years (24). Numerous studies have compared the simultaneous validity of the MABC and BOT-2 tests (14-16, 18). They stated that although the purpose of these two tests is different, a moderate correlation exists in most studies between the two tests. The simultaneous validity results of both tests were satisfactory; so a significant correlation was obtained between the total score and the scores of the BOT-2 and MABC test subscales.

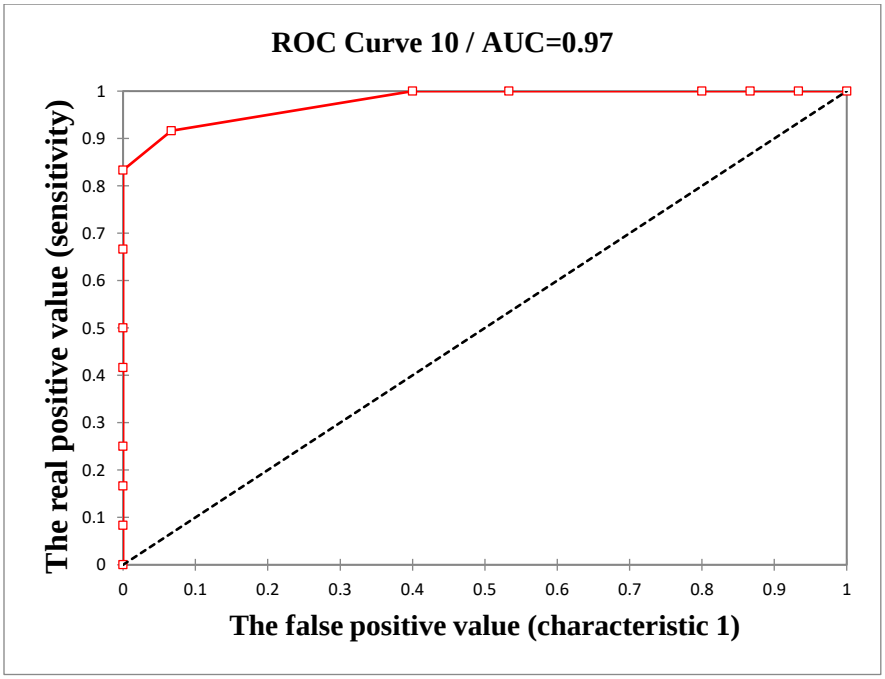

Figure 1. *ROC curve for sensitivity and characteristic of the BOT-2 test.*

Regarding the validity of the tool, it should be noted that the validity of a tool in a country or a community may not be appropriate for another country or community, and its validity should be re-evaluated; that is because the motor skills of preschool children may be influenced by factors such as nutrition, lifestyle, exercise, and physical activity, since all these differ in other countries

and cultures (24). Another issue that should be noted in the discussion of the validity of the developmental tests is that one should not be limited to a single approach in evaluating validity; instead, different methods should be used to ensure the validity of a tool (simultaneous validity, structural validity, formal validity). Therefore, a test has high validity when it has a high correlation with a similar test, and has high sensitivity, characteristic, and predictive value (33). The results of this study showed that when the five low percentile scores in the MABC test were diagnosed as DCD cases, they were consistent with the 15 percentile of BOT-2. Therefore, according to the objectives of both these tests, it is clear that there is a high correlation between the short form of BOT-2 and MABC. The most important possible reason for this high correlation in the two tests is the similarity between the BOT-2 and MABC test items. By looking at the items in both tests, it can be seen that the three items of threading squares, walking on a straight line, and route map are quite similar between the two tests. Spironello et al. (2009) showed that the correlation between the two BOT-2 and MABC tests was moderate (r=0.5) (20). However, when the cutoff point of 15 was considered, the percentage of consistency between the two tests was high. Previous studies (12, 20) also state that if MABC is accessible, then BOTMP should not be used to evaluate and diagnose DCD. However, the results obtained in this study, as well as the similarity of the two tests for some items, show that this test can be used to diagnose DCD in children aged four to seven years.

Another important point in motor development tests is the sensitivity to the environment. Billy and Welry (1989) state that among all the unique characteristics of children's motor development tests, it is crucial that the test be valid in terms of environment—that is, it should be sensitive to the child's environment and the place of implementation. This is because the biological validity of a test not only increases the level of confidence of the examiner but also maximizes the accuracy of the collected information (15). However, most kindergartens and preschool centers in Iran do not have sufficient space for children's activities. Hence, this could be a limitation in the evaluation and use of the BOT-2 test.

To evaluate the reliability of the test, the time reliability method was used. High correlation was obtained in the time reliability between the test and retest. These findings suggest that the BOT-2 test has good consistency. In general, the findings support the improved post-test performance, and they also state that in the age range of four to seven years, the test has consistency in measurements even after an interval of a few weeks. Many studies have examined the reliability of internal consistency, time reliability, and the reliability of the examiner of BOT-2. The obtained results support the high reliability of this test and are consistent with the results of this study (12, 21, 27). The results of this study regarding the reliability of the total test score were consistent with the results of Moore, Reeve, and Boan (1986); nevertheless, their research showed that some subscales had a low correlation with the total score and did not have proper reliability (17). It should be noted that in their study, the brief form of BOTMP was used. The intra-class correlation coefficient for time reliability in the total score of BOT-2 was found to be 0.57 to 1. These values indicate the suitable reliability of this test. The time reliability in some subscales and motor areas is low for some age groups and this can be a limitation to scoring for the therapist. The results of this research were consistent with the results of Lucas et al. (2013). They also stated that BOT-2 has an appropriate validity and reliability to evaluate the children's motor proficiency (23). The results of this study were inconsistent with the results of Venetsanou et al (15); the probable cause of this inconsistency between the two studies may be the difference in the type of test used; for example, in the study of Venetsanou et al, the long form of BOTMP test was used to evaluate the reliability (15). While supporting the reliability of BOT-2 test in evaluating the motor proficiency in children with Prader–Willi syndrome, White et al. (2012) concluded that a number of important factors such as attention, motivation, diagnosis ability, and weather conditions play a constructive role in the reliability of a tool (33). One of the most important reasons for the disagreement regarding the reliability of this tool can be the time considered between testing and re-testing. With a quick look at recent research on the reliability of motor development tests, it can be stated that the longer the time interval, the lower is the

reliability. One of the reasons for this in early age is the rapid development and growth of children. Hence, the interval between testing and retesting should be short in early ages (23). These may be the possible reasons for the inconsistency of this study with the previous studies. One of the important factors that can affect the reliability of the study is the interval between the two tests. Evaluating other methods of the tool reliability was one of the limitations of this study. If other reliability methods are evaluated, reliability can be ensured with greater certainty. These results support the use of the test in the effective evaluation of interventional motor programs and allow researchers to initially evaluate children by this tool. The reliability and test-retest results showed that the overall scores of the subjects in the first session significantly increased compared to the first session.

Another case examined in this study was the evaluation of the sensitivity and characteristic of the BOT-2 test so that it could be used in the screening process for identifying children with DCD. Previous studies have stated that as long as the sensitivity and characteristic of the BOT-2 test is not examined, it cannot be expressed that this test is suitable for screening (2). The high correlation of these two tests can be a reason for the high characteristic of the BOT-2 test. The results of this study showed that the BOT-2 test has the ability to identify and screen children with DCD. In other words, when the lowest five percentage scores of BOT-2 are used to diagnose DCD, then the consistency with MABC and the low score of five percentile are suitable and acceptable.

The results for the characteristic were consistent with the results of Venetsanou et al. (15) and Wuang and Su (22); however, their results were contradictory in terms of sensitivity. They stated that the BOT-2 and BOTMP-SF tests had a high characteristic and low sensitivity compared to BOTMP-LF (15, 22). McIntyre et al. (2017) showed that when the BOT-2 test was compared to the MAND test in adults, the former had high sensitivity; so people with motor weakness were diagnosed twice as frequently as with the MAND test (21). The results obtained in this study were opposed to the results of Cairney et al. (2009) who stated that BOTMP-SF could not be a good alternative to MABC (2). In general, previous studies were sensitive to the sensitivity and characteristic factor of BOT-2, and emphasized the sensitivity and characteristic of this test. Given the contradiction in evaluating the sensitivity and characteristic of the BOT-2 test, further research is needed in this regard, and it should be compared with other motor development tests. That is because previous studies have used different forms of this test with other tests. One of the most important issues regarding the results obtained in this study is that in the absence of a standard test and MABC for the DCD, BOT-2 can be used, and both the MABC and BOT-2 tests (27, 31) can be used to identify children with DCD. Considering the importance of the cultural environment and its effect on children's motor development, there are some concerns about using this test for screening and it has to be implemented in the screening with care. Finally, given the limitation of the present study, with regard to the cases mentioned in the American Health Association on identifying children, we are satisfied with just the MABC and BOT-2 tests, although factors such as academic success, weakness in routine activities, and cognitive and perceptual–motor problems should be considered in evaluating children with DCD. The consistency between the two tests is high, but we should note that the modified versions of both tests should be considered with other developmental tests. The other limitation of this study was the low age of children, since only children aged four to seven years were examined. Furthermore, because of the high amount of time spent on both tests (MABC and BOT-2), the low number of samples was another limitation of this study. Therefore, it is suggested that a larger age range be evaluated in future studies and include children of school age. Although in this study the sensitivity and characteristic of this test are appropriate, it is recommended that in future studies this test be compared with other developmental tests for older children. It is also suggested that teachers and experts in motor development use this test in schools, kindergartens, and preschool centers to evaluate major and fine motor skills, as well as to identify children with DCD. Because of the limitations of reliability in some subscales and age groups, therapists should be aware of the use of this test in determining motor levels in some areas of motor development.

CONCLUSION

In summary, the results of this research on the simultaneous validity of the BOT-2 test showed that the test was approved to evaluate the motor proficiency of preschool children. Also, the results of the study on tool reliability were acceptable and showed that this tool has a good reliability in preschool-age children. The results of the study supported the sensitivity and characteristic of the test for screening preschool-age children. Hence, this test can be used to screen both children of preschool-age and older children.

Future research should examine the validity and reliability of this test, as well as its sensitivity and characteristic in older ages. It is also suggested that teachers and experts in motor development use this test in schools, kindergartens, and preschool centers to evaluate major and fine motor skills, as well as to identify children with DCD. Because of the limitations of reliability in some subscales and age groups, therapists should be aware of the use of this test in determining motor levels in some areas of motor development.

APPLICABLE REMARKS

- The BOT-2 has appropriate validity and reliability as well as high sensitivity and characteristic in preschool children.
- The teachers and mentors can use the BOT-2 test to evaluate and screen children aged four to seven years.
- The BOT-2 can be used to evaluate motor skills and diagnose children with DCD.
- In addition to educational and intelligence tests, the BOT-2 test could be used to evaluate children's major and fine skills.

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