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Psychometric Properties of the Persian Version of Movement Assessment Battery for Children Checklist in 6- to 7-Year-Old Children

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Original Article

Abstract

Introduction: The Movement Assessment Battery for Children (MABC) checklist has been designed to investigate children's movement disorders at school; however, the validation characteristics of this checklist in Iran have not been evaluated. Therefore, the present study aimed to evaluate the psychometric characteristics of MABC checklist.

Materials and Methods: The participants in this study comprised 181 six-year-old children (87 girls and 94 boys) and 166 seven-year-old children (89 girls and 77 boys) from Isfahan City, Iran. Their sports teachers completed the MABC checklist. To measure concurrent validity, motor skills of 233 of these children were assessed using MABC. To measure construct validity, confirmatory factor analysis and convergent validity [Average Variance Extracted (AVE)] were used. Moreover, to measure reliability, Cronbach's alpha, composite reliability, and test-retest reliability were used.

Results: AVE indicator was used to evaluate subscales of child stationary/environment stable, child moving/environment stable, child stationary/environment changing, child moving/environment changing, and behavioral problems related to motor difficulties. The overall scores obtained were 0.51, 0.5, 0.53, 0.54, 0.49, and 0.5, respectively. Cronbach's alpha and composite reliability were 0.79 and 0.84 for the subscales of "the child is stationary and the environment is stable", 0.85 and 0.88 for "the child is moving and the environment is stable", 0.87 and 0.84 for "the child is stationary and the environment is changing", 0.89 and 0.91 for "the child is moving and the environment is changing", 0.81 and 0.82 for "behaviors related to physical activity", and 0.92 and 0.94 for all the subscales. The correlation coefficient of MABC with MABC checklist was 0.37, which was significant at $P < 0.001$.

Conclusion: The data indicate that MABC checklist is valid and reliable for 6- to 7-year-old children. Therefore, teachers are recommended to use this checklist in investigating children's movement disorders in primary school children.

Keywords: Developmental Coordination Disorder, Educational assessment, Children

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Introduction

From the age of two to seven, human movements are called fundamental motor skills (FMS). These skills include walking, running, jumping, hopping, rolling, hitting, and throwing. From the age of seven onwards, FMSs are combined to create more specialized and complex motor skills (such as performing complex sports skills). Therefore, individuals can be good at performing specialized motor skills when their cornerstones, i.e. FMS, are well developed. Physical activity and play are important for the development of motor skills (1). Daily physical activity can strengthen bones (2), increase muscle strength (3), improve balance (4), increase motor coordination (5), and control weight (6). In addition, physical activity and play improve social skills and improve brain function. However, about 20% of children have difficulty performing and learning motor skills, and their motor skills are so poor that they cannot successfully participate in sports and games with their peers (9).

These problems fall into a wide range, including incorrect judgments in distance and time, inability to coordinate complex movements that are essential for participation in age-appropriate sports and games, and difficulty in manipulating skills such as writing,

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copying, drawing, and dressing (9). In recent years, the rise in developmental coordination disorder (DCD) has attracted the attention of various specialists, including physicians, pediatricians, psychologists, therapists, and motor behavior specialists, because, contrary to old beliefs, children's mobility impairments are not temporary and persist throughout life and even in adulthood (10). Moreover, cognitive, behavioral, and psychological problems arise following motor problems for the individual (11), while these problems can be addressed with early intervention. The first step in starting early interventions is to diagnose these disorders in a timely manner.

Since teachers are capable of observing various motor skills and activities of children in the classroom and playground, they have a great opportunity to diagnose the children's motor impairments, however the principled diagnosis of DCD in school depends on the availability of standardized tests (12). So far, various tests such as Bruininks-Oseretsky (13), KorperKoordinations Test fur Kinder (KTK) (14), Test of Gross Motor Development-2 (TGMD-2) (15), Maeland (16), and the Movement Assessment Battery for Children (MABC) (17) have been employed to diagnose mobility problems among children, but conducting a motor test for screening children in schools is very time consuming and costly (17). Furthermore, some motor tests include items that require verbal comprehension and memory strength, and the failure of some children in these items may be due to poor verbal comprehension and memory strength rather than inability to perform a movement (17).

Some questionnaires seem to have solved the problems related to motor tests and can achieve the same desirable results in a shorter time (17). Although the use of questionnaires is less objective than motor tests, it provides a faster understanding of the children's motor competence level (18). Currently, there are several questionnaires to diagnose children's motor impairments. For example, the developmental coordination disorder questionnaire (DCDQ) has been developed in Canada (19) and in Iran, some psychometric features of this questionnaire (internal consistency, test-retest reliability, construct validity, and concurrent validity) have been examined and verified (18). Henderson and Sugden designed the MABC checklist in the United States. This checklist has been designed to assess children's motor status more quickly (17). In MABC, children are asked to perform certain motor skills and the implementation of these skills is scored. It takes 20 to 30 minutes to complete this step. The second part of the MABC checklist asks questions about children's motor skills from their physical education (PE) teachers. The goal of the designers in designing the MABC checklist is to evaluate children more quickly in crowded places such as schools (17). Based on the designers' beliefs, teachers may not have the time necessary to evaluate the motor skills of the every single student. Therefore, by consulting the PE teachers, one can faster identify individuals with mobility impairments (17).

The MABC checklist can be completed in two ways. If the teacher has enough knowledge about the student, he will complete the checklist in a few minutes, but if the teacher does not have enough knowledge, he will complete the checklist by observing the person during a week or a few sessions (17). The psychometric assessment of this checklist on 6- to 11-year-old Dutch children showed that this scale was an acceptable tool for screening Dutch children with DCD (20).

The applicability of the MABC checklist in other geographical areas is subject to the confirmation of its psychometric properties in the same area (21, 22). Accordingly, it has been suggested that in any culture, the construct and concurrent validity of the checklist be measured by the set of children's motor tests, as the response to the checklist is influenced by culture and perception, and in some cultures, the teachers may not be willing to assess their students' motor skills as weak (20). Therefore, the present study is conducted with the aim of determining the validity (construct and concurrent validity) and reliability of the MABC checklist for 6- and 7- year old children in Isfahan, Iran.

Materials and Methods

This study was a type of cross-sectional psychometry in which the data were collected in the spring of 2017. There is a disagreement among experts in the sample size to perform factor analysis. According to Field, at least 300 samples are required to perform factor analysis (23). For this purpose, 181 6-year-old (72 months and one day to 84 months) children (87 girls and 94 boys) and 166 7-year-old (84 months and one day to 96 months) children (89 girls and 77 boys) in Isfahan were selected using systematic stratified cluster multistage sampling method. In this way, first the list of schools in five geographical regions (north, south, east, west, and center) of the city was specified and then from each region, a girls' school and a boys' school (a total of 10 schools) were

selected. Among the children studying in these centers, the subjects were randomly selected.

After obtaining the consent of the children's parents and obtaining a permit from the department of education, 10 PE teachers, the level of education of all 10 of whom was bachelor's, completed the MABC checklist. Since the checklist had to be completed by a teacher who had knowledge of the child and had observed the child's movement in the open environment, the questionnaire of the students of each school was completed by the PE teacher of the same school, because if two teachers were supposed to complete the checklist for a certain student, the second teacher had to take time to make knowledge of the child.

MABC reserves the right to copy. This test, along with its tools such as the balls, coins, beads, checklists, manuals, and other appendices, were purchased in 2005 by the main executor of the project from the company selling this tool in the United States. Therefore, for the localization of the checklist, there was no need to obtain written permission from the test and checklist designer.

Of the checklists returned, 33 were dropped due to incompleteness, ultimately remaining 314 questionnaires. To measure the concurrent validity, the motor skills of 223 children whose PE teachers had completed the MABC checklist and whose parents were satisfied with their children's motor skills, besides, the school had allowed to assess the children's motor skills during the exercise time at the same school location, were assessed using MABC. Based on the G*Power software, at least 141 individuals were enough to measure the concurrent validity. In order to estimate the test-retest reliability, the checklist of 30 children which were randomly selected was completed after two weeks.

The data measurement tools are listed in the following.

MABC: This tool was used to measure the children's motor skills (Appendices 1 and 2). This test was designed by Henderson and Sugden with a review of the Test of Motor Impairment (TMI) (24) and inspiration from the Bruininks-Oseretsky test (13). MABC is a set of norm-referenced tests evaluating the motor function of children aged 4 to 12 years and includes three subtests as "manual dexterity skills, ball skills, and balance skills" (17). The score obtained from this test indicates the level of impairment in motor coordination, with a range varying from 0 to 40. Higher scores indicate poorer motor function. The content validity, construct validity, inter-rater reliability, and test-retest reliability of the MABC scale have been confirmed in various countries such as Japan (25), Netherlands (26), Sweden (27), and Iran (28).

MABC Checklist: This checklist has been designed by Henderson and Sugden to assess the children's daily movements' status (17). This scale is better to be completed by the PE teachers or therapists in the school environment, as the teacher shall carefully observe the children's motor skills for several sessions and then complete the checklist. The MABC checklist consists of five sections, with the first four sections gradually dealing with the complex interactions between the child and the physical environment. The focus of the assessment in each section is as follows: In the first part, the child is stationary and the environment is stable (stationary stability) (items 1 to 12), in the second part, the child is moving and the environment is stable (motor stability) (items 13 to 24), in the third part, the child is stationary and the environment is changing (change in stationary) (items 24 to 36), in the fourth part, the child is moving and the environment is changing (moving changes) (items 37 to 48), and the fifth part addresses behaviors related to physical activity (behavioral problems) (items 49 to 60).

For each of the 48 items in sections 1 to 4, there are four possible options, including "very good, good, almost, and not so much" with scores 0, 1, 2, and 3, respectively, indicating how well the child responds to the movement. Each item requires a total score. If several items are mentioned in one item, such as cutting, drawing, and tracing, the average score obtained by the individual from several activities should be considered. Then the scores of each section are summed up and the sum of the scores of the first four sections of the checklist is considered as the total score obtained. Given the MABC checklist evaluation table, children aged 6, 7, 8, and 9 years and older whose scores are respectively equal to or above 90, 75, 55, and 50 (scores obtained by the standard sample of this test in under 5 percentile), are likely to be impaired, and it can be definitely claimed that they require more detailed evaluation and special consideration. In this case, a full evaluation of the child using MABC is recommended. If the total score of the child is equal to or above 60, 50, 35, and 35, respectively (scores obtained by the standard sample of this test, between 5 and 15 percentiles), he/she is at risk.

The fifth part of this checklist is different from the other four parts in this regard, and it focuses on aspects of the behavior that may affect the child's success in the field of movement. For each item, one

of the options of "rarely, sometimes, and often" should be marked. This section describes behaviors that parents and teachers often consider harmful to the child's motor function. No scores are considered for the items of this section, rather a question is asked about the behaviors that often occur, as whether the behavior prevents the child from demonstrating his or her ability.

Method of Implementation: Once the project was approved by the Research Council, Isfahan (Khorasgan) Branch, Islamic Azad University, Isfahan, Iran, with registration number 23821402942058, an expert committee consisting of two experts in motor behavior and one translator was formed to translate the English version of the checklist into Persian. The checklist was then re-translated into English by another person who was fluent in both Persian and English. In the next step, the original version was compared to the retranslated version and minor modifications were made to the translated version. In order to evaluate the face validity, 10 PE teachers with 6 to 8 year-old students who were not from among the main study samples were asked to complete the checklist and provide feedback on the obscure sentences, phrases, and words of the checklist. To measure the construct validity, the checklist was provided to the PE teachers of the children and they were asked to complete the checklist based on their knowledge of the children. To examine the concurrent validity, out of 314 children whose checklists were completed by their teachers, the motor skills of 223 children were assessed using MABC, and the correlation between the motor tests was assessed using the MABC checklist. In order to determine the time reliability, the checklist of 30 children was completed twice with an interval of two weeks.

The confirmatory factor analysis (CFA) and convergent validity technique were utilized to investigate factor validity. Moreover, the average variance extracted (AVE) index was used to assess the convergent validity. Given this index, the mean square of the external loads of a reflective construct must be greater than 0.50 (29). Furthermore, the Cronbach's alpha coefficient and composite reliability were employed to measure reliability. To calculate these indices, the variance-based structural equation modeling approach was exploited and the Pearson's correlation coefficient was used to investigate the concurrent validity. Finally, the data were analyzed in SPSS software (version 23, IBM Corporation, Armonk, NY, USA) and SmartPLS version 3 (Smart PLS Gmbh, Bonningstedt, Germany).

Results

Out of the 347 checklists distributed and returned, 33 were removed due to incompleteness. The participants' demographic information is presented in table 1.

Table 1. Demographic characteristics of participants

Individual characteristics		Value
Gender of children [n (%)]	Girl	159 (50.6)
	Boy	155 (49.4)
Age of children (year) [n (%)]	6	163 (51.9)
	7	151 (48.1)
Gender of teachers [n (%)]	Female	5 (50.0)
	Male	5 (50.0)
Age of teachers (mean ± SD)	Female	34 ± 3
	Male	29 ± 2

The factor model of each subscale was developed as a first-order factor model. The factor validity evaluation indicators for each subscale are listed in table 2.

Table 2. Indicators of evaluation of factor validity of subscales

Subscale	Convergent validity	Reliability	
	AVE	Cronbach's alpha	Composite reliability
Stationary stability	0.52	0.79	0.84
Moving stability	0.50	0.85	0.88
Stationary changing	0.53	0.87	0.84
Moving changing	0.54	0.89	0.91
Behavioral problems	0.50	0.81	0.82

AVE: Average variance extracted

As table 2 indicates, the AVE index of all subscales was in a desirable. The Cronbach's alpha coefficient and the composite reliability index were indicative of the high measurement accuracy of the instrument in each subscale. The estimates of factor load, critical value, and significance level of each subscale are presented in table 3.

The values estimated in table 3 (factor load, critical value, and significance level) indicate that the factor loads related to all indicators of the subscales of stationary stability, moving stability, stationary changing (except for item 25), moving changing, and behavioral problems (except for items 51 and 54) were in good condition. In other words, the correlation of the subscales with the relevant indicators was estimated to be above average, and hence, the tools associated with these subscales had a factor validity.

Table 3. Values of factor loads of subscales

Subscale	Row	Item	Factor load	Critical value	P value
Stationary stability	1	Wears and removes his/her clothes (shirt, underwear, socks) without help.	0.63	6.10	0.001
	2	When wearing pants with skirt, she stands on one leg with stability.	0.60	7.22	0.001
	3	Ties his/her shoes, belt, zip, or buttons.	0.48	4.86	0.001
	4	Can easily wash his/her hands, brush his/her teeth, and comb his/her hair.	0.64	5.70	0.001
	5	Has a good posture when sitting behind a desk, on a chair, or standing in line.	0.48	4.81	0.001
	6	Keeps items such as scissors, pencils or pens, or brushes properly and firmly in his/her hand.	0.50	3.92	0.001
	7	Performs tasks such as cutting, drawing, or painting carefully.	0.59	6.25	0.001
	8	Writes or draws geometric letters, numbers, and simple geometric shapes accurately and legibly.	0.60	6.44	0.001
	9	Takes small objects such as puzzle pieces and beads.	0.59	4.63	0.001
	10	Using puzzle or logo pieces, he/she can create a proper shape.	0.58	8.09	0.001
	11	Turns the pages of a book one by one.	0.54	3.57	0.001
	12	Knows different parts of the body and its left and right sides.	0.43	3.14	0.001
Motor stability	13	Does not collide with surrounding objects or individuals when walking in the classroom or school.	0.40	3.83	0.001
	14	Does not collide with surrounding objects or individuals when carrying objects in the classroom or school.	0.67	10.66	0.001
	15	When running, he stops to avoid colliding with objects or other people.	0.69	10.16	0.001
	16	Runs a distance of 4.5 m as jumping with a stretched leg.	0.76	15.56	0.001
	17	Hopping on both legs in a controlled way.	0.73	11.16	0.001
	18	Jumps over surrounding obstacles.	0.66	7.78	0.001
	19	Uses fixed play equipment in a park or club, such as a slide or a swing.	0.26	2.10	0.037
	20	Based on his/her age and ability, passes through or around obstacles.	0.51	4.66	0.001
	21	He/she throws the ball or other objects into the box in the hand bottom position in the moving state.	0.61	7.06	0.001
	22	He/she throws the ball or other objects into the box in the hand up position in the moving state.	0.71	12.83	0.001
	23	While running, he/she shoots a large ball that is at a fixed point.	0.62	7.61	0.001
	24	With the front, back, up, down, left, right, etc. commands, he/she shows a good reaction.	0.67	9.50	0.001
Stationary changing	25	Takes objects from a person in the front row and gives them to the person on behind.	0.20	1.91	0.234
	26	In a group game, keeps a stable position.	0.44	3.47	0.001
	27	Stops moving objects, balls, or toys before reaching the end line.	0.57	8.42	0.001
	28	Grabs an approaching big ball with both hands.	0.76	14.27	0.001
	29	Grabs an approaching small ball with both hands.	0.66	9.47	0.001
	30	Shoots an approaching ball with his/her foot.	0.67	10.44	0.001
	31	Hits the approaching ball using a rocket or stick.	0.72	13.96	0.001
	32	Rolls the ball on the ground for another moving child to catch the ball.	0.77	17.66	0.001
	33	Throws the ball to another moving child to catch the ball.	0.76	17.55	0.001
	34	In the standing position, hits a large ball constantly to the ground.	0.65	11.90	0.001
	35	Turns a rope with enough force so that another child can jump over it.	0.72	11.78	0.001
	36	On the rhythm of music, claps or slaps on the ground.	0.69	11.35	0.001
Moving changing	37	Moves around the classroom or school without colliding with moving objects or people.	0.52	4.34	0.001
	38	Plays with unfixed park or stadium equipment such as swings without help.	0.59	5.69	0.001

Table 3. Values of factor loads of subscales (Continue)

Subscale	Row	Item	Factor load	Critical value	P value
	39	According to his/her age, plays with moving toys such as pedal cars and tricycles.	0.62	7.06	0.001
	40	Pushes or pulls wheeled vehicles such as carriages or barrows.	0.65	6.00	0.001
	41	Participates in chase games such as tag.	0.69	8.07	0.001
	42	Runs to the approaching ball to catch it.	0.76	15.15	0.001
	43	Runs to the approaching ball to shoot it.	0.75	13.91	0.001
	44	Runs to the approaching ball to hit it with a rocket or stick.	0.75	18.22	0.001
	45	In group games, uses skills such as hitting, shooting, catching, and throwing.	0.77	13.39	0.001
	46	Moves around as hits the ball to the ground with his/her hands.	0.68	10.37	0.001
	47	Jumps over a rotating rope.	0.61	8.13	0.001
	48	Moves in different directions with the rhythm of the music and at varying speeds.	0.63	9.25	0.001
Behavioral problems	49	Is hyperactive.	0.61	2.53	0.012
	50	Is passive.	0.67	2.53	0.012
	51	Is shy.	0.22	0.88	0.377
	52	Is nervous.	0.57	2.07	0.039
	53	Is hasty.	0.53	2.37	0.018
	54	Becomes distracted soon.	0.27	1.07	0.283
	55	Is confused.	0.69	2.37	0.018
	56	Overestimates his/her ability.	0.34	1.96	0.0050
	57	Underestimates his/her ability.	0.46	1.99	0.048
	58	Is not perseverant.	0.56	2.24	0.025
	59	Becomes sad after failing to do things.	0.73	2.93	0.004
	60	Is apparently unable to enjoy success.	0.51	2.00	0.045

The validity and reliability of the checklist were also generally examined in the form of a hierarchical factor model. Accordingly, the AVE index indicated the desirability of the convergent validity (AVE = 0.50). The Cronbach's alpha coefficient (0.92) and the composite reliability (0.93) were reported to be good, indicating the high measurement accuracy of the MABC checklist and, consequently, its reliability.

The values estimated in table 4 (factor load, critical value, and significance level) indicated that the factor loads associated with all subscales of the MABC checklist were in good condition. In other words, the variable correlation of the MABC checklist with its subscales was estimated at a high level, and as a result, the instrument was of factor validity.

Table 4. Values of factor loads of subscales of the Movement Assessment Battery for Children (MABC) checklist

Subscale	Factor load	Critical value	P value
Child stability in the stationary state	0.73	14.57	0.001
Child moving stability	0.89	30.30	0.001
Stationary changing	0.94	61.56	0.001
Moving changing	0.93	51.74	0.012

The correlation coefficient and the coefficient of determination (COD) between MABC and the MABC checklist were 0.37 and 0.14, respectively (P = 0.001).

Discussion

The present study was carried out with the aim to investigate the validity and reliability of the MABC checklist as a tool to measure DCD among children aged 6 and 7 years. The study findings showed the construct validity and the reliability of this checklist. The findings were consistent with those reported in previous studies on the validity and reliability of the checklist for 6- to 11-year-old Dutch children (20) as well as the validity and reliability of the checklist for identifying 7- and 8-year-old Singaporean children with DCD (30).

Given the results of the present study, the MABC checklist was significantly correlated with MABC, in which children's manual dexterity skills, ball skills, and balance skills were measured in a field, and the concurrent validity was confirmed. This finding was in line with the results of a study conducted in the Netherlands (20).

Although MABC is a valid and reliable tool to measure DCD, it is important to note that in

addition to the checklist, the motor skills of children must be measured by MABC in order to make a more definitive statement about DCD in children (30). This statement coincided with the official criteria of Diagnostic and Statistical Manual of Mental Disorders-4th Edition (DSM-IV). On the basis of this criterion, children with DCD should perform significantly lower than their age expectation in daily tasks that require motor coordination. Rejection of the MABC checklist, however, may be considered a problem in school activities (31).

Limitations

The main objective of this study was to early identify motor problems in children in primary school ages by the education department, while the MABC checklist has been designed for children aged 4 to 12 years. Accordingly, the present study was performed on children aged 6 and 7 years and the results cannot be generalized to other ages. Moreover, since the checklist must be completed by a teacher who is familiar with the child and has observed the child's movement in the open environment, the checklist was completed by the children's PE teachers and the inter-rater reliability was not investigated. In future studies, in addition to the child PE teacher, the checklist should be completed by another teacher who has knowledge of the child, in addition to measuring the inter-rater reliability.

Recommendations

Since the MABC checklist is a valid and reliable tool for measuring DCD, it is suggested that using this tool, children's motor skills be measured in order to identify children who are weak in relation to the norms set, in addition to planning to improve their FMS. Furthermore, according to the views that address the impact of the geographical situation on the growth of FMS, it is suggested that similar studies be conducted in other regions of the country and the norm of the checklist be designed in accordance with the same regions.

Conclusion

The MABC checklist was a reliable tool to collect information about the motor performance of 6 and 7 year old children in Isfahan.

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Authors' Contribution

Mahsa Alaei: Executive services, selection and screening of subjects; Rokhsareh Badami: Study design and ideation, executive services, selection and screening of subjects, study and analysis of data, statistical analysis, manuscript preparation, confirmation and submission of the paper, and correspondence.

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Conflict of Interest

There was no conflict of interest.

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Appendix 1. Movement Assessment Battery for Children (MABC) tasks for 6-year-old children

Task 1: Dropping a coin in the piggy bank

Equipment required: 12 plastic coins, a piggy bank, a table mat, a chronometer

How to perform: The piggy bank is put on the table mat. In the side of the box that is towards the child's dominant hand, put four rows of coins in the horizontal direction, each row containing 3 coins. The child holds the box with one hand and holds a coin with the other hand, and with the command to start, drops the coins one by one into the box, and after the last coin, the time is stopped. Then, he/she performs the task with the other hand. The criterion is the maximum possible speed in dropping the coins.

Task 2: Threading beads

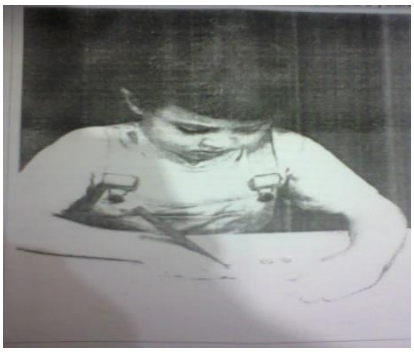
Equipment required: 12 cubic beads, thread, a table mat, a chronometer

How to perform: For 6-year-old children, 12 beads are put on the table mat in a row so that the bead holes are facing up. The child can choose the hand that he/she uses to hold the thread. The child holds the thread with one hand and a bead with the other. With the start announcement, he threads a bead each time at a maximum speed, and after the last bead, time stops. The criterion is the maximum possible speed to thread the beads.

Task 3: Threading beads

Equipment required: Bicycle movement form, a red pencil with soft tip, a soft pad that is not too stiff and slippery.

How to perform: The child draws a continuous line on the bicycle path without a contact with the path. The child should keep the pencil in contact with the paper while displaying the movement and draw the line in only one direction.

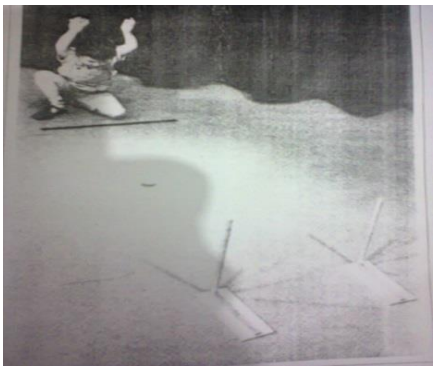


Task 4: Taking a bag

Equipment required: Bicycle movement form, a red pencil with soft tip, a soft pad that is not too stiff and slippery.

How to perform: Measure the distance of 2 m and mark it with two short strips. The child and the examiner are placed behind these lines, facing each other. The examiner throws the bags in such a way that they come down at the same level of the child's hands and the child catches the bag with both his/her hands. The 4-year-old children can also get help from their bodies to get the bags, but the 5- and 6-year-old ones have to hold them only with their hands. The number of throws is ten.

Task 5: Rolling the ball towards the target



Equipment required: jump base, tennis ball, colored strip

How to perform: Place two jumping bases at a distance of 40 cm from each other. Measure the distance of 2 m from the front side of the bases and mark it with the strip. The child kneels behind the starting line and chooses which hand to catch the ball with. He/she then rolls the ball on the ground towards the goal. The child can make ten moves and the score is the number of goals scored.

Task 6: One-leg balancing

Equipment required: a chronometer, the child can wear gymnastic shoes.

How to perform: The child stands on one leg for 20 seconds while holding his/her hands freely on his/her sides. The free leg is bent backwards to be placed behind the supporting leg. Fluctuations are allowed and the hands can move. The time starts after the baby reaches balance. The child can choose his first leg. Both legs are tested.

Task 7: Jumping over the strap

Equipment required: a jump base, 2 wooden pins, strap

How to perform: The child stands next to the jump rods. Then, a pin is put in the hole to keep the lowest distance from the child's kneecap and the other pin is placed in the same hole on the other jump rod and the strap is hung with the pins. The child should stand with the paired feet behind the strap and start jumping over the strap. The 4-year-old children can land in any situation, but the 5- and 6-year-old ones must land with their feet paired.

Task 8: Walking with the feet up

Equipment required: colored strip

How to perform: Using the colored strip, draw a line 4.5 m long on the ground. The child must walk on the line while raising his heels, without going out of the line. It takes 15 steps to make this move.

Appendix 2. Movement Assessment Battery for Children (MABC) tasks for 7-year-old children

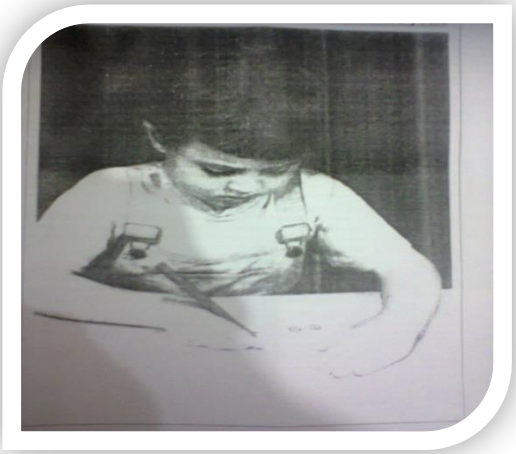
Task 1: Placing nails

Equipment required: 12 plastic coins, a box for nails, a soft pad, a chronometer

How to perform: The nail box is put on the pad. In the side of the box that is towards the child's dominant hand, 12 nails are placed. The child holds the box with the non-dominant hand and with the dominant hand, he is ready to put the nails into the box one by one with the command to start, and after the last nail, the time is stopped. He then repeats the task with the other hand. The criterion is the maximum possible speed in placing the nails.

Task 2: Sewing

Equipment required: thread, a soft pad, a piece of wood with a hole to pass the thread through, a chronometer



How to perform: The child can choose the hand to hold the thread with. The child holds the thread with one hand and the wooden piece with the other one. With the start announcement, he passes the thread through the wood hole at maximum speed each time and the time stops after the last hole. The criterion is the maximum possible speed of sewing.

Task 3: Flower maze

Equipment required: flower movement form, a red pen, a soft pad that is not too stiff and slippery.

How to perform: The child draws a continuous line on the flower path without touching it. The child must keep the pencil in contact with the paper while displaying the movement and draw the line in only one direction.

Task 4: Throwing a bag of beans in a box

Equipment required: a bag of beans, a box

How to perform: A distance of 2 m is specified and marked with two short strips. The child and the box are placed behind these lines as facing each other. The child must throw the bags with one hand in a way that they fall into the box. The number of throws is ten.

Task 5: Throwing and catching a ball with one hand

Equipment required: A tennis ball

How to perform: The child stands and chooses which hand to catch the ball with first. Then he/she bounces the ball on the ground and catches it. He/she can perform ten moves and the score is the number of balls he/she could bounce and catch. Then he/she repeats the move with the non-dominant hand.

Task 6: Stork balance

Equipment required: A chronometer

How to perform: The child stands on one leg for 20 seconds while holding his/her hands freely on his/her sides. The sole of the free foot should touch the other leg. The time starts after the baby reaches balance. Fluctuations are not allowed and the hands cannot move. The child can choose the first leg to stand on. Both legs are tested.

Task 7: Jumping inside squares

Equipment required: Colored strip

How to perform: Using the colored strip, 5 squares are drawn on the ground. The child initially stands into the first square and starts to jump into the other squares. He/should come down with their feet paired.

Task 8: Heel-to-Toe Walk

Equipment required: Colored strip

How to perform: Using the colored strip, a 4.5-m long line is drawn on the ground. The child must walk on the line in a way that the heel of the foot touches the toes of the front foot without going out of the path. 15 steps are required to perform this move.