MOTOR SKILLS ASSESSMENT AND EARLY INTERVENTION FOR PRESCHOOLERS WITH MENTAL AND DEVELOPMENTAL DISORDERS (CASE STUDIES)

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The purpose of the present study was to assess the motor skills performance of preschoolers with mental and developmental disorders and to propose individualized intervention programs. Participants included 6 children, 5 boys and 1 girl, 48 to 79 months old, who were attending the same special kindergarten. Both quantitative and qualitative aspects of their performance were examined. With regards to quantitative examination, participants were measured using the following test – the movement assessment battery for children (Henderson & Sugden, 1992). Meanwhile qualitative results were obtained through personal observation. Finally a motor skill intervention program was planned for each child according to his/her results.

Keywords: Mental and behavioral disorders, preschool age, MABC, motor skill assessment, intervention.

INTRODUCTIONS

Past investigations in the area of motor performance have repeatedly shown that children with special needs, and specifically children with mental retardation (MR) and developmental disorders (DD), demonstrate delays in the development of motor skills (Francis & Rarick, 1959; Malpass, 1959; Rarick, Widdop, & Broadhead, 1970; Reid, Collier, & Morin, 1983; Bouffard, 1990; Berkeley, Zittel, Pitney, & Nichols, 2001; Valentini & Rudisill, 2004).

The average scores of mildly mentally retarded children in some gross and fine motor skills have been reported to be 3 to 5 years behind non-handicapped children of similar ages (Rarick et al., 1970). With regards to autism, Manjiviona and Prior (1995) found that 66.7% of children with autism have definite motor problems as measured on the test of motor impairment, which Henderson revised, and performed at a level significantly lower than their same age peers. The same evidence was reported by Berkeley et al. (2001). Measurements done on a group (n = 59) of 4 year old children who were identified as at risk for developmental delays, reported a low level of locomotor and object-control skills, as measured by TGMD (Goodway & Branta, 2003). Object-control skills were measured also in a research project conducted by Hamilton, Goodway and Hanbenstricker (1999). The participants, 15 preschoolers (3 to 5 years old), at risk for developmental delay or academic failure, performed in the lower 20th percentile of the object-control subscale of TGMD.

The importance of motor skills has been well established by many authors (Eichstaedt & Lavay, 1992; Payne & Isaacs, 2002; Doty, McEwen, Parker, & Laskin, 1999; Haywood & Getchell, 2001). Gallahue (1989, p. 73) stated that: "The development of fundamental movement abilities is basic to the development of all children. A wide variety of movement experiences provide them with a wealth of information on which to base their perceptions of themselves and the world about them."

Proficiency in the performance of fundamental motor skills (FMS) has been considered to be an underlying factor for the success of the more complex movements used in aquatics, dance, games, and sports (Wickstrom, 1982). However, "sports" is not the only domain where motor skills "mastery" is important. According to Eichstaedt and Lavay (1992) competence in these skills caries over to functional skills necessary to perform movements required in daily living activities. Further, the continual failure to perform culturally normative skills within the range of acceptable proficiency may lead to serious secondary emotional and behavioral problems (Cratty, 1967).

Taking into consideration the importance of motor skills, as well as the problems that a delay in their development can result in, the necessity for early intervention is clearly demonstrated. This is also supported by a large number of studies (Casto & White, 1984; Cowden, Sayers, & Torrey, 1998; Guralinick, 1991; Odom, 1988; Orr, 1990; Sayers, Cowden, Newton, Warren, & Eason, 1996; Stedman, 1988; White & Casto, 1985).

THE MAIN AIM

With respect to the above the main aim of the present study was to identify the level of motor skills development of the preschool participants with mental retardation and/or developmental disorders according to the movement assessment battery for children (MABC – Henderson & Sugden, 1992). As the MABC instrument measures the quantitative as well as the qualitative picture of the childrens' movement level, the main aim had to be completed with the aid of three tasks:

a) to evaluate basic items of fine motor skills with quantitative data,
b) to provide information about the qualitative aspects of their motor performance according to personal observation and
c) to suggest a motor skill intervention program for each participant according to the quantitative results of MABC and qualitative information obtained by personal observation.

METHODS

The kindergarten design

The school is a public special kindergarten, founded in 1991 and located in the city of Olomouc in the Czech Republic. During its functioning it has participated in cooperation with other regular schools in several social activities (cinema, concerts, etc.) offered by the local educational department. Also, it often organizes outdoor activities, as well as short weekend camps for both students and their families. The kindergarten consists of 2 "playrooms", where physical education class takes place (1 hour per day), a dining room, a sleeping room, a hygiene room, a room for social events, and a small garden. The kindergarten is visited by 18 children. They are educated by three teachers as well as supportive assistants (APA or special education students). Three teachers are MA level special education graduates who have attended additional courses relevant to the understanding of the special developmental disorders of preschoolers. There is very good cooperation between the school and parents. All children-participants are attending the same school.

Participants

Preschoolers were recruited based upon the following criteria: a) diagnosis and b) age. Participants included 6 children, 5 males and 1 female, who were diagnosed with mental and/or behavioral disorders. It should be mentioned that none of them receives medication that can affect his/her motor performance. The age range was from 48 to 79 months old. All of them were attending the same special kindergarten.

M. A.: is a 68 month old boy. He was diagnosed with atypical autism and a specific developmental disorder of speech and language and there are suspicious about his cognitive ability. He has attended the kindergarten since 1. 3. 2004. M. A. is usually impulsive, impatient, disorganized and easily distracted. He starts an activity spontaneously without waiting for instructions. During the activity he presents no systematic way of doing it and he shows no patience. He becomes confused, he loses his concentration and finally he forgets how to do the activity.

M. T.: is a 60 month old boy. He was diagnosed with childhood autism and mild mental retardation (the exact IQ was not available to the author). He has been kept under psychological supervision. He has attended the kindergarten since 1. 9. 2005. M. T. is hyperactive and impulsive, easily distracted, as well as easily upset by failure. Usually he likes running around without a purpose, he doesn't pay attention when he is given instructions and, as a result, he needs assistance in order to accomplish a task. While he is engaged in an activity he loses his concentration because of other circumstances and he starts a new attempt but again, without following any instructions.

S. L.: is a 64 month old boy. He was diagnosed with moderate mental retardation (IQ = 46) and significant impairment of behavior requiring attention or treatment as well as with other childhood disintegrative disorder. He has had speech therapy. He has attended the kindergarten since 14. 3. 2005. S. L. is usually overactive and nervous while on some other occasions he exhibits passive behavior followed by day dreaming. Additionally, his characteristic is to lack persistence and he needs support and stimulation during controlled activities.

V. I.: is a 79 month old boy. He was diagnosed with expressive language disorder and a specific developmental disorder of motor function. He has attended the kindergarten since 1. 1. 2004. V. I. is usually nervous and stuffy. He enjoys participating in an activity and he wants to do his best but, in order to do it, he needs support and encouragement.

J. A.: is a 78 month old boy. He was diagnosed with Asperger's syndrome and his mental ability is unbalanced. He has attended the kindergarten since 1. 9. 2004. He is passive, disorganized and he lacks persistence. Another of his characteristics is day dreaming. J. A. presents no systematic way of doing things during his participation in an activity, he gets confused and he ends up tired and frustrated. As a result he often needs motivation and encouragement.

M. O.: is a 48 month old girl. She was diagnosed with expressive language disorder. She has attended the kindergarten since 1. 9. 2005. M. O. is usually passive, disorganized and she exhibits either fear or lack of will to be engaged in an activity. During it she gets confused, easily tired and she needs support and help to accomplish it. In addition, she lacks in facial expressivity and it looks like participating in an activity doesn't give her any pleasure.

Instrument

The instrument used to measure the motor skills performance of the participants in this study was the movement assessment battery for children (MABC), which was published in 1992 and is an updated version of the test of motor impairment (TOMI) (Henderson & Sugden, 1992). The test battery is focused on evaluation of basic items of fine motor skills development in three sets (see Fig. 1):

a) manual dexterity (M. D.) with items – 1. posting coins (P. C.), 2. threading beads (T. B.), 3. bicycle trial (B. T.),
b) ball skills (B. S.) with items – 4. catching bean bag (C. B. B.), 5. rolling a ball between goalposts (R. B.),
c) static & dynamic balance (S. & D. B.) with items – 6. one leg balance (O. L. B.), 7. jumping over a cord (J. O. C.), 8. walking with heels raised (W. H. R.).

It is a standardized test with strict permission to use only the original MABC package. The purpose of the test is to identify movement and coordination disorders in children, including those with developmental disabilities (Barnett & Henderson, 1998). Although MABC was validated on children without disabilities, it can be used also with children with disabilities who have the ability to acquire normal motor patterns such as children with mental retardation, autism, visual impairments, and hearing impairments (Horvat, Block, & Kelly, in press). The worldwide use of MABC, in a clinical as well as in a research context, proves its popularity in the field (Crawford, Wilson, & Dewey, 2001; Geuze, Jongmans, Schoemaker, & Smits-Engelsman, 2001).

According to the MABC manual, the test has acceptable validity and reliability (Henderson & Sugden, 1992). Correspondingly it has shown a high inter-rater and test-retest reliability with novice test administrators (Chow, Chan, Chan, & Lau, 2002; Croce, Horvat, & McCathy, 2001). Inter-rater reliability ranges from .70 to .89, and test-retest reliability is .75 (Henderson & Sugden, 1992).

The administration of the test is easy and not time consuming, while children are likely to participate willingly. The test is designed for use with children aged 4 to

Fig. 1
Description of age band

The following description is in accordance with the manual of MABC (Henderson & Sugden, 1992).

1) Manual dexterity (M. D.)
Posting coins (P. C.)

The purpose of this task is to drop 12 coins in a bank box (through a slot on the surface of the box) as quickly as possible. The participant has 1 practice attempt and 2 formal trials for each hand. The score corresponds to the number of seconds taken to complete each correct trial.

Threading beads (T. B.)

In this task participants who are 5 and 6 years old are asked to place 12 cube shaped beads on a lace as quickly as possible, while for participants who are 4 years old the task consists of 6 cube shaped beads. The child has 1 practice attempt and 2 formal trials, after choosing the hand which he/she will use. The score corresponds to the number of seconds taken to complete each correct trial.

Bicycle trail (B. T.)

The purpose of this task is to draw a single continuous line, following the trail without crossing its boundaries. The child has 1 practice attempt and 2 formal trials. The score corresponds to the number of errors that is the number of times the drawn line crosses the boundaries.

2) Ball skills (B. S.)
Catching bean bag (C. B. B.)

In this task the examiner tosses a bean bag from a distance of 2 m and the participant is asked to catch it. The participant is given 5 practice attempts and 10 formal trials. The score corresponds to the number of correctly executed catches out of 10 trials.

Rolling ball into goal (R. B.)

The purpose of this task is to roll a tennis ball into a goal which is placed in a 2 m distance from the starting line. The participant must stay behind the starting line and he/she is given 5 practice attempts and 10 formal trials. The score corresponds to the number of correctly executed goals out of 10 trials.

3) Static & dynamic balance (S. & D. B.)
One leg balance (O. L. B.)

The purpose of this task is to stand on one leg for up to 20 s. Both legs are tested and the child is given 1 practice attempt (10 s) and 2 formal trials for each leg. The score corresponds to the number of seconds (up to 20) that the child maintains balance.

Jumping over a cord (J. O. C.)

In this task the child is asked to jump with feet together over a cord which is placed on the level of the lower border of his/her knee cap. The participant is given 1 practice attempt and 3 formal trials. The score can be either P for a successful jump, or F for a failed jump.

Walking with heels raised (W. H. R.)

The purpose of this task is to walk along a straight line with heels raised without stepping off the line. Fifteen steps are required. The participant is given 1 practice attempt, which consists of 5 steps, and 3 formal trials. The score corresponds to the number of correct consecutive steps that the child accomplished.

12+ years. A total of 32 items are divided into four sets of eight, each intended for use with children of specific ages. The first set of items, which was the one used in the present study, labeled age band 1 is designed for use with 4 to 6 year old children, the second set, age band 2 for 7 and 8 year old children, the third for 9 and 10 year olds and the fourth for children 11 years old and above. Within each age band the structure of the test is identical. All children complete three items designed to assess manual dexterity, two items designed to assess ball skills and three items which assess static and dynamic balance.

Scoring of the MABC is a multi-step process. First, the examiner scores the child's raw score on each item. Raw scores are converted to scaled scores ranging from 0 to 5, with higher scores indicating poorer performance. Item scores are then summed to produce total scores, ranging from 0 to 40. Finally, percentile tables are consulted to determine how an individual compares with his/her age peers.

As the test is recommended mainly for clinical using (for the next intervention process) it should be supported with observation and a follow up qualitative description of child behavior. Attentive observation is guided with a specially structured check-list of items and a record list.

Procedure

The first step of the research process was to obtain the original MABC package and receive permission for its use in a Czech environment. Prior to the measurement a visit to the kindergarten took place for the purpose of providing appropriate conditions and contact with children for further, better communication between the administrator and the children. The parents were informed and signed their agreement with applying the MABC and afterwards, with the presentation of the results and an explanation of the intervention plan (at the request of parents).

The testing procedure was completed in the 2 following days. The protocol from the MABC was followed, and standardized testing procedures were used. The test permits the administrator to give verbal directions, as well as a physical demonstration of the task.

Real measurement was processed with cooperation between the tester administrator (English speaking) and the examiner, both of whom were master's degree program students in adapted physical activities. An examiner was engaged with the task to translate the instructions into the Czech language for the participants, and to observe their motor performance with regards to qualitative patterns. The teacher of the children was also present, in order to make the students feel more comfortable and secure. The participants were randomly assigned to perform the 8 items of the movement ABC test and the time needed for each participant was approximately 40 minutes.

The individual motor skills interventions were developed according to an example of an "Individual physical education program" proposed by Auxter, Pyfer, & Huettig (2005). The present level of performance was presented and three annual goals were selected for each participant. The three goals were selected correspondingly to the three items for which the participant obtained the higher scores. In case the participant had the same score in more than three items the selection of the goals was done according to the qualitative results.

RESULTS AND DISCUSSION

In this chapter quantitative and qualitative results are presented. Related to the MABC manual, both aspects should be analyzed in case studies for follow up intervention. The quantitative results include the Total Impairment Score (T. I. S), the scores in the three sets of MABC: manual dexterity (M. D.), ball skills (B. S.) and static & dynamic balance (S. & D. B.) and the item scores, altogether 8 items. T. I. S. is compared with the table of percentile equivalents from 1 to 93/96 for the determined age band (Henderson & Sugden, 1992, p. 17).

The qualitative results include personal observations and they are reported according to the following 8 items of MABC: 1. posting coins (P. C.), 2. threading beads (T. B.), 3. bicycle trail (B. T.), 4. catching bean bag (C. B. B.), 5. rolling ball into goal (R. B.), 6. one-leg balance (O. L. B.), 7. jumping over cord (J. O. C.), and 8. walking heels raised (W. H. R) (TABLE 1, 2).

Both domains are discussed.

Case studies

1) **M. A.** (68 months old, diagnosed with atypical autism, specific developmental disorder of speech and language, suspicious about his cognitive ability)

Quantitative results

M. A. obtained a T. I. S. of 19 which placed him on the 4th percentile for his age. In the subtest of M. D. he scored 10, while on B. S. he scored 0, and as for S. & D. B. his score was 9. His item scores were: P. C.: 3, T. B.: 5, B. T.: 2, C. B. B.: 0, R. B.: 0, O. L. B.: 4, J. O. C.: 0, W. H. R.: 5

M. A. had a T. I. S. of 19, which indicates a serious developmental delay, but his score on the subtest of ball skills was 0. This score (which corresponds to a very good performance) comes into contrast with the findings of Doty et al. (1999) who showed that 5 year old children with developmental disabilities are delayed in their ball skills. However, according to Auxter et al. (2005) learners with autism may exhibit unusual motor

TABLE 1
Quantitative results

Item scores

	P. C.	T. B.	B. T.	C. B. B.	R. B.	O. L. B.	J. O. C.	W. H. R.
M. A.	3	5	2	0	0	4	0	5
M. T.	4.5	5	5	5	2	5	5	3
S. L.	0	0	0	1	5	0	0	5
V. I.	4.5	5	0	1	1	4	0	2
J. A.	4	5	0	5	5	4.5	5	0
M. O.	4	5	5	5	0	5	5	5

Note
P. C. = posting coins, T. B. = threading beads, B. T. = bicycle trail, C. B. B. = catching bean bag, R. B. = rolling ball into goal, O. L. B. = one leg balance, J. O. C. = jumping over cord, W. H. R. = walking heels raised

TABLE 2
Quantitative results

Total impairment scores and subtests scores

M. T.	34.5	14.5	7	13
S. L.	11	0	6	5
V. I.	17.5	9.5	2	6
J. A.	28.5	9	10	9.5
M. O.	34	14	5	15

Note
T. I. S. = total impairment score, M. D. = manual dexterity, B. S. = ball skills, S. & D. B. = static & dynamic balance

behaviors. Although it has been previously suggested that formal testing would be difficult to administer to autistic subjects (Reid & Morin, 1981), no resistance was noted with regards to M. A. On the contrary he seemed to enjoy the testing procedure. A possible explanation could be that the presence of the children's teacher made him feel comfortable, or the fact that the whole procedure took place in a familiar environment.

Qualitative results

In the first item he was not concentrating and many times he was looking around. He seemed hyperactive, making unnecessary movements and also speaking quietly (like talking to himself). Nevertheless he was holding the box on the mat and he was picking up the coins fluently, using the pincer grip. He exhibited a particular strategy in the selection of the beads, but he had difficulties during their placement on the string and he dropped it on the mat several times. When he was tested in the bicycle trail he was grasping the pen, placing it vertically to the paper, drawing a line in order to reach the end as quickly as possible and without respecting the borders. But he improved in the second attempt. In the fourth item he had a correct body posture while waiting for the bean bag as well as while catching it. However, for some minutes he seemed lost in his thoughts without paying attention to the activity. Although M. A. accomplished fluently the fifth item, he had problems in the next one (one leg balance) as he couldn't keep his balance for more than a few seconds. In the item of jumping over the cord he showed no difficulty and as for the last item he was able to stand with heels raised but only in a stationary position.

Intervention plan

Present level of performance

1) M. A. was unable to accomplish the task of threading 12 beads within the given time of 55 s. The best time he obtained was 129.43 s.
2) M. A. was unable to balance on one leg for 20 s. The best time he obtained was 4.79 s (both legs were tested).
3) M. A. was unable to obtain 15 steps walking with his heels raised. He failed in all trials.

Annual goals

1) M. A. will be able to accomplish the task of threading 12 beads within 55 s. The objectives will be to thread within 55 s first 6, then 8 and finally 10 beads.

2) M. A. will be able to balance on one leg for 20 s (both legs will be tested). The objectives will be to balance on one leg, first for 15 s while holding his teacher's hands, then for 10 s independently and finally for 15 s independently.
3) M. A. will be able to obtain 15 steps walking with his heels raised. The objectives will be able to walk with his heels raised, first for 10 steps while holding his teacher's hands, then for 5 steps independently and finally for 10 steps independently.

2) M. T. (60 months old, diagnosed with childhood autism and mild mental retardation)

Quantitative results

M. T. had a total impairment score of 34.5, indicating that he fell below the 1st percentile for his age. Additionally he scored 14.5 in manual dexterity, 7 in ball skills, and 13 in static and dynamic balance. His item scores were: P. C.: 4.5, T. B.: 5, B. T.: 5, C. B. B.: 5, R. B.: 2, O. L. B.: 5, J. O. C.: 5, W. H. R.: 3.

M. T. obtained his highest score (34.5) in comparison to the rest of the participants. In case of a score like this Henderson and Sugden (1992) mentioned that "additional help for the child is imperative". Morin and Reid (1985) stated that the depressed motor behavior of lower functioning autistic subjects might be more a reflection of accompanying mental retardation than autism. Regarding the qualitative aspects of his performance M. T. seemed to have a problem in the comprehension of the instructions. This problem, which is probably one of the main reasons that resulted to M. T.'s low performance, could be due to an attentional deficit, which is a common characteristic of autistic individuals (Frith & Hermelin, 1969; Fulkerson & Freeman, 1980; Varni, Loovas, Koegel, & Everett, 1979; Wing, 1976).

Qualitative results

M. T. appeared to have problems in holding the box steady on the mat while afterwards he exhibited concentration and good eye contact with the coins and the slot. He was using the pincer grip for the collection of the coins. With regards to the second item, he started to thread the beads from the end of the string after observing it carefully for a while. After receiving supplementary instructions he developed a personal strategy changing hands according to the side of the beads he was picking up. However, he dropped the string on the mat a few times. As for the bicycle trail M. T. didn't seem to understand the instructions since he insisted on drawing a line directly from the beginning to the end without following the trail. He was grasping the pen instead of holding it with the fingers. In the fourth item he didn't seem able to catch the bean bag, since he was using only one hand, while in the fifth one it seemed to be easier for him to roll the ball using both hands. Finally he managed to roll the ball with one hand staying behind the starting line. In the static and dynamic balance subtest he was jumping on one leg without being able to stand on it, while he seemed to enjoy stepping over the cord but not being able to jump over it. Regarding the last item of this subtest he managed to walk on the line but without raising his heels.

Intervention plan

Present level of performance

1) M. T. was unable to catch the bean bag 10 times from a distance of 2 m. He failed in all trials.
2) M. T. was unable to balance on one leg for 20 s. He failed in all trials (both legs were tested).
3) M. T. was unable to jump (with feet together) over a cord placed on a height under his knees. He failed in all trials.

Annual goals

1) M. T. will be able to catch the bean bag 10 times from a distance of 2 m. The objectives will be to catch the bean bag, first 4 times from a distance of 1.5 m, then 4 times from a distance of 2 and finally 7 times from a distance of 2 m.
2) M. T. will be able to balance on one leg for 20 s (both legs will be tested). The objectives will be to balance on one leg, first for 15 s while holding his teacher's hands, then for 10 s independently and finally for 15 s independently.
3) M. T. will be able to jump (with feet together) over a cord placed on a level under his knees. The objectives will be to jump (with feet together), first on a stationary position, then over a cord placed on the floor and finally over a cord placed on the half of the initial goal level.

3) S. L. (64 months old, diagnosed with moderate mental retardation, significant impairment of behavior requiring attention or treatment and other childhood disintegrative disorder):

Quantitative results

S. L.'s total impairment score was 11 which correspond to the 14th percentile for his age. With reference to the subtests, his scores were 0 for manual dexterity, 6 for ball skills, and 5 for static and dynamic balance. His item scores were: P. C.: 0, T. B.: 0, B. T.: 0, C. B. B.: 1, R. B.: 5, O. L. B.: 0, J. O. C.: 0, W. H. R.: 5.

Despite a substantial body of literature that children with mental retardation (M. R.) are 3 to 5 years delayed in their gross and fine motor skills (Francis & Rarick, 1959; Rarick, 1973; Rarick et al., 1970). S. L. had a T. I. S. of 11 which means that he has a degree of difficulty almost on the borderline (Henderson & Sugden, 1992). His performance was the best among all the

participants. In some occasions he seemed able to develop a strategy and in some others he had a remarkable degree of progress even if past investigations regarding strategy production and progress toward goals have provided different evidence (Bray, 1987).

Qualitative results

Although S. L. showed a systematic way of posting the coins, and his body posture was also appropriate, it should be mentioned that he turned several times to his teacher looking for some support or ascertainment. In the threading beads item he was holding the string very high and he was changing hands every 3 beads. Referring to the bicycle trail he didn't seem to have any problem following the instructions as well as holding the pencil correctly. In the fourth item, even if his waiting position was not totally correct (arms wide apart, fingers extended), he exhibited remarkable improvement during the ten attempts to catch the bean bag. While rolling the ball into the goal, S. L. tried different grips, possibly looking for the most convenient way to do it. He fluently accomplished the one leg balance item; but as for the last two (jumping over the cord and walking with heels raised) he had great difficulties.

Intervention plan

Present level of performance

1) S. L. was unable to catch the bean bag 10 times from a distance of 2 m. He obtained 6 successful trials.
2) S. L. was unable to roll the ball into the goal for 10 times from a distance of 2 m. He obtained 1 successful trial.
3) S. L. was unable to obtain 15 steps walking with his heels raised. He accomplished 4 steps in his best trial.

Annual goals

1) S. L. will be able to catch the bean bag 10 times from a distance of 2 m. The objectives will be to catch the bean bag, first 8 times from a distance of 1.5 m and finally 8 times from a distance of 2 m.
2) S. L. will be able to roll the ball into the goal 10 times from a distance of 2 m. The objectives will be to roll the ball into the goal, first 4 times from a distance of 1.5 m, then 4 times from a distance of 2 m and finally 8 times from a distance of 2 m.
3) S. L. will be able to obtain 15 steps walking with his heels raised. The objectives will be to walk with his heels raised, first for 10 steps while holding his teacher's hands, then for 5 steps independently and finally for 10 steps independently.

4) V. I. (79 months old, diagnosed with expressive language disorder and specific developmental disorder of motor function):

Quantitative results

V. I.'s performance resulted in a total impairment score of 17.5 which placed him on the 1st percentile for his age. In the subtest of manual dexterity he scored 9.5, on ball skills he scored 2 and on static and dynamic balance he scored 6. His item scores were: P. C.: 4.5, T. B.: 5, B. T.: 0, C. B. B.: 1, R. B.: 1, O. L. B.: 4, J. O. C.: 0, W. H. R.: 2.

V. I.'s results (T. I. S. = 17.5) replicate the findings of previous studies, which demonstrated that children with D. D. have motor deficits (Zittel & McCubbin, 1996; Valentini, 1977; Hamilton et al., 1999). Hamilton et al. (1999) reported serious delay with reference to five object control skills (kicking, throwing, bouncing, striking and catching). However it should be mentioned that V. I.'s score and correspondingly his qualitative performance in ball skills was at a good level.

Qualitative results

V. I. was very focussed on, but quite slow in carrying out the item of posting coins. He exhibited a systematic way of picking up the coins and he used the pincer grip. His body posture was correct and he seemed to have good eye contact with the coins and the slot.

With reference to the threading beads item he was holding the string at an appropriate distance from his body even if he was changing hands continuously. The bicycle trial was accomplished easily. With regards to the fourth item (catching the bean bag) he seemed fluent and focussed. As for the task of rolling the ball into the goal despite some comprehension problems he finally managed to be successful. Although V. I. had no significant problems during the one leg balance and the jumping over the cord items, the last item (walking with heels raised) appeared very hard for him since he couldn't avoid stepping off the line.

Intervention plan

Present level of performance

1) V. I. was unable to accomplish the task of posting 12 coins within the given time of 17 s. The best time he obtained was 25 seconds (both hands were tested).
2) V. I. was unable to accomplish the task of threading 12 beads within the given time of 47 s. The best time he obtained was 124.5 seconds.
3) V. I. was unable to balance on one leg for 20 seconds. The best time he obtained was 6 s (both legs were tested).

Annual goals

1) V. I. will be able to accomplish the task of posting 12 coins within the given time of 17 (both hands will be tested). The objectives will be to post within the time of 17 s first 6, then 8 and finally 10 coins.

2) V. I. will be able to accomplish the task of threading 12 beads within 47 s. The objectives will be to thread within 47 s first 6, then 8 and finally 10 beads.
3) V. I. will be able to balance on one leg for 20 s (both legs will be tested). The objectives will be able to balance on one leg, first for 15 s while holding his teacher's hands, then for 10 s independently and finally for 15 s. independently.

5) J. A. (78 months old, diagnosed with Asperger's syndrome and unbalanced mental ability):

Quantitative results

The total impairment score of J. A. was 28.5 which pointed out that he fell below the 1st percentile for his age. As for manual dexterity, ball skills and static and dynamic balance, his scores were 9, 10, and 9.5 respectively. His item scores were: P. C.: 4, T. B.: 5, B. T.: 0, C. B. B.: 5, R. B.: 5, O. L. B.: 4.5, J. O. C.: 5, W. H. R: 0.

Similar to the findings of Ghaziuddin, Butler, Tsai and Ghaziuddin (1994), Ghaziuddin and Butler (1998) and Manjiviona and Prior (1995), J. A. had a high T. I. S. (28.5) which indicates a poor motor performance. Regarding the qualitative patterns of his performance J. A. seemed to have motor coordination difficulties (especially in the task of jumping over the cord) as well as sensory motor dysfunction (in the task of catching the bean bag). These are two characteristics of individuals with Asperger's syndrome which have also been mentioned in past investigations (Ghaziuddin & Butler, 1998; Iwanaga, Kawasaki, & Tsuchida, 2000).

Qualitative results

In the first item J. A. exhibited good eye contact with the coins and the box and a high level of concentration. His body posture was correct and he was selecting the coins systematically using the pincer grip. In the item of threading beads he seemed focussed and careful. In spite of the fact that he had a very slow rhythm (because of driving the beads until the end of the string) he developed his own strategy and he followed it until the end of the task. With reference to the bicycle trial he was holding the pen using the pincer grip. Meanwhile he was holding carefully the paper with the other hand. Next item – he had good eye contact with the bean bag. As for the fifth item J. A. seemed to react spontaneously, either without using a specific grip to roll the ball, or just pushing it instead of rolling. Before testing the item of one leg balance he seemed to concentrate and to be able to keep his balance easily, finally (during the actual attempts) he lost his concentration and the ability to accomplish the task. In the following item he was able to step over the cord but not to jump with his feet together. Contrarily he showed great fluency when he was asked to walk on a straight line with his heels raised.

Intervention plan

Present level of performance

1) J. A. was unable to catch the bean bag 10 times from a distance of 2 m. He obtained 4 successful trials.
2) J. A. was unable to roll the ball into the goal for 10 times from a distance of 2 m. He obtained 2 successful trials.
3) J. A. was unable to jump (with feet together) over a cord placed on a height under his knees. He failed in all trials.

Annual goals

1) J. A. will be able to catch the bean bag 10 times from a distance of 2 m. The objectives will be to catch the bean bag, first 6 times from a distance of 1.5 m, then 6 times from a distance of 2 m and finally 8 times from a distance of 2 m.
2) J. A. will be able to roll the ball into the goal 10 times from a distance of 2 m. The objectives will be to roll the ball into the goal, first 4 times from a distance of 1.5 m, then 4 times from a distance of 2 m and finally 8 times from a distance of 2 m.
3) J. A. will be able to jump (with feet together) over a cord placed on a level under his knees. The objectives will be to jump (with feet together), first on a stationary position, then over a cord placed on the floor and finally over a cord placed on the half of the initial goal level.

6) M. O. (48 months old, diagnosed with expressive language disorder):

Quantitative results

M. O. obtained a total impairment score of 34. This score placed her below the 1st percentile for her age. In manual dexterity she scored 14, in ball skills 5, and in static and dynamic balance she scored 15. Her item scores were: P. C.: 4, T. B.: 5, B. T.: 5, C. B. B.: 5, R. B.: 0, O. L. B.: 5, J. O. C.: 5, W. H. R.: 5.

It has been stated that the coexistence of language and motor problems is a well-known phenomenon (Bishop, 1990; Nicholson & Fawcett, 1994). M. O. had a very low motor performance (T. I. S. = 34) that reflects the above statement. Initially she seemed to have attention problems which have long been known to be associated with language disabilities (Cooper, Moodley, & Reynell, 1979; Lahey, 1988; Whitehurst & Fishel, 1994; Tirosh, Berger, Cohen-Ophir, Davidovitch, & Cohen, 1998). Generally M. O. had limited interaction with the environment and even more limited expressiveness during the whole testing procedure. In point of these characteristics, past investigation has demonstrated that social-skill deficits as well as different kinds of behavioral problems seem to co-occur with attention, motor, and language problems (Szatmari, Offord, & Boyle, 1989; Moffitt, 1990; Frick, Kamphaus, Lahey, & Loeber, 1991; Kavale & Forness, 1996).

Qualitative results

Regarding the item of posting coins M. O. had a very slow rhythm and a low level of concentration as she was mainly looking at her teacher. Nevertheless an improvement was obvious during her attempts. Her rhythm was slow also in the threading beads item. She was often looking around, while sometimes she needed time in order to find the hole of the bead. In addition she insisted driving every bead carefully to the end of the string until she was sure that it was placed correctly. She had great difficulty in holding the pen appropriately during the bicycle trial test. In the item of catching the bean bag M. O. was either not placing her hands in the right position (while waiting) or she was using only one hand. Besides, her reaction to the arrival of the bean bag was delayed. In spite of the fact that she managed to accomplish the task of rolling the ball into a goal without significant difficulties, she appeared to have problems in the next item (one leg balance) keeping her free foot in front of the standing leg. However, apart from these position problems she seemed able to balance. With respect to the seventh item, jumping over the cord, she was able to step over the cord as well as to jump in a stationary position but not to jump over the cord with her feet together. When she was asked to walk on a straight line with her heels raised she was able to stay on the line but without raising her heels.

Intervention plan

Present level of performance

1) M. O. was unable to accomplish the bicycle trail task. She failed in both trials she was given.
2) M. O. was unable to catch the bean bag 10 times from a distance of 2 m. She failed in all trials.
3) M. O. was unable to obtain 15 steps walking with her heels raised. She failed in all trials.

Annual goals

1) M. O. will be able to accomplish the bicycle trail task. The objectives will be to accomplish first both trials with the help of her teacher and finally one trial with the help of her teacher and the second trial independently.
2) M. O. will be able to catch the bean bag 10 times from a distance of 2 m. The objectives will be to catch the bean bag, first 4 times from a distance of 1.5 m, then 4 times from a distance of 2 m and finally 7 times from a distance of 2 m.
3) M. O. will be able to obtain 15 steps walking with her heels raised. The objectives will be to walk with her heels raised, first for 10 steps while holding her teacher's hands, then for 5 steps independently and finally for 10 steps independently.

SUMMARIZED DISCUSSION

The physical/motor domain has been identified as one of the five areas of developmental delay: a) self-care, b) receptive and expressive language, c) learning, d) capacity for independent living, e) mobility (PL 99–457, 1986; PL 105–17, 1997). Despite numerous studies on early intervention (Casto & White, 1984; Cowden et al., 1998; Guralinick, 1991; Odom, 1988; White & Casto, 1985; Zittel & McCubbin, 1996), little has been reported about the developmental status of preschool children who are at risk in the motor skill area. To effectively intervene in the lives of these children it is critical to plan a motor skill program based upon empirical evidence (Hamilton et al., 1999).

The importance of motor skills as well as the effectiveness of early intervention has been repeatedly stated (Gabbard, 2000; Haywood & Getchell, 2001; Payne & Isaacs, 2002; Seefeldt, 1980; Cunningham, 1988; Dunst, 1990; Goodway & Branta, 2003; Zittel & McCubbin, 1996). Nevertheless early intervention literature is mainly focused on cognitive, academic and social variables (Casto & White, 1984; Guralnick, 1991; White & Casto, 1985; Zigler & Muenchow, 1992). Contemporary literature on the benefits of motor skill intervention is limited; considering motor skill intervention for specific populations, as past investigations of preschoolers with mental retardation or developmental disorders are really few (Connolly, Morgan, Russel, & Richardson, 1984; Mahoney, Robinson, & Fewell, 2001; Goodway & Branta, 2003; Zittel & McCubbin, 1996).

In addition most of the studies which refer to motor skill assessment and development focus only on the gross motor skills (Morin & Reid, 1985; Di Rocco, Clark, & Phillips, 1987; Berkeley et al., 2001). Fine motor skills though are equally important and they should be taken into consideration before reaching assumptions about motor skill performance. The quantitative results of this research revealed great differences between fine and gross motor skills. This could be a sign of disharmony and unbalanced development, as well as an indication for further investigation. The achievements of the quantitative results of the skills should be combined with qualitative assessment as a similar percentile can be accompanied by different individual behavior relevant to individual diagnosis. Scores as well as skills design and a behavior picture is the basis for evaluation of any educational and/or therapy effect.

LIMITATIONS AND RECOMMENDATIONS

The main limitations associated with this study are the following three: a) the participation of only six children, b) time limitations and c) the difference of

language between the participants (Czech) and the test administrator (English).

Regarding future research, the same objectives could be investigated in a larger population, so that generalization of the results would be acceptable and meaningful.

Additionally more information could be collected not only for the participants but also for their families, so that parent-assisted intervention programs could be planned. Correspondingly another recommendation could be the actual implementation of the intervention plans and the discussion of possible effects on the participants' motor skill performance. Last but not least, since this study was the first one that used MABC in a Czech population, a proposal would be the translation of the test and its standardization in Czech population so that its use would be easier for future research.

CONCLUSION

The assessed children achieved very low scores in items of MABC. In general the results of the present study verified previous findings and showed the developmental delay of the participants. Nevertheless in some cases there were unexpected scores or behaviors which contrast with previous research. The quantitative results of this research revealed great differences between fine and gross motor skills, great differences in assessed items related to the individual diagnosis of each child. This could be considered as a denotation for further and deeper investigation.

It should also be mentioned that MABC, through its use in the present study, mainly combines an exact score with a qualitative description and has been confirmed as a precise and valuable instrument for motor skills assessment, as well as for intervention and further development of children's skills. The proposed intervention plans and specifically the goals set could be accomplished through the implementation of common games as drawing, small toys' manipulation, ball games, running, jumping, etc.

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HODNOCENÍ MOTORICKÝCH SCHOPNOSTÍ A ČASNÁ INTERVENCE U DĚTÍ PŘEDŠKOLNÍHO VĚKU S MENTÁLNÍMI A VÝVOJOVÝMI PORUCHAMI (PŘÍPADOVÉ STUDIE)

(Souhrn anglického textu)

Cílem této studie bylo hodnocení výkonu motorických schopností u dětí předškolního věku s mentálními a vývojovými poruchami a navrhnout individualizované programy intervence. Mezi účastníky bylo 6 dětí, 5 chlapců a 1 dívka, ve věku 48 až 79 měsíců, které navštěvovaly tutéž speciální mateřskou školu. Zkoumány byly jak kvantitativní, tak i kvalitativní aspekty jejich výkonu. Pokud jde o kvantitativní zkoumání, byli účastníci posuzováni pomocí následujících testů – baterie pro posuzování pohybu u dětí (Henderson & Sugden, 1992). Kvalitativní výsledky byly získávány osobním pozorováním. Podle výsledků byl nakonec u každého dítěte naplánován intervenční program pro rozvoj motorických schopností.

Klíčová slova: mentální a behaviorální poruchy, předškolní věk, MABC, hodnocení motorických schopností, intervence.

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