Gender differences in coordination and motor-skill development in pre-school years

Differenze di genere nello sviluppo della coordinazione e delle capacità motorie in età prescolare

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abstract

Introduction: **Psychomotor difficulties are characterized by clumsiness that interfere with activities of daily living; so early identification is very important.**
The purpose of this study is to evaluate the motor and psychomotor difficulties in children living in the province of Salerno aged between four and six with the aim of identifying gender differences in each age through the use of the Movement ABC (Assessment Battery for Children) Checklist.
Methods: **The sample was composed by 360 children living in the province of Salerno, aged between four and six. The tool used is Movement ABC (Assessment Battery for Children) Checklist, that allows the investigation of children's difficulties of movement and quality of motor coordination in action, in view of possible repercussions that could be encountered in the socio-relational skills and learning due to poor motor skills.**
Findings: **From the study carried emerges the hypothesis according to which females, with age and compared to males, could become more coordinated and skilled in terms of motor skills. The data show, in fact, that females get lower results (which represent better performance) in each measure, but three exceptions in the group of four-years-old.**
Conclusions: **The scenario presented confirms the potential of refining children's motor skills in the pursuit of full autonomy of the body in pre-school years through the expansion of mobility opportunities for both males and females.**

Key-words: developmental coordination disorder (DCD), gender differences, Movement ABC, motor skills.

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1. Introduction

There are a lot of motor and psychomotor difficulties among males and females. Developmental Coordination Disorder (DCD) is a definition that appears in the early 1900s to describe developmental motor problems in children. This condition is characterized by clumsiness and took the name of "motor weakness" or "psychomotor syndrome" (Missiuna, 2013). According to the Dsm-V, there are other DCD definitions, such as "childhood dyspraxia", "specific developmental disorder of motor function", and "clumsy child syndrome". Therefore, as evidenced by the DSM-V, motor performance in DCD, in terms of coordinated motor skills, is below normal. There is a correlation between DCD and clumsiness, slowness and inaccuracy. These characteristics interfere with activities of daily living and cannot be attributed to other diseases or disorders (Dsm-V, 2003).

Early identification of motor disorders is essential for each child's development and it allows for timely referral for developmental interventions as well as diagnostic evaluations and treatment planning (Garey, *et al.*, 2013).

Early identification of motor difficulties in children is important for the present (because children with motor difficulties often have problems to succeeding in the classroom) and for the future (these types of difficulties also can lead to secondary problems, such as poor self-esteem, learning difficulties, low academic achievement) (Harris, *et al.*, 2000).

Pre-school years is a period during which children could have difficulties to adapting to the new rules and limitations and they may respond by displaying behavioral, social and motor problems. So any tensions arising from change and difficulties encountered at the start of pre-school period for a child may cause negative consequences. There may be various causes which can affect individual differences in child characteristics, for example activity, sociability, and attention, such as biological, environmental and emotional factors (Yoleri, 2014).

People who are able to give personal opinion of motor behavior in children are teachers in the school. They are often the first to notice if a child has difficulty in motor tasks. A valid tool, easy and useful, which can identify the difficulties of movement, is the Movement ABC (Assessment Battery for Children) Checklist (Henderson & Sugden, 1992). It was designed to reflect activities in which children participate routinely and it is a complementary tool to alert teachers to the existence of movement difficulties (Harris, *et al.*, 2000).

Usually teachers see difficulties in motor tasks and differences between boys and girls. The relationship between gender and motor difficulties could be related to lifestyle (Wrotniak, *et al.*, 2006) and could have psychosocial implications (Skinner & Piek, 2001). Sometimes individually differences in motor skills depend on hereditary and constitutional factors.

There is a vast range of motor skills (Chambers & Sugden, 2002; Burton, 1998). A problem in motor activity can be found in clumsiness, bad coordination (DCD "developmental coordination disorders"), awkwardness, dyspraxia, visual-motor problems, space-time organization, attention deficit, motor control, perception (Hellgren, *et al.*, 1994) and a lot of other qualitative elements of movement that may affect motor skills (Roy, *et al.*, 2004).

There are differences in the acquisition and development of motor skills. They also depend on environmental and contextual factors. For example, many

differences are found between children living in a small town or a rural area and children living in the city. Therefore, the surrounding in which the child lives is the basis for its training and education and the substrate for the learning of motor skills. It is therefore necessary to provide the child with the highest number of motor experiences to promote the acquisition of basic skills (Priori, *et al.*, 2009).

2. Objective

The purpose of this study was to evaluate the motor and psychomotor difficulties in children and to identify possible gender differences.

3. Material and methods

Participants

The sample was composed by 360 children living in the province of Salerno, aged between four and six, as follows (Tab. 1):

AGE	**BOYS**	**GIRLS**
4	72	57
5	106	83
6	21	21

Table 1. The sample

Measures and procedures

The tool used is Movement ABC (Assessment Battery for Children) Checklist. Movement ABC is one of the most popular instrument in the assessment of children with movement coordination problems (Ruiz, *et al.*, 2003; Van Waelvelde, 2004, 2007, 2008) and, since its publication, it has been used in many studies examining the motor performance of typical children or children with special needs (Venetsanou, 2011).

The Movement ABC Checklist can be filled in 10 minutes or less and can be completed by someone who is involved with the student, in fact it is primarily intended for teachers but may be used also by others professionals and parents (Dewey & Tupper, 2004; Croce, *et al.*, 2001). This teachers'Checklist allows the investigation of children's difficulties of movement and quality of motor coordination in action, in view of possible repercussions that could be encountered in the socio-relational skills and learning due to poor motor skills. As a specialist in both physical and special education, Sugden's primary concern was to alert

teachers to the broader educational significance of such difficulties (Barnett & Henderson, 1998).

The Checklist used is composed of 48 items relating to the behavior of the child in motor activities commonly performed by children in the school environment, such as writing, drawing, using scissors, running, ball catching and so on. The Movement ABC Checklist is divided into five sections: the first four indicate the relationship between the child and the surroundings, in order to highlight the performance of the child in progressively more complex situations (48 items). The fifth part indicates the behavior that may affect the performance of the child (12 more items) (Tab. 2) (Henderson & Sugden, 1992).

For each of the questions in sections 1 to 4 there are 4 possible responses, which describe the way in which the child reacts; so the teacher is required to observe how well the child performs these tasks and to give a score. A high score in the checklist indicates difficulties (Tab. 3) (Chow & Henderson, 2003; Chow, *et al.*, 2001).

Section 1	baby latch in stable surrounding
Section 2	baby moving in stable surrounding
Section 3	baby latch in changing surrounding
Section 4	baby moving in changing surrounding
Section 5	behavioral problems related to difficulties

Table 2. Sections of the Movement ABC Checklist

0	1	2	3
very well	Well	enough	Low

Table 3. Scale of scores

4. Analysis and results

Movement ABC Checklist was administered by teachers in the school.

In order to obtain a complete view of the results of Movement ABC Checklist, the data used included measures of location and measures of dispersion (average, standard deviation, median, first and third quartile and interquartile range) and a total of each measure for all four sections of the Checklist (Tab. 4). In this case, the collection of statistical information make it possible to summarize the results of data obtained and to evaluate the accuracy and reliability of them. Therefore, the data show that females always get lower results (which represent better performance) in each measure, but three exceptions in the group of four-years-old.

The study shows that females, over time and when compared to males, could become more coordinated and skilled in terms of motor skills.

Four-year-old boys							Four-year-old girls						
Checklist Sections	average	SD	Median	IQ	IIIQ	Diff	Checklist Sections	average	SD	Median	IQ	IIIQ	Diff
1	20,4	5,8	19	16	25,0	9	**1**	20,2	6,7	18	15	27,0	12
2	19	5,4	18,5	15	22	7	**2**	19	6,8	18	13	25,5	12,5
3	21,7	5,9	21,5	17,3	25	7,7	**3**	21,0	7,6	20	14	28	14
4	21,3	5,2	22	17	25	8	**4**	21,1	6,1	20	17	26,5	9,5
tot.1-4	82,6	20,5	84,5	66	94	28	**tot.1-4**	80,9	25,9	74	60,5	108,5	48
Five-year-old boys							**Five-year-old girls**						
Checklist Sections	average	SD	Median	IQ	IIIQ	Diff	Checklist Sections	average	SD	Median	IQ	IIIQ	Diff
1	16,7	7,1	17	13	22,3	9,3	**1**	14,5	7,2	16	10	19	9
2	16	7,3	17	12	21	9	**2**	14,4	6,5	15	10,8	18	7,2
3	19,5	6,8	20	15	24	9	**3**	18,3	6,5	18	15	23	8
4	17,7	7,1	18,5	12,8	23	10	**4**	16,9	6,6	18	12	21	9
tot.1-4	68,8	26,4	71	52,8	87	34	**tot.1-4**	63,9	24,9	67	49	78	29
Six-year-old boys							**Six-year-old girls**						
Checklist Sections	average	SD	Median	IQ	IIIQ	Diff	Checklist Sections	average	SD	Median	IQ	IIIQ	Diff
1	16,2	6,8	15	12,5	20,0	7,5	**1**	12,6	4,0	12	11,5	15,5	4
2	17	6,7	15	12,5	21	8,5	**2**	14	5,5	14	10	18,5	8,5
3	18,7	6,8	17	13	23	10	**3**	17,0	6,3	15	14	22	8
4	16,9	5,7	15	12,5	20,5	8	**4**	15,2	5,9	15	11,5	20	8,5
tot.1-4	68,3	23,3	62	50,5	83	32,5	**tot.1-4**	58,3	20,3	56	49	74,5	25,5

Table 4. Administration of Movement ABC Checklist: results

5. Discussion and Conclusions

Some studies (Livesey, *et al.*, 2007) have indicated that gender comparisons of the mean raw scores on each of the test items indicate that girls performed at a higher level than boys on both manual dexterity and static balance tasks while boys were superior in ball skills.

So, in this case, with the aid of Movement ABC it is possible to find the origin and extent of motor difficulties. But the range of tasks used to identify sex differences is very large.

Usually the number of boys and girls in the studies focusing on children with motor difficulties is not always specified but, when it is, often there are more boys than girls. Due to the nature of the selection procedures, it is not always clear whether this is a true representation of the population from which these children are drawn. However, this pattern does seem to reflect the general finding that more boys suffer from developmental disorders than girls (Barnett & Henderson 1998).

Also in others researches the use of Movement ABC to identify sex differences were fundamental for the development of motor skills.

On the total scores and in the two of three sections (manual, dexterity and balance) boys were significantly worse than girls. There were no significant differences between the sexes with respect to ball skills competence (Sigmundsson & Rostoft, 2003).

In this case, it is evident that with age the distance between the scores of males and females increases progressively.

Future prospects indicate the possibility of investigating the differences in motor development between boys and girls.

The scenario presented confirms the potential of refining children's motor skills in the pursuit of full autonomy of the body in pre-school years through the expansion of mobility opportunities for both males and females.

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