

Research Article

Educator's ability to identify students with coordination disorders: A review of literature

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Abstract

According to research 5-7% of the total school population face motor learning difficulties such as Developmental Coordination Disorder (DCD). In addition to that, recent findings regarding comorbidity revealed that specific learning difficulties such as Dyslexia are very often co-exist with movement difficulties such as DCD. School environment seems to be an ideal setting for early identification, assessment and in-school intervention. Therefore, educators' knowledge regarding DCD and their ability to identify and assess children with movement difficulties are crucial dimensions for an effective interventional management. The goal of the current paper was a review of the relative literature. The findings reveal that, without specific education, the educators have limited ability to recognize children with DCD. Furthermore, research has shown that well informed and educated educators can be very effective in identification and classification of students with movement difficulties. As a result, early intervention strategies can be developed and applied to help the students and their families. Therefore the current article provides a review of literature regarding the ability of the educators to identify their students with motor coordination difficulties. A review of the most commonly used identification instruments was also provided.

Keywords: Developmental Coordination Disorder, identification, assessment

1. Introduction

Developmental Coordination Disorder (DCD) has been recognized as one of the six most common developmental disorders in childhood [27, 39] and refers to motor performance that is substantially below expected levels, given the person's chronologic age, which significantly interferes with activities of daily living during childhood, and is

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not due to a known general medical condition [1, 2]. In addition to that “Developmental coordination disorder is diagnosed only if the impairment in motor skills significantly interferes with the performance of, or participation in, daily activities in family, social, school, or community life. Examples of such activities include using specific tools in class such as rulers and scissors, and participating in team exercise activities at school. Not only is ability to perform these actions impaired, but also marked slowness in execution is common. Handwriting competence is frequently affected, consequently affecting legibility and/or speed of written output and affecting academic achievement” [1].

Research has revealed that children with DCD have below average physical conditions [5, 13, 32], are not physically active [6, 42], and are at high risk of obesity levels that leads to type-II diabetes [4, 13, 16]. Apart from the motor domain, these children may experience social and emotional deficiencies [7], low self-esteem, isolation from friends, and reduced participation in games [28, 34]. Children with DCD find it difficult to compete in strength, speed and skill in games with their peers as they make comparisons that result in personal failure and thus lower self-esteem. Finally, a growing body of literature regarding comorbidity suggests that deficits in motor skill performance frequently exist among children with learning disabilities [21], such as dyslexia [37] and Attention Deficit Hyperactivity Disorder [25].

The importance of early motor identification and assessment has been early highlighted (Miyahara, Kaplan, Crawford & Wilson, 2002; Larkin & Rose, 2005). However, it seems rather impossible for all preschoolers and early school-aged students to be assessed. Therefore, it seems crucial for educators to be able to screen and identify students with motor coordination difficulties [12]. The school environment seems the ideal environment for early detection of children with DCD. In schools the teachers spend many hours with children daily, that are familiar with the schools ‘friendly and pleasant environment. Early and accurate identification and assessment leads to individualized and effective intervention strategies. The current article provides a review of literature regarding the ability of the educators to identify their students with motor coordination difficulties. A review of the most commonly used identification instruments was also provided.

2. Methods

The search for available articles on educator's ability to identify students with DCD was made through the widely used databases PubMed, ERIC, Medline, EBSCO, Scopus, SportDiscus. There was no chronological limitation to the search, other than that defined by the database itself. The keywords introduced were Developmental Coordination Disorder, identification, motor assessment, only studies related to the teacher's ability to recognize students with developmental coordination disorders were selected.

3. Educators' ability to identify movement difficulties

The knowledge of the teachers for the first identification of children with motor disorders is very important but even more vital is the ability of systematic intervention for effective and faster intervention. Two studies investigated the specific knowledge regarding Developmental Coordination Disorder among classroom teachers and physical educators in Greece and Cyprus [3, 38]. Both studies confirmed the limited knowledge of the educators in regard to Development Disorders and Movement Coordination. In addition, further data analysis revealed that there was no significant correlation between years of previous work experience and specific knowledge [3]. Participants of both studies expressed their belief that they would benefit from specific ongoing education and training.

In their study on 70 ten year-old boys, Morris and Winter (1971), found that teachers were able to recognize correctly 50% of children had movement disorders. In another study, Keogh, Sugden, Raynald, & Calkins (1979) stated that teachers who participated in the investigation could not identify more than 20%-30% of cases of children with physical clumsiness. Accordingly, Revie and Larkin (1993) declared that teachers who participated in their research, showed low recognition capability (42%), when they evaluated children in the age range 5-9. Similarly, Sovik and Maeland (1986) found that the teachers identified eight out of the 21 children to have motor/ kinetic difficulties, while seven children with motor disorders were not recognized.

Wilson, Neil, Kamps, and Babcock, (2012) studied the awareness of family doctors, pediatricians, school teachers and parents to identify movement disorders in children. The findings suggested that compared to other mental disorders, they also were not able to identify motor disorders such as, motor learning disability, dyspraxia, developmental coordination disorder and clumsy child syndrome.

It is important that teachers receive more training regarding movement difficulties and how they affect children. The school is often the primary source of reference, as the teachers are the first to observe poor developmental children's skills to interfere with classroom work and overall academic performance [36]. While secondary school teachers have shown that they are more capable to identify some children with DCD, the literature suggests that primary teachers cannot distinguish those children and this may be related to various factors such as the lack of knowledge [11, 15, 19, 29]. One solution to these problems is the control and observation checklists on motor disorders to be distributed to the teachers, but apparently do not work well, as they are often extensive and time consuming [17]. Piek and Edwards (1997) evaluated the ability of teachers and physical education teachers to identify children with motor coordination problems using the Movement Assessment Battery for Children (MABC; Henderson & Sugden, 1994). The results showed that the teachers were able to identify 25% of children with DCD, and physical education teachers were able to identify 49%. However, this was expected due to the nature of the profession. Physical education teachers are responsible for physical education, so they have a better ability to observe the mobility of children. The fact that in countries like Cyprus the lesson of physical education is taught by elementary school teachers results in the lack of teaching basic skills to children of these ages, as well as the lack of teachers' experiences of perceiving children's motor weaknesses. In South Africa, physical education was rejected by South African schools as an autonomous topic and they still do not receive a targeted physical education program at school [8].

The teachers have excellent opportunities to observe children in their daily lives in various movement activities in the classroom [24]. Nevertheless, according to Gubbay (1975) it seems that the teachers have low ability to identify the DCD. In alignment with this statement other researchers [9, 12, 22] agreed that most teachers do not have the knowledge to identify children with motor disorders. Ellinoudis and colleagues (2009) explored the ability of Physical Educators to identify movement difficulties among 340 primary education children. According to the results educators exhibited a low identification ability recognizing correctly only 27% of the 59 children with severe and moderate movement difficulties. On the other hand, they were able to identify with relative accuracy all the children without any motor difficulties, thus revealing a lack of specific knowledge regarding this issue. The important role of specific training of educators regarding identification of students with movement difficulties has been shown by Kourtessis and colleagues (2009). The purpose of this study was to investigate whether an educational program focused on specific issues regarding motor learning disorders

would enhance the educators' ability to recognize and identify students with such difficulties. Both kindergarten and physical education teachers were randomly assigned into an experimental and a control group. Participants of the control group were asked to identify children with motor difficulties without any previous information whereas their colleagues of the experimental group were asked to do the same after a 3-week intensive educational program. The results revealed that whereas the educators of the control group exhibited low identification ability, their trained participants showed significantly higher identification ability. Furthermore, an interesting finding was that non-trained kindergarten teachers exhibited higher identification ability compared to their non-trained physical education colleagues. The researchers concluded that the specific training had a positive effect on the educators' ability to identify children with movement difficulties. Therefore, continuing education on similar issues should be an integral part of any educational system.

The studies mentioned above, focused on the ability of teachers to identify motor disorders. The following table summarizes the various studies, the instruments they were used and the results. Most of the studies imply that primary school teachers have limited familiarity and knowledge to identify children with motor disorders. Yet, this identification seems to be easier for physical education teachers but still have their own weaknesses.

4. Checklists and Questionnaires for teachers

An equally important part are the questionnaires and checklists used by teachers to be able to detect children with mobility difficulties. Listed below are the most popular instruments of this kind (Table 2).

The Movement Assessment Battery for Children 2 Checklist [19] which has been designed to serve as a first screening in the identification process. This is done based on a list of specific motor behaviors that can be observed in an everyday setting such as a classroom or playground. A child's performance on each item is rated by an adult observer in terms of how competently it is executed. These ratings are summed to provide a total score, which is then mapped onto a 'Traffic Light' system showing whether a child falls into the age-appropriate range (green zone), shows some delay or some minor movement problems that need to be monitored (amber zone) or is highly likely to have a more severe movement problem (red zone). The checklist has been designed to be used by Physical Education teachers, classroom teachers, parents, therapists and other professionals involved with children who have movement difficulties [19]. The

Authors	Instruments	Results	Weaknesses
Gubbay 1975	Questionnaire	Teachers have low ability to identify the DCD. It was much lower than 50%.	- Teachers recognized more girls than boys, something that does not agree most of research.
Ellinoudis et al 2009	Movement ABC-Checklist	Teachers have low ability to identify the DCD. (27.1%)	The age of children was a factor that may affected physical education teachers, since they failed to successfully recognize children of the 6th grade
Kourtessis et al 2008	Movement ABC-Checklist	Teachers have low ability to identify the DCD	Relatively small sample
Sovik & Maerland 1986	-Test of Motor Proficiency -Test of motor impairment -Questionnaire	-Teachers' ratings of clumsiness had low correlation with criteria of clumsiness derived from the performance tests -The teachers identified 8 out of the 21 children to have motor/ kinetic difficulties, while 7 children with motor disorders were not recognized.	-Only children aged 9 years. -Although no systematic examination could be done in regard to articulation, social and emotional problems among subjects within the sample of clumsy children, some information of this kind was collected from their teachers. -The two tests and the questionnaire detect different children: TOMI 52% TMP 39%
Revie & Larkin, 1993	BMAT-R Checklist	Teachers have low recognition capability (42%),	- Small sample. - Only the gross motor of children was evaluated.
Junaid et al 2000	Movement ABC-Checklist	Teachers cannot identify children with motor coordination problems. - They recognized only children (3.9%) with severe motor problems.	- The teachers criticized the checklist for being too long and time consuming to complete. - The 32 participating educators were not taught how to complete the checklist. They were just given the few instructions that were included in the test kit. -Language expression and understanding may have affected the exposure of children to certain tests on the checklist and influenced the teachers and graded them graciously on the checklist.

TABLE 1: Summary of the main studies on teachers' familiarity to identify motor disorders.

Authors	Instruments	Results	Weaknesses
Piek & Edwards 1997	Movement ABC-Checklist [18]	Teachers could identify 25% of children with DCD but the physical education teachers were able to identify 49% of DCD children.	Lack of experience of Classroom teachers regarding the movement characteristics of the children
Milander 2016	Movement Assessment Battery for Children - Test & Checklist	The ability of teachers to use the MABC-C to correctly identify children with motor difficulties was low.	- An important factor that may have influenced teachers' low knowledge is that in South African schools they do not teach physical education lessons that result in children's poor motor skills. - In addition, Kinder kineticists and teachers have different backgrounds and experiences and may have influenced the outcome. Some of the teachers have several years of experience in motor development

TABLE 1: Table Continued.

MABC-2 Checklist was used in the present project as an identification criterion to be decided if a case demanded further motor assessment.

The Developmental Disorder Coordination Questionnaire'07 [41] is a questionnaire for parents and teachers of 5 to 15 year old children and includes 15 questions rated on a 5 point-scale (1=not at all like your child; 5=extremely like your child). The total score ranged from 15 to 75. A lower score indicates suspicion of DCD. Different cutoff scores were established for different categories of ages. Below 8 years, the cutoff is ≤ 46 , for children between 8 and 10 years, the cutoff is ≤ 55 and for children above 10 years, the cutoff is ≤ 57 . The items are classified in three factors (1) control during movement, (2) fine motor/handwriting, and (3) general coordination.

The Motor Observation Questionnaire - T (MOQ-T) is a questionnaire for teachers and is aimed at children aged 5 to 11 years. This questionnaire was developed in the Netherlands and its previous version was the Groningen Motor Observation Scale (van Dellen & Kalverboer, 1987) which was aimed at children aged 6-11 years and was then extended to include children aged 5 years. The MOQ-T was adapted based on reliability data that used a large database of 1919 children to compose the new rules [34]. The

Checklists and questionnaires	Year	Age	Objectives
Movement Assessment Battery for Children 2 Checklist	Henderson , Sugden & Barnett, 2007	From 5 to 12 years old	A list of specific motor behaviours that can be observed in an everyday setting. Focuses on how a child manages daily tasks at home and at school.
Developmental Disorder Coordination Questionnaire'07	Wilson, Kaplan, Crawford & Roberts, 2007	From 5 to 15 years old	Control during movement. Fine motor/handwriting. General coordination.
Motor Observation Questionnaire - T (MOQ-T)	Previous version was the Groningen Motor Observation Scale (van Dellen & Kalverboer, 1987) Schoemaker, 2003	Children aged 5 to 11 years	Fine and gross motor functioning. Identify children with DCD or clumsiness.
Children Activity Scales for Teachers (ChAS-T)	Rosenblum, 2006	Children aged 4-8	Activities of daily living (ADLs) skills. Organization in time and space. Motor performance

TABLE 2: The most popular questionnaires and checklists.

original questionnaire included 20 items and then adjusted to 18 items rated on a 4-point scale (1 = never valid, 4 = always valid) with the total score ranging from 18-72. The high score of the questionnaire shows that the child is at risk of DCD.

The Children Activity Scales for Teachers (ChAS-T) is a questionnaire developed in Israel and can be used by teachers in children aged 4-8 who are at risk for DCD [32]. It contains 21 items that are similar to Children Activity Scales for Parents (ChAS-P). Due to the fact that teachers were having difficulty with some questions, 6 elements from the daily living activity of ChAS-P were removed. ChAS-T has been developed to provide information on how children work in everyday life in the natural environment. These elements relate to organizing space and time in day-to-day activities, gambling activities, ball skills, mobility, joint school and preschool activities and academic ability. Its credibility and validity regarding the ChAS-T scale has been examined with encouraging results [32].

5. Conclusion

According to De Milander and colleagues (2016) the ability of teachers to recognize children with DCD is rather low and perhaps an important factor may be their limited knowledge regarding coordination disorders. If the teachers are not properly educated and especially trained during their basic studies, they cannot identify and properly evaluate these children. On the contrary, well trained and educated teachers can have a very good effect to identify and correctly classify children with mobility disabilities [22]. The importance of early assessment and diagnosis of children with disabilities has been stressed repeatedly by most researchers. Yet, it is practically impossible to assess all students of primary schools of a country. Hence, teachers and especially physical education teachers could play a key role in identifying these children and, then, refer the children for further evaluation to experts (Kourtessis, 1997). In the last decades, teachers emphasize on the agility of movement, in order to teach other fields as mathematics, geography, etc. Thus, the importance of proper and timely identification of children with difficulties in movement in order to receive the necessary assistance, is evident [22].

In conclusion, as we have seen in the above review, teachers' ability to correctly identify children with developmental coordination disorders is moderate to low. Although the literature shows that physical education teachers are more capable than primary school teachers in identifying children with DCD, they still do not have the sufficient ability to recognize all of these children. Trained and educated teachers can be very effective in identifying and classifying children with movement difficulties. Motor assessment combined with the Questionnaires/Checklist are a very good evaluation tool for children with movement disorders. Therefore, it is very important for teachers to use the Questionnaires / Checklists on children who have indications that they may present DCD. Professional training and relevant future research for teacher education appear to be justified and necessary.

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