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Identifying developmental coordination disorder: MOQ-T validity as a fast screening instrument based on teachers' ratings and its relationship with praxic and visuospatial working memory deficits

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ABSTRACT

The present study was devoted to test the validity of the Italian adaptation of the Motor Observation Questionnaire for Teachers (MOQ-T, Schoemaker, Flapper, Reinders-Messelink, & De Kloet, 2008) as a fast screening instrument, based on teachers' ratings, for detecting developmental coordination disorders symptoms and to study its relationship with praxic and visuospatial working memory deficits. In a first study on a large sample of children, we assessed the reliability and structure of the Italian adaptation of the MOQ-T. Results showed a good reliability of the questionnaire and a hierarchical structure with two first-order factors (reflecting motor and handwriting skills), which are influenced by a second-order factor (general motor function) at the top. In a second study, we looked at the external validity of the MOQ-T and found that children with symptoms of Developmental Coordination Disorder (children with high scores on the MOQ-T) also had difficulty reproducing gestures, either imitating others or in response to verbal prompts. Our results also showed that children with high MOQ-T scores had visuospatial WM impairments. The theoretical and clinical implications of these findings are discussed.

Developmental coordination disorder (DCD) is a chronic neurological disorder that can affect planning of movements and coordination. In the category of neurodevelopmental disorders, it is classified as a motor disorder, and characterized by a delayed acquisition of coordinated motor skills, beginning in the early stages of development, that persistently interferes with activities of daily living and cannot be adequately explained by intellectual or visual impairments (DSM-5, American Psychiatric Association, 2013). DCD has an estimated prevalence of 1.8%, with a male-to-female ratio of 1.9:1 (Lingam, Hunt, Golding, Jongmans, & Emond, 2009). The causes of DCD are still not entirely clear, possibly including perinatal (e.g., low birth weight; (see Edwards et al., 2011 for a review)), genetic and physiological factors (see Blank, Smits-Engelsman, Polatajko, & Wilson, 2012).

Children with DCD may have a variety of dysfunctions. In particular, they may have problems with gross motor skills, such as imitating body positions, following motor commands or reproducing gestures in response to verbal prompts

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(e.g., Sinani, Sugden, & Hill, 2011), or with fine motor skills, such as grasping, dressing and handwriting (e.g., Biancotto, Skabar, Bulgheroni, Carrozzi, & Zoia, 2011), as well as psychosocial problems and difficulties in activities of daily living (Barnhart, Davenport, Epps, & Nordquist, 2003; Magalhães, Cardoso, & Missiuna, 2011).

Many of the difficulties that children with DCD encounter relate to visuospatial processing deficits, and problems with visual memory have been associated with DCD. For example, children with DCD have trouble drawing sequentially-presented geometrical patterns (Dwyer & McKenzie, 1994), and there is abundant evidence to confirm that the most often observed deficits in children with DCD involve visuospatial processing (Wilson & McKenzie, 1998). Children with DCD have working memory (WM) deficits too, particularly as far as visuospatial material is concerned (Alloway & Temple, 2007; Alloway, Rajendran, & Archibald, 2009). Overall, poor spatial abilities may give rise to other problems, such as illegible handwriting or poor drawing skills, that are often associated with DCD.

Questionnaires are often useful for the early diagnosis of DCD. Several questionnaires for parents and teachers are available for screening for DCD symptoms. They serve as a first step in the diagnostic process, and their use is recommended as a tool for collecting information on DCD symptoms (Blank et al., 2012), partly because assessing motor skills with objective measures such as the Movement ABC-2 (Henderson, Sudgen, & Barnett, 2007) may not be feasible in screening protocols due to the time and costs involved (Blank et al., 2012). Among the various questionnaires available, the Motor Observation Questionnaire for Teachers (MOQ-T) seems valuable as a screening tool for identifying children at risk of DCD (Jongmans, Smits-Engelsman, & Schoemaker, 2003), revealing good psychometric properties, sensitivity and specificity (Schoemaker et al., 2008). The Questionnaire is based on teachers' ratings and therefore seems particularly useful when population screenings are required and they must be carried out within the school system. Furthermore, research has showed that the Developmental Disorder Coordination Questionnaire (DCD-Q; Wilson, Kaplan, Crawford, Campbell, & Dewey, 2000), which has been successfully used for the identification of motor coordination disorders on the basis of parents' ratings, and the MOQ-T are highly correlated ($r = -.64$) (Schoemaker et al., 2008). These findings suggest that the ratings obtained by the MOQ-T may be substantially confirmed by teachers ratings. Further research on the properties of the MOQ-T is still needed, however, especially as concerns its validity and its adaptation to different languages and countries.

The aim of the present study was to test the validity of the Italian adaptation of the MOQ-T as a fast screening instrument for detecting developmental coordination disorders symptoms and to study its relationship with praxic and visuospatial working memory deficits. In the first part of the study, the Italian version of the MOQ-T was administered to a large sample of children to assess its reliability and its factorial structure. In the second part, we administered a series of tests assessing ideomotor and praxic abilities, and visuospatial WM to a sample of children with or without symptoms of DCD based on the MOQ-T results to see whether or not children with scores in the clinical range on the MOQ-T also showed deficits in motor and visuospatial functions associated with DCD.

1. Study 1. Psychometric properties and factorial structure of the MOQ-T

The aim of the first study was to assess the psychometric properties of the Italian version of the MOQ-T. We performed an exploratory factor analysis (EFA), then used the results to perform a series of confirmatory factor analyses (CFA). We also investigated the reliability of the MOQ-T.

1.1. Method

1.1.1. Participants

A sample of 363 children was assessed by their teachers in the first study. Children and teachers were from Northern Italian schools. From 1 to 3 teachers completed the questionnaires for each child. There were 102 children in second grade ($M_{age} = 92.82$ [3.49], females = 40), 80 in third grade ($M_{age} = 105.09$ [3.76], females = 38), 81 in fourth grade ($M_{age} = 116.58$ [4.81], females = 43), and 100 in fifth grade ($M_{age} = 128.79$ [3.44], females = 51).[2]

1.2. Materials and procedure

1.2.1. The Motor Observation Questionnaire for Teachers (MOQ-T)

The MOQ-T is a questionnaire developed to help teachers identify children between 5 and 11 years old with DCD. It contains 18 items regarding fine and gross motor functioning. It has revealed good psychometric properties, specificity and sensitivity for detecting symptoms of DCD (Schoemaker et al., 2008). The original was translated (and a back-translation was assessed by the author of the questionnaire) to develop the Italian version of the MOQ-T.

[2] Children with special needs are included in normal classes in Italian schools, and a small proportion (about 3.3%) of the children in our sample were certified as having various special needs. However, results are consistent and do not change markedly when these children are excluded from the sample.