Developmental Coordination Disorder

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Children who do not have the motor competence to cope with the demands of everyday tasks can be found in every classroom and may be described by parents, teachers and peers as "clumsy" or "physically awkward." Pediatricians and therapists, in an effort to explain the children's motor difficulties, may propose that they have "perceptual motor dysfunction," "sensory integrative dysfunction," "clumsy child syndrome," or "developmental dyspraxia" (Missiuna & Polatajko, 1995). Although first recognized in the early 1900s, children with movement skill problems have received little attention in the literature until recently due to the belief of many that, if left alone, the children would outgrow their problems. Finally, in the 1990s, we have strong evidence that the difficulties of these children do not disappear with increasing age and that failure to address their problems may lead to academic, behavioural, physical, and psychosocial consequences. Increasing awareness of the problem, combined with studies which demonstrated prevalence estimates of 5-6% around the world, have prompted recognition by the American Psychiatric Association (1994) and the World Health Organization of a distinct movement skill syndrome which they have classified as "Developmental Coordination Disorder." At an international consensus meeting held to debate all of these different labels, researchers and clinicians from around the world accepted this definition and agreed to publish all future papers using this term (Polatajko, Fox, & Missiuna, 1995).

The determination that a child is showing evidence of Developmental Coordination Disorder (DCD) is made when a child lacks the motor coordination necessary to perform tasks that are considered to be appropriate for his/her age, given normal intellectual ability and the absence of other neurologic disorders (American Psychiatric Association, 1994). A child may demonstrate significant difficulty with self-care tasks (e.g., dressing, using utensils); with academic tasks (e.g., handwriting, organizing seatwork, gym class); with leisure activities (e.g., sports, playground activities, social interaction); or with a combination of the above.

Due to the diverse spectrum of difficulties, children with DCD may be brought to the attention of any number of professionals including occupational therapists, physical therapists, special educators, physical educators, psychologists, pediatricians, neurologists and family physicians. This explains, in part, the observation that, although children with DCD may be easy to pick out on the playground, there has been remarkably little consensus about how to screen for, assess, or remediate their motor difficulties. So what do we know from recent studies about children with DCD?

*In the interest of space, only key studies have been referenced in this report.

Are children with DCD a definable group, with similar motor difficulties?

Early studies in this field explored a variety of methods for identifying and describing children with DCD. Since there are no clear-cut criteria which define clumsiness and there is no "generally accepted" level of motor proficiency, it was found that the characteristics of children who were identified as having DCD depended upon the source of referral, the professional discipline of the researchers, and the types of assessments used (Sugden & Keogh, 1990). Identification and assessment continues to be a major source of debate in the field and is confounded by the use, in different disciplines, of terminology or assessment methods which imply causation: DCD has no known cause. All children with DCD have some impairment of motor skill, in the absence of other physical and intellectual disorders; however, they are certainly not an homogeneous group. The only characteristic that has been demonstrated consistently in empirical studies is that children with DCD have slower movement time, regardless of the type of task or how it is taught or measured (e.g., Henderson, Rose & Henderson, 1992; Missiuna, 1994). A recent trend in the research is to attempt to define subtypes of children within the DCD
classification (e.g., Hoare, 1994), in the hope that this may contribute to our understanding of why many treatment methods have been largely ineffectual.

**Do children with DCD have kinesthetic or visual perceptual dysfunction?**

After conducting a series of research studies, Laszlo and colleagues have argued strongly for kinesthetic dysfunction (e.g., Laszlo, Bairstow, Bartrip, & Rolfe, 1988) and Hulme and colleagues for visual perceptual dysfunction (e.g., Lord & Hulme, 1987) as the underlying problem in children with DCD. The kinesthetic findings have since been called into question (e.g., Hoare & Larkin, 1991) and there is evidence that most children with DCD do not have any visual acuity or other ophthalmologic problems (e.g., Mon-Williams, Pascal, & Wann, 1994). The possibility of visual processing difficulties, however, remains an area of controversy that is continuing to be investigated (e.g., Rosblad & vonHofsten, 1994). At this time, evidence is mounting which suggests that children with DCD may rely more heavily on visual feedback for movement control (e.g., Missiuna, 1994; Smyth, 1991) and that they may not use rehearsal strategies to retain visual information in memory (e.g., Dwyer & McKenzie, 1994).

**Will children with DCD outgrow their problems?**

Children with DCD have only received concentrated attention from researchers in the past 16 years; therefore, well-designed longitudinal investigations are only just beginning to be published. There is now some strong scientific evidence that the motor problems of children with DCD persist at least into adolescence. Further, it appears that the natural history of DCD results in children who are more likely to have poor social competence, academic problems, behavioural problems, and low self-esteem, and are less likely to be physically fit or to participate voluntarily in motor activities. Some key studies in this area include Cantell, Smyth, & Ahonen, 1994; Geuze & Borger, 1993; Gillberg & Gillberg, 1989; and Losse et al., 1991. There appears to be little question that participation of children with DCD in structured and unstructured physical activities differs from that of their peers and puts their social interactions, motor skill development, fitness, and health at risk (Bouffard et al., 1996).

**Do some children with DCD have learning disabilities?**

While we know that many children with DCD are referred for intervention due to academic difficulties and/or a suspicion that they have learning disabilities, the literature in this area is inconclusive. Learning disabilities and DCD may be caused by the same underlying mechanism; learning disabilities may co-exist in some children who have DCD; or learning difficulties may arise as secondary complications when a child has DCD. For example, a child who finds handwriting and copying to be laborious is likely to experience problems in mathematics, spelling and written language. The possible relationship between DCD and the cluster of academic problems that is often referred to as "non-verbal learning disabilities" needs further investigation. In the meantime, intervention should address the academic difficulties that a child is actually experiencing, not an hypothesized relationship (Missiuna, 1995).

**Do some children with DCD have attention deficit disorder?**

The literature concerning the possible link between DCD and attention deficit disorder is equally inconclusive. As described above, the underlying mechanism for both disorders may be shared; attention deficit disorder may co-exist in a child with DCD (with or without an accompanying learning disability); or a child who is not able to sustain attention to a motor task may appear to be clumsy. Therapists who observe children during performance of daily activities are usually able to distinguish the child who is inattentive during a motor task from the child who is actually having difficulty learning and performing that task. The hypothesis of a link between DCD and other diagnosable conditions is now being empirically studied.

**What types of intervention are being used, and are they effective?**
A series of clinical research studies have been published recently which used rigorous methodologies and large samples to evaluate sensory integration, perceptual motor, and process-oriented treatment methods (e.g., Humphries, Snider, & McDougall, 1993; Polatajko, Anstett, Malloy-Miller, Murphy, & Noh, 1993; Polatajko, Kaplan, & Wilson, 1992; Wilson, Kaplan, Fellowes, Gruchy, & Faris, 1992). In all cases, with intensive treatment, the researchers concluded that the gains made by children with DCD using these motor-based intervention methods were small or non-existent. One study which has reported some improvement in movement skill development, suggested that improvement may be attributable to an increase in the children's confidence and willingness to participate in motor tasks (Schoemaker, Hijlkema, & Kalverboer, 1994). The possibility that occupational and physical therapy with children with DCD may lead to an increase in the child's perceived self-competence and willingness to engage in physical activity is now being explored in studies at a number of centres. Cognitive interventions, which take a "top-down" approach to the performance difficulties experienced by children with DCD, are also being studied by the DCD Research Group in London, Ontario. Much more evidence will be required before some of these newer approaches become available.

**What is the impact of DCD on the family?**

Despite the prevalence of DCD, only one study has been published thus far which investigated the impact of a child with DCD on other members of the family (Stephenson, McKay, & Chesson, 1991). Parents in this study indicated that they were particularly stressed during the period of time when they suspected that their child had difficulties but were unable to obtain a formal diagnosis or treatment. This important area of research needs to be the focus of investigation in the near future.

Progress in our understanding and treatment of children with DCD will depend upon the willingness of clinicians and parents to critically appraise research which has been conducted from different perspectives by researchers from a wide variety of disciplines. There is a need for professionals to use consistent terminology, to be clear about methods when identifying and describing the children, to evaluate existing treatment approaches, and to systematically study new ones. Focused research will lead to greater understanding of the characteristics and needs of children with DCD and to an improved ability to facilitate their performance.

**Additional Resource:**

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