History and terminology

Some children who appear to be physically and intellectually normal have difficulties performing skilled movements and daily activities. They are diagnosed as children with Developmental Coordination Disorder or DCD.

The term ‘Developmental Coordination Disorder’ was first introduced by the American Psychiatric Association in the revised third edition of the ‘Diagnostic and Statistical Manual of Mental Disorders (DSM-III) in 1987 (American Psychiatric Association). In the current edition, DSM-IV (1994), the diagnostic criteria for DCD are:

A. Performance in daily activities that requires motor coordination is substantially below that expected given the person’s chronological age and measured intelligence. This may be manifested by marked delays in achieving motor milestones (e.g. walking, crawling, sitting), dropping things, ‘clumsiness’, poor performance in sports, or poor handwriting.

B. The disturbance in criterion A significantly interferes with academic achievement or activities of daily living.

C. The disturbance is not due to a general medical condition (e.g. cerebral palsy, hemiplegia, or muscular dystrophy) and does not meet the criteria for Pervasive Developmental Disorder.

D. If mental retardation is present, the motor difficulties are in excess of those usually associated with it.

Previously, DCD has been described under a variety of labels. In 1937, Orton defined abnormal clumsiness as one of the six most commonly occurring developmental disorders. In the seventies, Gordon and McKinley (1970) and Gubbay (1975) described the ‘clumsy child syndrome’ in great detail. Ayres (1972) referred to the clumsiness seen in some learning disabled children as ‘developmental dyspraxia’. Other terms used to describe these children are ‘perceptual-motor dysfunction’ (Laszlo & Bairstow, 1985) and ‘physical awkwardness’ (Wall et al., 1990). In the 1980s in the Netherlands, the term ‘Minimal Brain Dysfunction’ (MBD) was advocated by the Health Council (Kalverboer, 1996). MBD was a catchall term for defining children of ‘normal intelligence’ who demonstrated behavioural and learning problems, which were assumed to be related to a minimal dysfunction of the nervous system.
In Sweden, Gillberg and Rasmussen (1982) coined the acronym DAMP for children with ‘Deficits in Attention, Motor control and Perception’. However at the moment, in both the Netherlands and Sweden, the term DCD is most commonly used (Kalverboer, 1996; Landgren, Kjellman & Gillberg, 1998; Geuze, Jongmans, Schoemaker & Smits-Engelsman, 2001). A growing international consensus on the use of the term ‘DCD’ is obvious (Geuze et al., 2001).

In the ‘International Classification of Diseases’, the World Health Organisation (1993) provides a description of a ‘Specific developmental disorder of motor function’ that is very similar to DCD. The most important differences are the way in which the WHO deals with intellectual ability, as they propose an IQ below 70 as an exclusion criterion in the research version, and they do not mention a Pervasive Developmental Disorder as an exclusion criterion (World Health Organisation, 1993). In the Netherlands health care policy provides guidelines not to exclude children with autism from a diagnosis of DCD. This policy is also taken over by Flemish clinicians. DCD is a descriptive diagnosis and does not pretend to link the motor problem to any etiological process. Therefore it seems not sense full to exclude children with autism.

Clinical picture

A child with DCD might move clumsy, awkward and poorly coordinated. Such children may have a history of delayed acquisition of motor milestones. Mostly they are reported as requiring much more effort and taking much longer than their peers to learn specific complex age-appropriate motor skills. Their motor problems can affect gross motor skills, fine motor skills, or both and any related functional skill such as jumping, catching, throwing, buttoning, tying shoelaces, writing, drawing or handling objects (Polatajko, 1999). The clinical picture of children with DCD is heterogeneous. Gordon and McKinley (1970) stated that ‘there is no typical clumsy child’.

The movement characteristics of the child with DCD are different in nature and less severe than those experienced by children with major neurological disorders. Sometimes it is difficult to draw a clear demarcation line between e.g. cerebral palsy and lesser disabilities of motor function and control (Henderson & Barnett, 1998). In particular, a minor degree of an ataxia type of cerebral palsy can be difficult to classify. The clinical relevance of ‘soft neurological signs’ such as mirror movements, choreiform movements, dysdiadochokinesia and a slight increase or decrease of tendon reflexes is a point of discussion amongst paediatricians. In the category of prematurely born children in particular, the question remains whether the presence of a brain lesion, however small or transitory, constitutes a ‘medical condition’ and excludes the child from the DCD category (Henderson & Barnett, 1998).

It is also difficult to identify what distinguishes the child with DCD from children with normal motor development. The first criterion of the DSM-IV classification requires a motor performance in daily activities substantially below that expected given the person’s chronological age. One major problem is the absence of a ‘gold standard’ for mapping the level of motor performance (Henderson & Barnett, 1998). The Movement Assessment Battery for Children (M-ABC) (Henderson & Sugden, 1992) is one of the most frequently used standardised tests for this purpose (Geuze et al., 2001). This test assesses motor proficiency on a representative set of eight fine and gross motor tasks. However, in general, the psychometric qualities of tests assessing movement skills are still not optimal (Burton & Miller, 1998; Van Waelvelde, De Weerdt, De Cock & Smits-Engelsman, 2004a). A second problem is the ‘degree’ of impairment required before a child will be categorised as having DCD. Researchers, clinicians and health authorities use criteria ranging between percentiles five and fifteen (Geuze et al., 2001). Children with DCD are by definition ‘delayed’ on norm-referenced motor tests, but it is also important to know how the child performs a task. A study comparing the quantitative and the qualitative measurement of ball catching, revealed that the reliability of the qualitative measures of ball catching was lower than the reliability of the quantitative measures but both measures were strongly correlated to each other. Children with DCD performed quantitatively and qualitatively worse than same-aged typically developing children. But children with DCD were not only delayed in ball catching, they also seemed to use different movement
strategies compared to younger typically developing children (Van Waelvelde, De Weerdt, De Cock, Peersman & Smits-Engelsman, 2004).

The impact of the impairment on daily activities is another important criterion. Activities of daily life can be evaluated reliably. However, it is difficult to interpret failure without having insight into the child’s past experiences at home and at school (Henderson & Barnett, 1998). A checklist for parents and/or teachers could offer an additional tool for evaluating the interference with daily activities (Wilson, Kaplan, Crawford, Campbell & Dewey, 2000; Schoemaker, Smits-Engelsman & Jongmans, 2003). Another unsolved issue is how many and what sort of daily activities the child should fall out before he or she is considered to be a child with DCD. For example, handwriting is not covered in many of the performance tests, yet an isolated handwriting deficit may be a sign of a serious condition (Geuze et al., 2001).

Overlap with other disorders

The use of catchall terms such as MBD and DAMP suggests an overlap between motor coordination disorders and other developmental disorders. Kaplan, Wilson, Dewey & Crawford (1998) report that in a group of 244 children referred due to learning and attention problems, 81 children with DCD were detected. Fifty-five of these 81 children with DCD had a diagnosis of a reading disorder or ADHD or both in addition to the DCD diagnosis. Large Swedish epidemiological studies especially stress the co-morbidity between DCD and ADHD (Landgren et al., 1998; Kadesjö & Gillberg, 2001). Gillberg (2003) states that about 50% of the children with ADHD also suffer from DCD and vice versa. Jongmans, Smits-Engelsman & Schoemaker (2003) compared children with DCD without learning disorders and children with comorbid DCD and learning disorder. The last group performed lower on a standardized assessment of perceptual–motor ability.

Different disorders interact, thus the impact of multiple impairments in children is larger than the sum of all the components (Shaw, Levine & Belfer, 1982). The stress and social constraints can be tremendous for these children. Their need for therapeutic help is undeniable. This considerable co-morbidity or co-occurrence of deficits (Kaplan, Dewey, Crawford & Wilson, 2001) has a disruptive effect on the search for the underlying mechanisms of each individual disorder.

Prevalence

The estimates of the proportion of children with DCD vary between 4% and 10%. This can be explained by the various assessment tools and cut-off points used to identify DCD (Gubbay, 1975; Henderson & Hall, 1982; Iloeje, 1987; Johnston, Crawford, Short, Smyth & Moller, 1987; American Psychiatric Association, 1994; Wright & Sugden, 1996a). Boys outnumber girls by two to one (Henderson & Hall, 1982; Johnston et al., 1987). A number of longitudinal studies (Gillberg, Gillberg & Groth, 1989; Losse et al., 1991; Cantell; Smyth & Ahonen, 1994; Geuze & Börger, 1994; Rasmussen & Gillberg, 2000; Pless, Carlsson, Sundelin & Persson, 2003) have demonstrated that DCD does not necessarily resolve with time. Important long-term effects persist into adulthood.

Underlying mechanisms

Over the last twenty years, the information processing approach to motor control has provided a model for studying the underlying processes of DCD (Wilson & McKenzie, 1998). In this approach, distinct processes – perceptual, cognitive and effector - are thought to operate sequentially between stimulus and response (Fitts & Posner, 1967; Marteniuk, 1976). Researchers have tried to identify processing deficits that might account for the observed inadequacies in the motor performance of children with DCD. These researchers seemed to seek a unitary cause, a unitary disrupted process, for the children’s motor difficulties (Henderson, Barnett & Henderson, 1994). Several studies have compared the various perceptual and motor abilities and impairments of children with DCD to those of non-DCD control children. Putative deficits include visual perception (Lord & Hulme, 1987a, b, 1988; Van der Meulen, Denier-van-der-Gon, Giel, Gooskens, Willems, 201a,b; Henderson et al., 1994; Mon-Williams, Wann & Pascal, 1999; Schoemaker et al., 2001; Smyth, Anderson & Churchill, 2001; Sigmundsson, Hanson & Tallbot, 2003); kinaesthetic perception (Bairstow & Laszlo, 1981; Lord & Hulme, 1987a, b; Hoare & Larkin, 1991; Sims, Henderson, Hulme & Morton, 1996a,b; Smyth & Mason, 1998b; Pick, Pitcher...
& Hay, 1999; Schoemaker et al., 2001), cross-modal perception or the transfer of information between sensory modalities (Hulme, Biggerstaff, Moran & McKinlay, 1982; Rösblad & von Hofsten, 1992; Newnham & McKenzie, 1993; Sigmundsson, Ingvildsen & Whiting, 1997; Smyth & Mason, 1998a; Schoemaker et al., 2001), response selection (Van Dellen & Geuze, 1988; Geuze et al., 1994), deficits in motor programming (Smyth, 1991), deficits in the timing of movement (Geuze & Kalverboer, 1987; Lundy-Ekman, Ivry & Woollacott, 1991; Volman & Geuze, 1998; Williams, Woollacott & Ivry, 1992) and deficits in processing speed (Smyth & Mason, 1997). This list is certainly not complete. Wilson & McKenzie (1998) published a meta-analysis of this research into deficits associated with DCD. They came to the conclusion that the group of motor-impaired children performed more poorly on nearly all investigated items of information processing when compared to a control group. The largest effect size was found in complex visual-spatial tasks involving a motor component. For visual-perceptual tasks without a motor component, the effect size was moderate to high.

Inter-group comparisons do not seem to be very effective in unravelling the underlying mechanisms of DCD. The heterogeneity of the clinical picture and the co-morbidity with other developmental disorders probably undermine this kind of approach. The design of such studies does not make it possible to examine whether any present association is causal or not. Still, this approach remains attractive to researchers because of the promise of a causal relationship and the speculation that remedial strategies might be refined as processing deficits are isolated (Wall, Reid, & Paton, 1990). Wright and Sugden (1996b) have described these comparative studies as a search for inter-group differences. On the basis of our current knowledge, no specific information-processing deficit or mono-causal underlying deficit can be identified. On the contrary, mono-causality is doubtful (Henderson et al., 1994). In keeping with the heterogeneity of this syndrome, it is more than likely that different systems are implicated in different children (Polatajko, 1999). Wright and Sugden (1996b) have argued that there is a need for more intra-group research to explore the nature of DCD.

Work is already done to identify subtypes of DCD (Miyahara, 1994; Hoare, 1994; Wright & Sugden, 1996b; Macnab, Miller & Polatajko, 2001; Jongmans, Smits-Engelsman et al., 2003). Unfortunately, these studies show discrepant results and do not clearly solve the issue of aetiology and treatment. Without a theoretical or clinical hypothesis regarding subtypes, the choice of the variables to be investigated is arbitrary.

Correlation analysis allows the investigation of the association between assumed underlying deficits and motor performance. However correlation analysis does not allow to conclude causality. Further research is then warranted in order to unravel the association between the deficits. The ultimate proof of a causal relationship can only be established by a true experimental study. One should be able to demonstrate that a specific training programme not only improves a postulated information-processing deficit, but that it has also a positive effect on motor performance. Ethical and methodological constraints do not allow this kind of research without first having convincing evidence that positive results might be expected. Still, when two deficits are not significantly correlated, it forms an important argument for causing some doubt regarding the possibility of a causal association. Significant correlation between two deficits might be interpreted as a confirmation of a theoretically postulated causal relationship.

In a recent study correlation analysis was used to investigate the underlying mechanisms of DCD. To encounter the problem of the heterogeneity of a group of children with DCD, a select group of children with poor ball catching performance was investigated (Van Waelvelde, 2004). As it seemed unrealistic to expect to find ‘the’ underlying mechanism(s) of DCD, the aim was to explore the mechanisms of a deficit in one specific skill. Ball catching was chosen because it is a complex and demanding motor skill, it is quantifiable and it is a relevant activity for a child. Moreover, ball skills seem to be a sensitive item in clinical practice for detecting motor impairment. Balance, manual dexterity, bimanual coordination, attention, reaction time, visual timing and kinaesthetic perception were evaluated, together with a ball catching test. The various component tasks of ball catching were
mostly moderately but significantly correlated with ball catching performance in the group of children with DCD, with the exception of kinaesthetic perception and reaction time. A ‘limb coordination’ deficit seemed to be a major contributing factor for a considerable number of children with both DCD and ball catching impairment. However, the individual profiles of the test results of the children with DCD were incoherent. For each variable, many children with DCD scored in the clinical range. Nevertheless, an important number of children with DCD scored quite well on each task, some of them even above the median of the control group. These findings indicate that even in a select group of children with DCD with a similar impairment in ball catching, many different possible underlying deficits and combinations of deficits can be found.

From a dynamical system perspective motor coordination is considered to arise via the system of self-organizing rather than being the result of a central executive controlling a chain of different processes (Kelso & Tuller, 1984; Thelen & Smith, 1994; Wade, Johnson & Mally, 2005). To solve the problem of the atypical motor behaviour of children with DCD it will not be sufficient to point to one impaired process or one impaired capacity to compute a well coordinated movement. A dynamical systems view of DCD may be grounded in a child’s capacity to exhibit self-organisation of movement as a complex non-linear system of different interacting cognitive, perceptual and action systems within a specific environment and within a specific task. The poor ball-catching performance of children with DCD, evaluated with a specific task in a specific environment, seems to be the result of different interacting deficits unique to each child. This approach helps to understand the heterogeneity of the clinical picture of DCD and the difficulty of subtyping the disorder.

Deficits in visual perception have been considered as typical for children with DCD and a causal relationship between visual-perceptual deficits and motor performance was assumed (Lord & Hulme, 1988; Wilson & McKenzie, 1998). However, Henderson and colleagues (1994) and Schoemaker and colleagues (2001) failed to establish a strong relationship between both deficits. As the visual impairment of many children with DCD was not related to the degree of motor impairment, they doubted a causal relationship between both impairments. This kind of discussion strongly reflects an information-processing approach to explain coordinated motor action. The role of perceptual ability in coordination was determined by the isolation of perception from motor action. However, an ecological approach to explain motor coordination emphasizes the reciprocity of perception and action. Adaptive behaviour cannot be assigned exclusively to any part of the system (Chiel & Beer, 1997). A significant correlation between a timed response test to a visual moving stimulus and ball catching performance could be demonstrated in children with DCD (Van Waelvelde, De Weerdt, De Cock, Smits-Engelsman, 2004b). This finding might indicate that the association between visual perceptual and motor deficits is task specific and only can be demonstrated in a perception-action related task.

Nevertheless, correlation analysis will never make it possible to demonstrate causality. The next issue to be addressed is whether the motor skills of children with DCD can be improved once a critical factor(s) in the system controlling a specific skill have been identified and targeted for treatment. This hypothesis can only be verified once there is better knowledge of the factors relevant to the various motor skills and once the appropriate clinical instruments for their assessment and the treatment tools for their rectification have been developed.

**Treatment**

Historically, therapy for children with DCD has been based on theories which advocate that the treatment of underlying deficits would result in improved function. The most well-known approaches are sensory integration (Ayres, 1972; Fisher, Murray & Bundy, 1991) and perceptual motor training (Kephart, 1960; Hallahan & Cruishank, 1973; Cratty, 1981). The most important common aspect of these treatment methods is that they are designed for children with learning disabilities. It is postulated that by treating sensory integrative deficits, motor abilities and perceptual-motor abilities, academic learning is improved as well. The meta-analysis of Kavale and Matson (1983) rejected the effectiveness of perceptual-motor training systems.
programmes to improve academic learning. In a review paper, Polatajko, Kaplan & Wilson (1992) also concluded that no support is provided for sensory integration therapy as an effective treatment modality for the academic problems of children with learning disabilities. Humphries, Wright, Snider & McDougall (1992) compared the effects of sensory integration therapy and perceptual motor training on motor ability. The effect of both methods was similar but only modest.

An approach developed specifically for treating children with motor problems was proposed by Laszlo and Bairstow (1985). This process-oriented approach was based on the premise that children with DCD have kinaesthetic problems and that the treatment of those problems will improve motor performance. Several studies, questioning this approach (Doyle, Elliot & Connolly, 1986; Hoare & Larkin, 1991 and Sims et al., 1996a, b), tried to replicate the findings of Laszlo and Bairstow (1985). The results of these studies were mixed and the evidence in support of Laszlo’s method is inconclusive.

Task-specific intervention was put forward by Revie and Larkin (1993). Investigation into the effectiveness of this method demonstrated significant gains in performance of the trained skill. Transfer to other tasks was not observed. In recent years, different cognitive approaches have been described (Bouffard & Wall, 1990; Henderson & Sugden, 1992). One, the ‘Cognitive Orientation to Daily Occupational Performance’ has been proposed by Missiuna (2001) and investigated by Polatajko, Mandich, Miller & Macnab (2001). Along with the task-specific intervention, these cognitive approaches could be described as task-oriented in contrast to the older process-oriented treatment programs. In the Netherlands, the Neuromotor Task Training and other task-oriented intervention strategies have been developed and evaluated (Jongmans, Linthorst-Bakker, Westenberg & Smits-Engelsman, 2003; Niemeijer, Smits-Engelsman, Reynders & Schoemaker, 2003).

A meta-analysis of the intervention studies on DCD (Pless & Carlsson, 2000) has revealed that a skill-specific approach is the most effective. Notwithstanding the new trend to advocate task-oriented approaches, it remains important in our opinion to understand the underlying motor disorders of children under treatment. The current state of affairs does not allow drawing firm conclusions about the importance of specific information-processing deficits as regards motor performance and motor learning processes. A better understanding of the relationship between different deficits and motor performance is still needed, especially at the level of the individual child. It might be that treatment cannot change the motor abilities of a child with DCD fundamentally. In that case, therapists are only able to teach these children strategies for learning new skills or to train specific skills. However, with the current research it is still too early to come to this conclusion. The plasticity of the nervous and neuromuscular system has been demonstrated in motor learning in animals, in healthy people and after brain injury (Shumway-Cook & Woollacott, 1995; Staudt et al., 2002). The positive effects of training specific deficits and critical factors related to motor tasks cannot be excluded beforehand. One optimal treatment strategy cannot be put forward for all children with DCD.

A better understanding of the association between deficits and better instruments for evaluating the deficits of the individual child might allow the therapist to offer more tailor-made rehabilitation.

Therapists should meticulously assess the abilities and deficits of children with DCD in a wide range of information processing aspects relevant to motor performance. They might try to find a critical factor that would allow them to change the dynamics of the interacting system, resulting in a shift to a higher level of motor performance. Therapy should be tailored to the patient, taking executive, perceptual and cognitive processes into account.

Randomised clinical trials for evaluating the effectiveness of therapeutic interventions are sorely needed. Careful selection of an experimental group, determination of a theoretical sound therapeutic intervention and relevant outcome measures are necessary to come to relevant conclusions.

Finally, we want to advocate rehabilitation for most children with DCD, even though it is not always possible to attain a better level of motor performance. The task of the therapist
goes beyond the physical component of the disorder. Children with multiple impairments in particular, often suffer stress as a result of their disabilities. Almost 60% of the children with a diagnosis of DCD and ADHD at age 7 years, have a very poor outcome at age 22, with severe persistent personality or psychiatric disorder, substance abuse, or serious criminal offences (Rasmussen & Gillberg, 2000). Therapists could teach parents and children to cope with the disorder, teach children to enjoy motor activities by offering them the experience of success, help teachers to understand the disorder and give them support in dealing with children with DCD.

**Suggestions for future research**

DCD is a descriptive diagnosis and does not refer to any etiological process. It is not reasonable to suppose a single etiological mechanism for a group of children with DCD. Therefore, to understand the underlying mechanisms of the movement disorder of a child with DCD it is not fruitful to compare a random group of children with DCD with a control group. Even when researchers use more sophisticated metrics they should not consider only the mean of a group of children with DCD, but investigate the variance within the group and if necessary the individual results. Case studies are rare, but are probably of high value to help to unravel the underlying mechanisms of the motor performance of the child with DCD.

Brain imaging techniques as MRI and fMRI can offer new insights in different developmental disorders. But as far as we know there are no such studies available with children with DCD. Also the study of neurochemical agents in relation to DCD may provide an explanation for the motor performance of some children with DCD. However, those new techniques will only be fruitful if they are used within studies starting from specific deficits in motor performance and not from the diagnosis DCD.

**References**


Kinder mit motorischer Ungeschicklichkeit (DCD)

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Abstract


Schätzungen des Anteils an Kindern, die an DCD leiden, schwanken zwischen 4% und 10%. Längsschnittstudien haben gezeigt, dass DCD sich mit der Zeit nicht notwendigerweise von alleine löst. Erhebliche Langzeitwirkungen bestehen bis ins Erwachsenenalter fort.

Obwohl Fortschritte im Zusammenhang mit dem Verständnis der fertigen Handlung erzielt worden sind, wird es auch in Zukunft sehr schwierig bleiben, einen Einblick in die Ursachen motorischer Schwierigkeiten bei Kindern mit DCD zu gewinnen. Zieht man Studien zu Rate, die die Mechanismen näher untersuchen, welche an der Basis von DCD liegen, so belegen diese ein leichtes allgemeines Defizit in nahezu allen erfaschten zugrunde liegenden Informationsverarbeitungssystemen. Visuell-räumliche Mängel waren am meisten ausgeprägt. Der heterogene Charakter von DCD und die Komorbidität mit anderen Entwicklungsstörungen erklären dieses breite

Les enfants souffrant du trouble de l’acquisition de la coordination

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Abstract

Le trouble de l’acquisition de la coordination (TAC) est diagnostiqué chez les enfants qui éprouvent des difficultés de mouvement disproportionnées par rapport à leur développement général, en l’absence de toute condition médicale connue ou maladie neurologique identifiable. En cas de retard mental, les difficultés motrices viennent s’ajouter à celles qui lui sont habituellement associées (Association psychiatrique américaine, 1994). La première chose qu’il conviendrait peut-être d’épingler à propos du TAC est qu’il constitue un groupe hétérogène. Les mouvements des enfants souffrant du TAC présentent des caractéristiques diverses. Les problèmes peuvent se manifester dans des capacités fonctionnelles comme l’action de sauter, attraper, lancer, se boutonner, attacher ses lacets, écrire, dessiner ou manipuler des objets. Les troubles du développement associés, tels que le « trouble d’hyperactivité avec déficit de l’attention » (THADA), la dyslexie, les difficultés d’apprentissage ou les troubles du comportement, sont fréquemment diagnostiqués chez ces enfants, ce qui complique encore davantage le tableau clinique. Différents troubles interagissent entre eux contribuant à ce que l’impact des multiples déficiences chez ces enfants soit plus important que la somme de toutes ces déficiences. Ces enfants peuvent en outre être soumis à un stress et des contraintes sociales énormes.

Les estimations de la proportion d’enfants présentant un TAC varient de 4 à 10%. Les études longitudinales ont démontré que le TAC ne se résorbe pas nécessairement avec le temps. Des effets importants à long terme persistent à l’âge adulte.

A moins que nous ne progressions dans la compréhension de l’habilité acquise, nous éprouverons encore beaucoup de difficulté à pénétrer les causes des troubles moteurs des enfants souffrant du TAC. L’examen des travaux sur les mécanismes sous-jacents du TAC révèle la présence d’un léger déficit généralisé dans presque tous les systèmes de traitement des données sous-jacentes qui ont été étudiés. Les déficiences visuospatiales se sont révélées les plus prononcées. Le caractère hétérogène du TAC et la comorbidité avec d’autres troubles du comportement expliquent ce large spectre de déficits. Les études comparatives ne permettent
toutefois pas d’établir une distinction entre les déficits concomitants et les mécanismes sous-jacents. Afin d’analyser l’association entre un déficit concernant la réception d’une balle chez des enfants atteints du TAC et divers problèmes sous-jacents possibles, des enfants ont été soumis à des tests de réception de balle, d’équilibre, de dextérité manuelle, de coordination bimanuelle, d’attention, de synchronisation visuelle, de perception kinesthésique et de temps de réaction. Toutes les variables ont présenté des différences significatives entre les enfants souffrant du TAC et un groupe de contrôle. Une corrélation significative, mais seulement modérée, entre la capacité de réception d’une balle et la plupart des variables a été observée dans le groupe des enfants atteints du TAC. Le rapport ne s’est pas révélé significatif pour la perception kinesthésique et le temps de réaction. Un déficit de « coordination des membres » semble apparaître comme un facteur contribuant majeur pour un nombre considérable d’enfants atteints du TAC et présentant une déficience concernant la réception d’une balle. L’incohérence des profils individuels des déficits chez les enfants souffrant du TAC laisse supposer que les déficits surviennent et interagissent entre eux selon une combinaison unique pour chaque enfant. Cette découverte permet de comprendre l’hétérogénéité du tableau clinique du TAC et la difficulté de sous-classifier ce trouble. Pour la pratique clinique, cela implique la nécessité de réaliser une évaluation globale de chaque enfant afin de créer un programme de réadaptation personnalisé.

Traditionnellement, la thérapie des enfants atteints du TAC est basée sur des théories soutenant que le traitement des déficits sous-jacents contribue à une amélioration fonctionnelle. Plus récemment, une intervention spécifique à la tâche a été mise en avant. Différentes approches cognitives vis-à-vis des méthodes thérapeutiques centrées sur la tâche, ont été décrites. La recherche semble montrer que les approches spécifiques aux capacités s’avèrent les plus efficaces. Néanmoins, la tâche du thérapeute va au-delà du composant physique du trouble. Les enfants présentant des déficiences multiples sont souvent victimes de stress en raison de leurs incapacités. Les thérapeutes pourraient apprendre aux parents à appréhender le trouble, aux enfants à prendre plaisir à réaliser des activités motrices en leur offrant l’expérience du succès, aux enseignants à comprendre le trouble et les aider à traiter les enfants souffrant du TAC.
Children with Developmental Coordination Disorder

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Abstract

Developmental Coordination Disorder (DCD) is diagnosed in children who experience movement difficulties out of proportion with regard to their general development, in absence of any known medical condition or identifiable neurological disease. If mental retardation is present, the motor difficulties are in excess of those usually associated with it (American Psychiatric Association, 1994). Perhaps the first thing that ought to be recognized about DCD is that it is a heterogeneous group. The movement characteristics of children with DCD are diverse. Problems can manifest in many functional skills such as jumping, catching, throwing, buttoning, tying shoelaces, writing, drawing or handling objects. Associated developmental disorders such as ‘Attention Deficit Hyperactivity Disorder’ (ADHD), dyslexia, learning or behavioral disorders are frequently diagnosed in these children, which complicates the clinical picture even further. Different disorders interact with one another, thus the impact of multiple impairments in these children is larger than the sum of all their impairments. The stress and social constraints can be tremendous for these children.

The estimates of the proportion of children with DCD vary between 4% and 10%. Longitudinal studies have demonstrated that DCD does not necessarily resolve with time. Important long-term effects persist into adulthood.

Unless progress in the understanding of skilled action is made, it will remain very difficult to gain insight into the causes of the motor disorders of children with DCD. A review of studies exploring the underlying mechanisms of DCD demonstrate a mild generalized deficit to be present in almost all the underlying information processing systems that were investigated. Visuo-spatial deficiencies were most pronounced. The heterogeneous character of DCD and the co-morbidity with other developmental disorders explain this broad spectrum of deficits. However, comparative studies do not make it possible to discriminate between co-occurring deficits and underlying mechanisms. To explore the association between a ball catching deficit in children with DCD and different possible underlying problems, children with DCD were tested for ball catching, balance, manual dexterity, bimanual coordination, attention, visual timing, kinaesthetic perception and reaction time. All variables differed
significantly between children with DCD and a control group. A significant, but only moderate, correlation between ball catching skill and most variables was found in the group of children with DCD. The relationship was not significant for kinaesthetic perception and reaction time. A ‘limb coordination’ deficit seems to be a major contributing factor for a considerable number of children with both DCD and ball catching impairment. The incoherence in the individual profiles of deficits in children with DCD leads to the assumption that deficits occur and interact with each other in a unique combination for each individual child. This finding helps to understand the heterogeneity of the clinical picture of DCD and the difficulty of sub-typing the disorder. The implication for clinical practice is that there is a need for a comprehensive assessment of each child in order to develop a tailor-made rehabilitation program.

Historically, therapy for children with DCD has been based on theories which advocate that the treatment of underlying deficits would result in improved function. More recently task-specific intervention was put forward. Different cognitive approaches to task-oriented therapy methods have been described. Research seem to reveal that skill-specific approaches are the most effective. However, the task of the therapist goes beyond the physical component of the disorder. Children with multiple impairments in particular often suffer stress as a result of their disabilities. Therapists could teach parents and children to cope with the disorder, teach children to enjoy motor activities by offering them the experience of success, help teachers to understand the disorder and give them support in dealing with children with DCD.