They're Bright but Can't Write: Developmental Coordination Disorder in school aged children

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Abstract

Handwriting problems are readily apparent to classroom teachers but may be only the tip of the iceberg for children who have significant coordination difficulties. School is a daily frustration for these children as their finished work does not reflect their abilities, they struggle with the simplest of tasks and are victimized by their peers. Strong evidence is now available indicating that children who appear to only have "mild" motor difficulties go on to experience serious secondary social and emotional problems. Educators have a pivotal role in early identification and in facilitating success using a strategy that will better M.A.T.C.H. each task to the child with coordination difficulties. In this article, the typical characteristics of these children are described, behavioral observations are explained, and practical suggestions are outlined.

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In many classrooms there is one, or even two, student(s) who are a real puzzle. They seem to be bright enough and are good readers. They participate actively in class discussions and, yet, they are struggling. They are slow to finish any written work and the end product of their efforts is usually messy and illegible. Although they can tell interesting and complex stories, they never seem to get around to writing anything down. They are the last to get ready to go outside for recess and, once there, wander the playground aimlessly. Clumsy and awkward, they are often isolated by their peers and are rarely chosen for competitive games. Their homework is usually incomplete because it never seems to make it from their desk to their backpacks. At the end of the day, they often go home frustrated and in tears.

These children are a little recognized group who have a condition known as Developmental Coordination Disorder (DCD) (American Psychiatric Association, 2000). DCD affects 5-6% of school aged children; that is, approximately one child in every classroom. It is a movement skill syndrome involving physical awkwardness and a motor skill delay that impacts the child's ability to perform everyday tasks. Despite the high prevalence and the evidence that is accumulating about the secondary consequences of DCD, very little information about this disorder has been described within educational literature. In an environment that stresses learning through "doing", children with DCD fall short of their potential because they have coordination difficulties that impact their academic, social and physical development. This review article provides information that special educators need to recognize children with DCD, and practical strategies that can be used by classroom teachers to enhance the ability of these children to participate successfully in school.

By definition, DCD is a motor impairment that affects a child's ability to perform the skilled movements necessary for daily living, including the performance of academic and self-care tasks (APA, 2000). In most states and provinces, a diagnosis of DCD can only be made by a physician. It was once assumed that children with DCD would "grow out" of their difficulties (Fox & Lent, 1996). We now know that their motor problems continue at least into adolescence and often into adulthood and lead to devastating long-term secondary consequences (Rasmussen & Gillberg, 2000). Nearly every school activity, especially in the early school years, is a motor activity. For children who have coordination difficulties, participation in all school-related activities that have a motor component requires tremendous effort and is often unsuccessful. Coordination difficulties also have an impact on the child's life beyond the classroom since children with DCD have difficulty getting ready for recess, interacting with peers on the playground and participating in physical education. Early and ongoing failure leads to poor academic performance, feelings of low self-esteem, withdrawal, behaviour problems and in many cases, depression (Cantell, Smyth & Ahonen, 1994; Schoemaker & Kalverboer, 1994; Skinner & Piek, 2001).

Typical Classroom Presentation

*C*hildren with DCD may experience difficulty with fine motor activities, gross motor activities or both (Maeland, 1992). Usually, their ability to perform self-care activities such as doing

up snaps, zippers and buttons, tying shoelaces, opening snack containers is poorer than expected for their age (May-Benson, Ingolia & Koomar, 2002). They are often the last to be able to get snowsuits, jackets and boots on or to get their knapsacks organized to go home at night. Activities requiring good eye-hand coordination will always present problems for children with DCD (David, 2000). Printing/handwriting may be illegible, inconsistent in sizing, messy and very effortful (Parush, Pindak, Hahn-Markowitz, & Mazor-Karsenty, 1998). Frequent erasures of work, inaccurate spacing of words and unusual letter formation are evident. Pencil/crayon grasps may be awkward and written work not well aligned. Pencils may be dropped frequently and pencil leads broken or paper torn because they use excessive pressure on the page (Case-Smith & Weintraub, 2002). Many children with DCD tend to avoid art projects and craft activities that require cutting and pasting (May-Benson et al, 2002).

Coordination of eyes and hands at a whole body level is equally problematic so children with DCD usually have difficulty with activities such as throwing, catching and kicking a ball accurately. At recess, children may be hesitant to participate in playground games and are often the last to be chosen for competitive sports (Watkinson et al, 2001). Balance difficulties are displayed in poorly coordinated running, skipping, jumping and hopping. Learning new skills in physical education is a continuous challenge and children may try to avoid these classes with complaints of illness or problem behaviour.

Slow awkward movements are typical of children with DCD and are easy to casually observe. What is less evident is the extra effort that motor skills seem to require and the struggle that children have to adapt and "fine-tune" movements (Case-Smith & Weintraub, 2002). Maintaining a posture for a long time is often fatiguing for these children so they may appear to be slumped over their desk, falling off their chairs and complaining that their hands are tired when they are writing. Sitting on the floor is also a problem because children fatigue easily when trying to maintain sitting balance so they may try to lean against the wall or onto other children.

Although teachers often notice many of the above physical characteristics, it is usually the child's behavioural problems that become the forefront of concern in the classroom. Disruptions in the classroom are common as children with DCD may knock things over, drop objects or bump into other children's desks. Clumsiness, in school lineups or walking between classes, can be irritating when it leads to stumbling into and tripping over children and objects in their path. Children with DCD frequently have organizational difficulties (May-Benson et al, 2002; Leew, 2001) and task initiation and task completion are often major issues. Avoidance of written work can result in "behaviour" such as needing to sharpen the pencil multiple times, talking and asking questions, attention-seeking and interference with other children. A lack of interest in motor tasks, low frustration tolerance, decreased motivation and poor self-esteem are commonly observed (Schoemaker & Kalverboer, 1994; Skinner & Piek, 2001).

Is it actually DCD?

In medical circles, differential diagnosis is important because figuring out the exact type of disorder may lead to a

radically different type of treatment. In education, though, effective intervention strategies may be quite similar across exceptionalities so obtaining a diagnosis may be less critical. It is important, however, to figure out whether or not motor coordination problems are present and whether they are occurring in combination with another recognized condition. Strong associations have been demonstrated between DCD and Attention Deficit Hyperactivity Disorder (ADHD), speech/articulation difficulties and learning disabilities (Hill, 2001; Kadesjo & Gillberg, 1998; Rasmussen & Gillberg, 2000). When a child has any of these conditions, there is at least a 50% likelihood that DCD is also present and teachers need to be aware of the implications of having both. Interventions that are appropriate for one condition, such as the use of kinesthetic and multisensory methods to teach letters to a child with a learning disability, may be inappropriate if the child has DCD (Martini, Heath & Missiuna, 1999). It is now recognized that children who have DCD in addition to ADHD have a significantly poorer outcome than children with ADHD alone (Tervo, Azuma, Fogas, Fiechtner, 2002; Rasmussen & Gillberg, 2000).

Implications for Special Education Practice

Special educators can play an instrumental role in the early detection of children with DCD. Classroom teachers will often identify concerns such as difficulty learning to print or avoidance of written work. Through awareness of the characteristics of DCD, special educators can facilitate early identification and more timely intervention. Children who are showing signs of DCD should be referred to a physician for diagnosis and to an occupational and/or physical therapist for intervention. Today, the overall objective of most intervention approaches is not to change the child's motor abilities but rather to prevent the onset of secondary academic, social and emotional problems. Many children with DCD will not qualify for special education services so a realistic role for the special educator may be as consultant to classroom teachers.

Observing the child who is struggling

- What types of tasks does the child find *difficult*?
- What types of tasks does the child *avoid*?
- Is there a physical or sensory component to those tasks?
- Are behavioural or attentional problems linked to specific activities?
- Does the child appear to understand the instructions?
- At what point, does the breakdown occur?

If a child is listening and reading appropriately for their age but is having difficulty with copying, written expression, handwriting, and other motor-based activities, DCD should be suspected. Referral to other service providers, as well as the provision of adaptations by special educators and classroom teachers, can help children to be more successful in the school environment.

The M.A.T.C.H. Strategy: The motor difficulties of children with DCD do not go away (Cantell & Kooistra, 2002) so the focus needs to be on helping children learn to cope with the demands of the classroom

environment in a way that encourages maximal learning and participation. Classroom teachers can adapt and modify activities to allow children to achieve curriculum expectations with less emphasis on the motor components of those activities. As a general strategy, classroom teachers can be taught how to "M.A.T.C.H." each task to the needs of the child. Table 1 illustrates five different ways for a teacher to adjust a task so it is a better fit with the abilities of the child.

An example of the M.A.T.C.H. strategy, applied to a common problem in kindergarten, is illustrated in Table 2.

M.A.T.C.H. sheets have been developed by the authors that outline common areas of difficulty for each grade level and suggest practical ways in which teachers can modify activities or adjust their expectations. These "Educator Resources" can be found on the *CanChild* Centre for Childhood Disability Research website by browsing for DCD and following the link for Educational Materials (www.fhs.mcmaster.ca/canchild/). Information for parents, medical practitioners, community leaders and sports instructors is also available on this website.

Suggestions for the Classroom: One of the most effective types of classroom modifications for children with DCD involves reducing the amount of writing required and allowing extra time to complete written assignments. It is important to decrease the motor (output) part of the task, though, without changing the cognitive expectations. For example, having the child draw the story instead of writing it may decrease the cognitive requirements of the task without altering

Table 1: M.A.T.C.H. THE ACTIVITY TO THE CHILD

Modify the task

Change aspects of an activity that are too difficult for the child to perform. The important thing about modifying the task is that the child can still experience success if they make an effort to participate in the activity.

Alter your Expectations

Consider what the ultimate goal of an activity is and then think about where you can be flexible. Allowing extra time or alternate methods of completing a task can make the difference between a lesson learned and an experience of failure for a child with DCD.

Teach Strategies

Children with DCD have full capacity to learn with their peers, but may require a slightly different teaching approach. Investigate alternate teaching strategies designed for children with special needs. Many of these strategies are also useful for typically developing children in your classroom.

Change the Environment

Pay attention to what is going on around a child when he/she is experiencing success or difficulty (i.e. noise, level of activity, visual distractions). Change the environmental factors that make performance difficult for the child.

Help by Understanding

Understanding the nature of DCD will help you to problem solve and provide your students with a rich learning experience. If a child feels supported and understood, he/she may be more likely to attempt new activities and persevere with them until success is achieved.

Table 2: M.A.T.C.H. Strategy Applied to a Common Kindergarten Problem

Situation: You observe that a kindergarten child is the last to get ready for recess or the bus and always has a messy, untidy appearance.

Modify the Task
- Suggest to parents that they place a toggle on the zipper of a jacket
- Recommend Velcro shoes, or easy to manage clothes such as sweat pants or t-shirts

Alter your Expectations
- Send the child out early to begin getting ready
- Pair the child with an older student to help

Teach Strategies
- Teach all children the order of dressing and undressing (e.g., "snow pants first" song)
- Introduce a strategy such as putting finished art projects or unfinished seatwork directly into knapsack throughout the day to prevent end of the day disorganization

Change the Environment
- Ensure child has enough space to dress or undress (e.g., place child at an end cubby or have a few children dress on the carpet instead of in a hallway or cloakroom)
- Label, or provide visual cues for, front/back or right/left (e.g., **r**ed dot on the **r**ight shoe)

Help by Understanding
- Enable success by helping child with any steps that they cannot do (e.g., assist with everything except boots and hat; then have the child finish pulling up zipper)
- Reinforce effort, quietly, so child doesn't feel singled out

the physical aspects; instead, children can dictate stories into a tape recorder or work in pairs with one child "reporting" the story and the other child acting as the scribe. Introduction to keyboarding as early as possible is another very effective strategy. Typing seems to be a complex motor task; however, keyboarding is much easier for children with DCD to learn than handwriting. Keys don't change location so children are able to learn the motor program required to push them down. Handwriting requires the child to continuously monitor the writing with his eyes and never becomes completely automatic in a child with DCD. Introduce keyboarding skills as early as six or seven years so children can become proficient before needing to meet the increased written requirements of higher grades.

A child with DCD may experience difficulty lining up columns of numbers for

math questions and may be very slow in copying numbers or math questions from a text or from the blackboard. This written effort reduces the amount of attention that the child can give to understanding the math concept. Instead, math questions can be photocopied so the child only has to print the answer. Similar difficulties are encountered in spelling: children who are having difficulty with letter formation may not be able to attend to new spelling words adequately. Spelling aloud, dictating words and fill-in-the-blank methods are all preferable to the child having to print a full sentence for each spelling word.

For science or social studies projects that require cutting/gluing, the child with DCD can be paired with another child who can do these parts while still encouraging the child to contribute actively to the "thinking" or "idea generating" part of the task. Manipulatives and discovery methods are problematic for children with DCD – buttons or popcorn kernels for counting are small and difficult to handle, requiring the child to work with materials (pouring, measuring) and may cause significant frustration. It is important to investigate alternative ways to teach concepts and assess academic abilities that don't rely heavily on motor competency.

Suggestions for Physical Education: It is more difficult to decrease the motor requirements in physical education where motor performance is the focus. Strategies can be used, though, to encourage children with DCD to make progress within their own abilities, to foster self-esteem and promote the value of physical activity for long-term fitness and health. When teaching physical activities to children with DCD, an emphasis should always be placed on encouraging fun, effort and participation rather than proficiency. Non-competitive games, in which goals are measured against one's own performance and not that of other children, may be helpful. Another strategy is to divide the class into smaller groups when practicing skills as there will be fewer obstacles to avoid. When teaching a new skill to the class, the child with DCD can be a model while instructions are given so he/she has an opportunity to experience the movement in addition to observing. With ball skills, modifying the equipment will decrease the risk of injury and increase the likelihood of successful participation: using beanbags, Nerf balls and large balls can all be effective strategies. Children with DCD can also be encouraged to participate in extra-curricular activities that are physical and will be most successful with sports that don't require adjustment to a changing environment. These include activities such as running on a track, skiing, skating, swimming and cycling. All are life-style sports that promote health and physical activity.

Suggestions for Recess: Children with DCD are often the last to get ready to go out for recess, especially in the winter months, and missing recess time only adds to their already diminished opportunities for physical development. They are also hesitant to play in the playground and are often socially isolated and excluded by others (Smyth & Anderson, 2000); as a result, they may be deliberately slow dressing to avoid going outside. Allowing extra time to get ready for recess, ensuring a bench or safe location for the child to sit while dressing, or pairing with an older student may be helpful. The complexity of self-care tasks can also be reduced by the use of velcro, sweat pants and shirts, t-shirts, and easy fasteners (Missiuna, 2003).

For outside play, introducing children with movement difficulties to playground equipment on an individual basis and teaching them how to use the equipment when in a relaxed environment will increase their motivation to try independently. Children with DCD often avoid playground apparatus from an early age and have not had the experience of discovering how the equipment can be used (Watkinson et al., 2001). The addition of moving objects (in this case, other children) increases the complexity of the environment significantly. Guiding them toward activities where they are more likely to have success (e.g., running or tag instead of ball games) will foster positive self-esteem and reward participation.

Conclusion

With a prevalence rate of 5-6% of school-aged children (APA, 2000), there is potentially a child with DCD in every classroom. Their coordination difficulties may appear subtle but they can have serious academic, social and emotional consequences (Cantell & Kooistra, 2002; Missiuna, Moll, King, King & Law, submitted). Special educators are in an ideal position to facilitate identification and referral of these children to health care practitioners. They can also play a vital role in helping the classroom teacher to make accommodations and modifications to everyday activities. Using strategies that help M.A.T.C.H. classroom tasks to the child's needs can make a significant difference in the child's ability to participate, to be successful and to enjoy school.

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