

# An Investigation of Dyspraxia: What We Know and Why the Research Is So Far Behind

Emily Meachon

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Developmental Coordination Disorder (DCD), also known as dyspraxia, is a condition prevalent in approximately 10% of the population, with a prevalence rate of 1 in 10 students in the United Kingdom (Colley, 2006; HDCD, 2017; DSM, 2013). DCD is marked primarily by a delay or disorder in movement execution and planning, however it is often associated with additional deficits in attention and perception (Colley, 2006). In the UK, DCD is categorized as a specific learning difficulty (SpLD) alongside Attention-Deficit Hyperactivity Disorder (ADHD), dyslexia, and dyscalculia, a disorder of arithmetic (Malpas, 2012). Unlike other SpLDs, the causes of DCD are unknown and the condition is not well understood. In fact, research on DCD has been observed to be significantly behind by comparison to similar developmental disorders and SpLDs (Bishop, 2010; Gomez & Sirigu, 2015). More specifically, SpLDs like dyslexia and ADHD are recognizable to the public and more popular in research despite their prevalence rates to be about the same as DCD in the United Kingdom (Malpas, 2012; Bishop, 2010; Holden et al., 2013). This begs the question: why is the research so far behind when it comes to Developmental Coordination Disorder?

There are several existing features which may explain the lack of interest and likely discouragement in the research of DCD. Primarily, DCD is highly complex, often interacting with other SpLDs, mood disorders and more, and each case of DCD can be unique (Dyspraxia Foundation, 2017). The complexity of the condition and variation in symptom presentation makes it quite difficult to examine and treat. Additionally, a lifelong prognosis for those affected by dyspraxia has led many to seek treatment for individual symptoms and a unified cure is unlikely to exist (Colley, 2006). Thus, clinicians have settled into a pattern of treating affected people with respective symptom-by-symptom interventions. These temporary solutions, though often costly, may provide the façade that research on the condition is not as warranted. Furthermore, a general lack of public awareness about the disorder, likely a result from ambiguous nomenclature for the condition among medical professionals, prevents people from joining forces to encourage and fundraise for research on DCD. For example, ADHD is well-known to the public and receives significant attention in funding and research despite the condition having a similar prevalence rate as DCD. Other factors, such as an under-diagnosis for the condition, and variation in diagnostic criteria across cultures could also explain some of the gaps in research on DCD.

The purpose of this paper is to delve into the inconsistencies and ambiguities of DCD in order to highlight the gaps currently existing in the understanding of the condition with regard to affected populations in the United Kingdom. The reasons for lack of research interest in DCD will be explored in greater detail and several solutions will be proposed. This investigation can serve as a guide for future research, inform others about a lesser understood condition, and assist those who are in search of a comprehensive outline of DCD.

## **Inconsistencies**

### **Nomenclature**

Developmental Coordination Disorder can be a difficult condition to explore in research due to numerous inconsistencies in its nomenclature, prevalence and epidemiology. In nomenclature, there has been significant debate among medical professionals on the precise term to be used for DCD, which has been referred to with phrases and names such as 'motor learning difficulties,' 'developmental dyspraxia,' 'sensory integrative dysfunction,' 'disorder of attention motor control and perception (or DAMP),' 'clumsy child syndrome' and more (Carlsaw, 2011; Colley, 2006).

The significant confusion caused by the lack of a universal term for the condition pushed scientists and medical professionals to create a single specific title for the condition, now known as Developmental Coordination Disorder (DCD). DCD became the official name for the condition in 1994 and is now the most common term for the condition, appearing in the Diagnostic and Statistical Manual in the USA (Carlsaw, 2011). However, some confusion still exists because the terms 'Developmental Dyspraxia' or simply 'Dyspraxia' are still common in the mental health sector, especially in the UK (Dyspraxia Foundation, 2017). The disparity of nomenclature and subsequent spread in the literature on DCD can contribute to a weaker understanding of the condition compared to the more consistently-named related SpLDs and disorders.

### **Prevalence & Comorbidity**

It is a challenge to classify the prevalence of DCD, because like many other psychological disorders, it is prevalent far beyond the finite number of people who are able to be diagnosed with the condition. In the United Kingdom, the prevalence rate for DCD ranges between 1.4 and 19% with the variation dependent upon the particular diagnostic criteria used by practitioners (Carlsaw, 2011).

Furthermore, DCD has high comorbidity – or presence of at least two health concerns- with several disorders. In a review of cases of comorbidity to DCD, Visser (2003) found that symptoms of ADD/ADHD, reading disability (RD) and specific language impairments (SLI) most frequently coexist with DCD. The most significant case of co-occurrence is observed for ADHD, which is estimated to have an overlap of approximately 50% with DCD (Goulardins et al., 2015). In other words, about half of those who have DCD also have ADHD. It has also been observed that many with Autism Spectrum Disorder exhibit symptoms often comorbid with dyslexia and DCD (Caeyenberghs et al., 2017; Gooch et al., 2014). The precise comorbidity rates with other disorders remain rather unclear. This gap could be due to the lack of proper assessment for DCD in past screening methods for SpLDs as well as a general lack of knowledge of DCD among the medical professional populations (Wilson et al., 2012). It is clear that increasing awareness of DCD among physicians, paediatricians, and generally across the medical community would assist in proper and timely diagnoses for those suffering from DCD.

## **Etiology**

The precise origins, or etiology, of DCD remain unknown however certain biological patterns exist. In rare cases, DCD might be acquired through brain injury such as stroke. Primarily, DCD has been observed to be inheritable and is speculated to be linked to the underdevelopment cells in the brain known as neurones (Colley, 2006). The genetic etymology and continuous nature of the disorder signifies that sufferers will be affected by symptoms of DCD throughout their lifetimes (Gomez & Sirigu, 2015). However, current research has not found a single clear explanation of DCD through any neurological abnormalities (Dyspraxia Foundation, 2017). Overall, the literature on the etiological features of DCD is largely lacking and future research should consider investigating this area in greater detail.

It has been argued by Goulardins et al. (2015) and Lange (2017) that DCD and ADHD may have a similar if not the same etiology due to their high overlap, but the researchers concluded that the two disorders require distinct treatment even if they stem from similar genetic causes.

## **Diagnosis and Treatment**

The diagnosis of DCD must be performed by psychologists. Neurologists and paediatricians with specialisation in DCD also can assess and diagnose potentially dyspraxic patients. Often the signs of DCD are noticed in school settings when children begin formal learning and perform numerous activities which can be demanding on fine and gross motor skills. Thus, the diagnosis often takes place between six to twelve years of age. However, in some cases it can be diagnosed earlier (Carslaw, 2011). There is some debate over the causes of DCD, and the symptoms of the condition are extensive, often overlapping with many other conditions necessitating an intensive diagnostic process. Those who have DCD are frequently affected by comorbid disorders such as ADD/ADHD, dyslexia, anxiety, depression, and more (Colley, 2006). Given that DCD and related disorders have symptoms across modalities of perception, mood, attention, learning, and more, it can be incredibly difficult to treat the symptoms at once. Currently, the treatment for DCD is on a per-symptom basis as there is no cure nor synchronised treatment for all symptoms of DCD alone.

## **Symptoms**

Overall, those affected by DCD often experience symptoms involving the lack of coordination in motor functions, resulting in the difficulty or inability to execute smooth gross and/or fine movements. Though many affected by DCD also experience symptoms involving perception, memory, and more, the presence of DCD varies greatly across intelligence levels, signifying that it is unlikely intelligence is significantly different due to having DCD (Dyspraxia Foundation, 2017). More specifically, studies of IQ levels of children with DCD concluded that there is some weakness in working memory and processing speed however, this deficit could be further explained by motor difficulties (Sumner, Pratt & Hill, 2016). The literature and understanding of the cause of DCD in the

context of motor functions is not yet extensive enough to properly explain its full range of effects on other cognitive processes.

Symptoms of DCD are presented in various stages depending on the age of the afflicted person and can arise in countless variations. Though the condition is not reversible, it is possible for the symptoms of an individual with DCD to change overtime based upon environmental factors (Dyspraxia Foundation, 2017).

Most diagnostic criterion sustain several major categories of DCD symptoms, in the UK this includes primary symptoms such as: gross motor coordination, fine motor coordination, speech and language, eye movements, perception, learning, thought and memory (American Psychiatric Association, 2013). Furthermore, secondary symptoms, or those which may arise as a result of struggling with primary symptoms, include emotional and behavioural reactions (Colley, 2006).

Symptoms in the realm of gross motor coordination, or large and more holistic movements could include difficulties with balance, poor posture and fatigue, a lack of rhythm in activities such as dancing, and an overall clumsy demeanour (Colley, 2006). The fine motor coordination symptoms, or those involving precise movements, include trouble with handwriting and typing, difficulty with grooming procedures, and a general lack of manual dexterity (Dyspraxia Foundation, 2017). Manual dexterity in particular can affect tasks like cooking, cleaning, and crafting, causing certain academic and professional skills to be a great challenge for dyspraxics. Speech and language symptoms include difficulty controlling the volume, tone and pitch of one's voice, and trouble organising speech in order and content. Furthermore, those with DCD may have trouble visually tracking or relocating objects (Colley, 2006). In perceptual symptoms, those with DCD may exhibit oversensitivity to light, touch, and smells, and might generally lack an awareness of their body in space such that they could bump into and trip over objects (Dyspraxia Foundation, 2017). Finally, in the sector of learning, thought, and memory, dyspraxics could be slow to complete tasks, struggle to maintain concentration, have poor short-term memories, and have trouble following more than one instruction at a time (Colley, 2006). Some have noted that there are several positive aspects of DCD in that many affected people learn to develop sophisticated coping techniques, resulting in creativity and determination in their demeanours (Colley, 2006; Dyspraxia Foundation, 2017).

Presentation of the numerous symptoms of DCD can also vary based on the age of the sufferer. For example, a toddler with DCD may exhibit signs of the condition by being late in reaching certain milestones for motor functions such as crawling and walking, they may have difficulties walking up and down stairs, and might exhibit trouble in sorting games (Dyspraxia Foundation, 2017). At a young school-age, an affected child may avoid physical education activities, perform poorly in a classroom but significantly better when working on an individual basis, and could struggle copying notes from the blackboard (Dyspraxia Foundation, 2017). Some of these symptoms may shift or manifest uniquely into adulthood.

These symptoms are merely the beginning of the extensive lists of difficulties experienced by those with DCD. Often, several symptoms are relatable to those in the

general population, but this does not necessarily signify an individual is affected by DCD. In order to be diagnosed with DCD, a high majority of the primary symptoms in the full list of diagnostic criteria must be exhibited on a frequent basis.

## **Treatment**

Frequently the treatment for DCD involves a multifaceted approach with several professionals involved in various forms of therapy and training. Additionally, depending on the age of the affected person, family, teachers, and employers may be involved in the treatment to assist in creating more accessible environments for work, study, and daily life.

Primarily, a psychologist will work with individuals affected by DCD to further their understanding of the condition and relieve any emotional troubles which may be related to coping with DCD. The professionals who are further involved in treatment are dependent upon the symptoms presented by an affected individual and can include speech therapists, occupational therapists, behavioural optometrists and physiotherapists in addition to the psychologists involved in the diagnosis (Colley, 2006).

## **Conclusion**

There is a wide gap in the research on DCD, as the etiology of the condition is still unknown, and much disparity in nomenclature over the years continues to affect the accessibility and interest in DCD. The general research interest gathers around buzzword disorders such as ADHD and dyslexia, while DCD is lacking in research despite its presence in the same family as these disorders (SpLDs) and equal prevalence rate. This is problematic because those affected by the condition are treated on a symptom-by-symptom basis and with a lifelong prognosis, overcoming many symptoms can be costly and a time-burden. Those with DCD who are fortunate enough to be diagnosed, might find trouble in sustaining long-term multi-faceted treatment plans and would benefit from a stronger understanding of their condition by medical professionals.

The vast number of people affected by DCD may face significant trouble in the workplace, school, and in daily life on an ongoing basis. The emotional toll on dyspraxics and economic toll in their respective industries could be reversed significantly with a better understanding of DCD. The understanding of DCD can be increased through raising awareness among the general public through campaigns and charities. Furthermore, a stronger inclusion of DCD in the school curriculum for students in studying education, psychology, and other related courses could be beneficial.

It is important that research delves much deeper into the causes of the condition so that it can be determined with confidence if it has a biological or environmental root such that adjustments to the influence can be made by means of prevention and treatment. We have countless tools to examine these areas in psychology and neuroscience, however research interest is lacking. Increasing knowledge on DCD among the general population would support widened interest, as well as the disorder becoming a stronger focus point in the general psychological education.

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