



## Research Paper

# The impact of developmental coordination disorder on educational achievement in secondary school



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## ABSTRACT

**Background:** Developmental coordination disorder (DCD) is a common developmental disorder but its long term impact on health and education are poorly understood.

**Aim:** To assess the impact of DCD diagnosed at 7 years, and co-occurring developmental difficulties, on educational achievement at 16 years.

**Methods:** A prospective cohort study using data from the Avon Longitudinal Study of Parents and Children (ALSPAC). National General Certificate of Secondary Education (GCSE) exam results and Special Educational Needs provision were compared for adolescents with DCD (n = 284) and controls (n = 5425).

**Results:** Adolescents with DCD achieved a median of 2 GCSEs whilst controls achieved a median of 7 GCSEs. Compared to controls, adolescents with DCD were much less likely to achieve 5 or more GCSEs in secondary school (OR 0.27, 95% CI 0.21–0.34), even after adjustment for gender, socio-economic status and IQ (OR 0.6, 95% CI 0.44–0.81). Those with DCD were more likely to have persistent difficulties with reading, social communication and hyperactivity/inattention, which all affected educational achievement. Nearly 40% of adolescents with DCD were not in receipt of additional formal support during school.

**Conclusions:** DCD has a significant impact on educational achievement and therefore life chances. Co-occurring problems with reading skills, social communication difficulties and hyperactivity/inattention are common and contribute to educational difficulties. Greater understanding of DCD among educational and medical professionals and policy makers is crucial to improve the support provided for these individuals.

## What this paper adds?

Developmental coordination disorder (DCD) is one of the most common developmental conditions of childhood. However, its impact on longer term health and education is not well understood. This paper contributes robust epidemiological evidence of the persisting impact that DCD can have on learning and achievement in secondary school.

Using a population-based cohort, individuals with DSM-IV classified DCD at 7 years were 70% less likely to achieve 5 or more qualifications at 16 years than their peers. Co-occurrence of reading difficulties and other developmental traits, such as social communication difficulties and hyperactivity/inattention, were commonly present in adolescence and these difficulties contributed to poor educational achievement. This study also illustrates the extent to which DCD can be a hidden disability – 37% of those with

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the condition were not in receipt of additional formal teaching support.

These results demonstrate the impact DCD can have on educational attainment, and therefore on future life prospects. It is hoped this work will contribute to raising awareness and understanding of the impact of DCD and stimulate discussion about how best to support those with this complex condition.

## 1. Introduction

Developmental coordination disorder (DCD) is a common neurodevelopmental disorder characterised by deficits in both fine and gross motor coordination which have a significant impact on a child's activities of daily living or school productivity (American Psychiatric Association, 2013). These deficits are present in the absence of severe intellectual or visual impairment, or another motor disability, such as cerebral palsy. It is thought to affect around 5% of school-aged children (American Psychiatric Association, 2013), but despite its high prevalence it remains one of the less well understood and recognised developmental conditions in both educational and medical settings.

Schoolwork of children with DCD often does not reflect their true abilities as they struggle with fine motor skills, including handwriting (Missiuna, Rivard, & Pollock, 2004). However, there is also evidence of a wider academic deficit involving reading, working memory and mathematical skills (Alloway, 2007; Dewey et al., 2002; Kaplan, Wilson, Dewey, & Crawford, 1998). Although initially identified on the basis of motor difficulties, the condition may develop into complex psychosocial problems, with difficulties in peer relationships and social participation (Sylvestre, Nadeau, Charron, Larose, & Lepage, 2013), bullying (Campbell, Missiuna, & Vaillancourt, 2012; Skinner & Piek, 2001; Wagner et al., 2012), low self-worth and perceived self-competence (Piek, Baynam, & Barrett, 2006), and internalising disorders, such as anxiety and low mood (Lingam et al., 2012). It may be that these sequelae lead to poor performance in school.

As well as secondary psychosocial consequences, those with DCD have a higher risk of displaying other developmental traits, such as hyperactivity and social communication difficulties, and specific learning disabilities, particularly dyslexia. (Kadesjo & Gillberg, 1999; Lingam et al., 2010; Sumner et al., 2016). Overlapping difficulties in two or more developmental and educational domains implies that discrete diagnosis of a single disorder is often not appropriate (Kaplan, Dewey, Crawford, & Wilson, 2001). In some individuals with DCD, it may be that co-occurring difficulties contribute to or explain some of the sequelae of the condition (Conti-Ramsden, Durkin, Simkin, & Knox, 2008; Loe & Feldman, 2007). Previous work has highlighted the importance of identifying co-occurring problems in DCD by demonstrating the mediating effects of social communication difficulties and hyperactivity can have on psychological outcomes (Harrowell, Hollén, Lingam, & Emond, 2017; Lingam et al., 2012). In the evaluation and management of a child with suspected DCD, consideration of other possible co-occurring difficulties is essential.

Although the body of literature on DCD demonstrates many reasons why a child with DCD might struggle in school (Zwicker, Harris, & Klassen, 2013), lack of awareness of the condition by medical and educational professionals is widespread, highlighted by parental reports of difficulty accessing support and services for their child (Missiuna, Moll, Law, King, & King, 2005; Novak, Lingam, Coad, & Emond, 2012). One study found that 43% of parents were not offered any practical support (Alonso Soriano, Hill, & Crane, 2015). Even when support is provided, it may not be appropriate for the child, which parents put down to lack of understanding of the condition (Maciver et al., 2011). A study of students in further and higher education found that those with dyslexia were more likely than students with DCD to receive Disability Student Allowance from the government, despite greater self-reported difficulties in the DCD group (Kirby, Sugden, Beveridge, Edwards, & Edwards, 2008). Furthermore, there were no differences between the types of support provided for these two different developmental disorders. This not only emphasises the poor recognition of DCD, but also lack of understanding of the specific needs of those with coordination problems.

By definition, children with DCD have motor difficulties that interfere with academic achievement (American Psychiatric Association, 2013). However, longitudinal studies of educational achievement in secondary school for those with DCD are few, and those that have been conducted lack strict diagnostic criteria or have been drawn from clinical samples. (Cantell, Smyth, & Ahonen, 1994; Gillberg & Gillberg, 1989; Losse et al., 1991). Thus, the primary aim of this research was to assess the impact of DCD on educational achievement in secondary school, using prospective data from a large population-based cohort study. Secondly, we aimed to assess the presence of co-occurring difficulties in reading ability, social communication problems and hyperactivity/inattention, and whether these impacted upon educational achievement in DCD. Thirdly, we aimed to determine how many of those meeting the criteria for DCD were identified for formal additional educational support in school, and assess whether provision of support was related to educational achievement.

## 2. Methods

### 2.1. Study participants

The Avon Longitudinal Study of Parents and Children (ALSPAC) is a population-based birth cohort which invited all pregnant women in the Avon area of southwest England, with expected dates of delivery between 1 April 1991 and 31 December 1992 to take part. The original sample comprised 14062 live-born children, with 13968 surviving to 1 year. ALSPAC has collected data on a large range of socio-economic, environmental and health measures for both parents and children; data were collected using questionnaires, face-to-face assessments and linked health and education data. Recruitment of participants and data collection have been described in detail elsewhere (Boyd et al., 2013). The study website contains details of all the data that are available through a fully searchable data dictionary (<http://www.bris.ac.uk/alspac/researchers/data-access/data-dictionary/>). Ethical approval for ALSPAC was

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