Research in Developmental Disabilities 31 (2010) 131–139

Contents lists available at ScienceDirect

Research in Developmental Disabilities

The development and standardization of the Adult Developmental Co-ordination Disorders/Dyspraxia Checklist (ADC)

Amanda Kirby[a,*], Lisa Edwards[a,1], David Sugden[b,2], Sara Rosenblum[c,3]

[a] The Dyscovery Centre, Allt-yr-yn Campus, University of Wales, Newport, NP20 5DA, UK
[b] School of Education, University of Leeds, Leeds, LS2 9JT, UK
[c] Faculty of Social Welfare and Health Studies, University of Haifa, Haifa, 31905, Israel

ARTICLE INFO

Article history:
Received 14 August 2009
Accepted 26 August 2009

Keywords:
Developmental Co-ordination Disorder (DCD)
Dyspraxia
Adults
Screening
Assessment

ABSTRACT

Developmental Co-ordination Disorder (DCD), also known as Dyspraxia in the United Kingdom (U.K.), is a developmental disorder affecting motor co-ordination. In the past this was regarded as a childhood disorder, however there is increasing evidence that a significant number of children will continue to have persistent difficulties into adulthood. Despite this, there remains little information as to how the difficulties might present at this stage, and additionally the impact on every day functioning. As young people move into further and higher education there is a need for screening and assessment tools. Such tools allow for identification of these difficulties, access to support, and clarification of areas where appropriate support needs to be targeted. This paper describes the first adult screening tool for DCD. The development and the results from testing this tool in two countries, Israel and the U.K. are outlined and the implications for its use in further and higher education discussed.

1. Introduction

Developmental Co-ordination Disorder (DCD), also known as Dyspraxia in the United Kingdom (U.K.), is a developmental disorder affecting motor co-ordination. The Diagnostic and Statistical Manual for Mental Disorders (DSM-IV; American Psychiatric Association; APA, 2000) cites the prevalence at 6% for children in the age range of 5–11 years. The DSM-IV classification for DCD describes difficulties across a range of daily living activities and skills, such as recreation and leisure pursuits in the community and educational attainment in school. It has been characterized in childhood only, by difficulties at home with tasks such as self-care and dressing, and in school with difficulty with tasks such as handwriting, and playing team games such as football.

The most recent, formal and widely internationally used term to describe these children is DCD. It appears in both the DSM (APA, DSM-III-R, 1987; APA DSM-IV, 1994; DSM-IV-TR, 2000) and the International Classification of Diseases and Related Health Problems (WHO, ICD-10, 1992a, 1992b, 1993). Ongoing discussion in the literature about the characteristics of children with DCD, as well as the appropriate tools for DCD diagnosis and evaluation based on the definition has been undertaken (Dewey & Wilson, 2001; Flapper, Houwen, & Schoemaker, 2006).

---

[*] Corresponding author. Tel.: +44 01633 432330.
E-mail addresses: amanda.kirby@newport.ac.uk (A. Kirby), lisa.edwards@newport.ac.uk (L. Edwards), D.A.Sugden@education.leeds.ac.uk (D. Sugden), rosens@research.haifa.ac.il (S. Rosenblum).
[1] Tel.: +44 01633 432330.
[2] Tel.: +44 0113 3434533.
[3] Tel.: +972 4824 0474.

0891-4222/$ – see front matter © 2009 Elsevier Ltd. All rights reserved.
doi:10.1016/j.ridd.2009.08.010

A consensus by leading academics on the diagnostic criteria for children has been produced, firstly in Hamilton, Canada (Polatajko, Fox, & Missiuna, 1995) and then following this, an update in Leeds, U.K. 10 years later (Sugden, 2006). However neither of these considered a diagnosis in adulthood.

Usually, the diagnosis in children in the U.K. is made by a clinician such as a paediatrician or occupational therapist when the child presents with significant motor difficulties beginning in childhood and where there is evidence of significant impairment. In the U.K., the most common standardized test used for the diagnosis of DCD to measure impairment is the Movement Assessment Battery for Children (M-ABC-2; Henderson & Sugden, 2007). This test has been standardized on children between the ages of 3–16 years. The Bruininks Oseretsky Test-2 (Bruininks & Bruininks, 2005), more often used in the United States is normed up to 21 years. A third test, the McCarron Assessment of Neuromuscular Development (MAND; McCarron, 1982) has been normed to 18 years of age.

While the impact of DCD has been acknowledged as continuing into adulthood, the knowledge and understanding of symptoms and intervention approaches for this disorder comes mainly from studies in children. As there is increasing evidence that children with DCD do not all ''grow out'' of their difficulties (Cousins & Smyth, 2003; Hellgren, Gillberg, Bagenholm, & Gillberg, 1994; Losse et al., 1991) the understanding of the pattern of presentation in adults with DCD and the impact this has on individual's lives remains limited (Cousins & Smyth, 2003; Kirby, Sugden, Beveridge, & Edwards, 2008). Additionally, no available standardized screening tools for evaluating and characterizing the functional deficits that may influence participation in various areas of life exist in this group. Most studies in adolescents and adults with DCD have adapted children's measurements and have varied from study to study, therefore making it difficult to accurately predict prevalence rates in adults. For this reason, the reported extent of continuation of difficulties ranges from 30 to 87% (Cantell, Smyth, & Ahonen, 2003; Geuze & Borger, 1993; Knuckey & Gubbay, 1983; Losse et al., 1991). This figure varies also because of selection criteria, severity of symptoms and/or if the individual has overlapping diagnoses with other developmental disorders such as ADHD, Dyslexia and Asperger's Syndrome. Studies to date on children with DCD show a high rate of co-occurrence, for example with ADHD and DCD (60%, Rasmussen & Gillberg, 2000) and Specific Language Impairment and DCD (60%, Hill, 1998) and DCD and Aspergers Syndrome (Green et al., 2002). In particular, the combination of DCD with ADHD seems to predict a worse long-term prognosis (Hellgren et al., 1994). A community-based study of children who had been diagnosed at 7 years with DCD and ADHD were reviewed at 22 years of age. Those with the combination of DCD and ADHD showed that they were more likely than their matched controls to be unemployed, have had problems with breaking the law, to be alcohol or drug misusers and to have mental health difficulties (Rasmussen & Gillberg, 2000).

Few paediatricians and adult physicians have experience in assessing and diagnosing DCD in adolescents and adults, partly due to a lack of standardized tools and protocols and little awareness of the continuing nature of the disorder. The current criteria, describing a *childhood* developmental disorder, may not describe the changes in presentation. Some symptoms of DCD may diminish or alter in adulthood, and this may be due to several reasons. Firstly, intervention may have taken place in childhood; secondly, symptoms may appear to be reduced because of the young adult learning coping mechanisms or thirdly, the individual may be able to avoid situations that emphasize the difficulties. A significant change for the individual is the ability to choose and also to be able to avoid the environment that highlights difficulties (e.g. being able to avoid playing team games or using a keyboard rather than hand writing in order to record information). In addition, it could be conjectured that there is the potential for continuing improvement into the 20s' because of brain maturation especially of the pre-frontal cortex which may see a consequent improvement, particularly in the area of executive functioning which has been shown to be important in children with DCD (Diamond, 2000; Giedd, 2004). However, it is clear that on testing of motor function, persistence in motor difficulties continues in many and this may be particularly evident when a new or novel task is presented (Cousins & Smyth, 2003).

As greater numbers of children grow up and present in adulthood, and with a greater awareness of developmental disorders, the need for assessment and screening tools increases. While the DSM-IV criteria for DCD may generally be applied to adults, with slight amendments (for example, using work instead of school as an additional setting where impairment takes place); the description tends to reflect presentations in childhood and does not describe the pattern of presentation in adulthood. Current tests are able to measure motor functioning (Criterion A of the DSM-IV), but are not able to consider how and where the difficulties impact on the adult's life (Criterion B of the DSM-IV).

Thus, the objective of the current study was to develop a new screening tool to identify youth and adults at risk for DCD, and to establish its validity and reliability. Additionally, authors aimed to establish a basis for appropriate intervention prior to the potential onset of secondary emotional impairments, hence improving overall quality of adult life.

In order to meet these objectives, a criterion based questionnaire was developed that addresses Criterion B of the DSM-IV diagnostic criteria. The Adult Developmental Co-ordination Disorders/Dyspraxia Checklist (ADC) is a practical, easy to use self-report questionnaire which provides information about the client's ability to function within varied contexts (such as home, academic and social environments). The questionnaire takes only 15–20 min to complete and includes items relating to organisation in space and time during the performance of daily living and self-care skills, common academic and vocational activities (such as writing or driving), and items relating to hobbies and social participation ability. The items chosen are based on up to date knowledge about the underlying mechanisms of DCD as well as areas of functioning that have been found to be problematic for children and adults with DCD.