Assessment of developmental coordination disorder in adulthood: a scoping review

Dorothy Armstrong
Private Occupational Therapy Practice, Co. Kildare, Ireland

Abstract

Purpose – Developmental coordination disorder (DCD) is a life-long condition, but the diagnostic process for adults has not been formally established. The purpose of this study was to ascertain which assessment tools are used to assign participants into the group with DCD in studies investigating this condition in adulthood.

Design/methodology/approach – A scoping review was conducted using PRISMA guidelines. Peer reviewed literature published between January 2008 and April 2024 was searched using five databases: AMED, CINAHL Ultimate, Google Scholar, PubMed and Scopus. Data was extracted using the "Joanna Briggs Institute" scoping review guidelines.

Findings – In total, 36 articles were identified as meeting the inclusion criteria for this review. The Adult Developmental Co-ordination Disorders/Dyspraxia Checklist was the most frequent tool used to measure current and past impact on occupational performance. Level of motor skill was only measured in 51% of the studies, and none of these studies used tests with norms for an adult population. The Movement Assessment Battery for Children 2 was the most commonly used tool to measure level of motor skill.

Originality/value – Findings from this scoping review could be used in the creation of a pilot pathway for the assessment of adults for DCD.

Keywords Assessment, Adults, Developmental coordination disorder

Paper type Literature review

Introduction

In 2019, the European Academy of Childhood Disability (EACD) produced international clinical practice recommendations addressing developmental coordination disorder (DCD) in relation to definition, diagnosis, assessment and intervention (Blank *et al.*, 2019). It was concluded that there is sufficient evidence that DCD is a life-long condition and thus continues to impact self-care, productivity and leisure throughout adulthood. The EACD produced criteria for a diagnosis of DCD in adults which are based on the DSM-5 (American Psychiatric Association, 2013) criteria with some amendments:

- "The acquisition and execution of coordinated motor skills is substantially below that expected given the individual's chronological age and sufficient opportunities to acquire age-appropriate motor skills;
- The motor skills deficit described in criterion I significantly and persistently interferes with activities of daily living appropriate to chronological age (e.g. self-care, self-maintenance and mobility) and affects upon academic productivity, prevocational and vocational activities, leisure and work;
- The motor skills deficits are not better accounted for by any other medical, neurodevelopmental, psychological, social condition or cultural background; and
- Onset of symptoms is in childhood." (Blank *et al.*, 2019, p. 274).

Occupational therapists have a central role in the identification of children with DCD and can assess and provide findings in relation to the first, second and fourth criteria (Hunt *et al.*, 2023). There is no existing assessment protocol for assessing adults for DCD (Mayes *et al.*, 2024); thus, if a person has not been diagnosed in childhood, it can be very difficult to get a diagnosis in adulthood.

Having DCD in adulthood presents a myriad of challenges in addition to the obvious issues with motor coordination and resultant impact on occupational performance which are inherent in the diagnosis. Thomas and Christopher (2017) found increased levels of fatigue in adults with DCD. They conducted a cross-sectional group comparison between groups with DCD ($n = 53$) and Chronic Fatigue Syndrome ($n = 84$) and a matched control group ($n = 52$). They also found that the group with DCD had significantly lower self-esteem than either of the other groups and had significantly higher levels of fatigue

The current issue and full text archive of this journal is available on Emerald Insight at: **https://www.emerald.com/insight/2398-8819.htm**

Irish Journal of Occupational Therapy
Emerald Publishing Limited [ISSN 2398-8819]
[DOI 10.1108/IJOT-08-2024-0033]

Deloitte for their generous contribution to this research through the Deloitte People's Impact Fund and Dyspraxia/DCD Ireland for their ongoing support in this field.

Research ethics: Ethics approval was not required for this study.

Received 2 August 2024
Revised 7 October 2024
Accepted 7 October 2024

with related cognitive issues than the control group. The DCD group had the highest rates of anxiety and depression, and it was postulated that these problems with emotional regulation may have been the contributing factor to the levels of fatigue. Scott-Roberts and Purcell (2018) conducted a phenomenological study exploring the lived experience of six adults with DCD, and based on these findings, they recommended that a measurement of anxiety and fatigue be standard as part of any assessment process in this population. Participants reported needing to be on high alert when managing everyday tasks, and it was noted that the ability to apply problem-solving skills to make adaptations to tasks and environments helped people to cope with their difficulties. Zaguri-Vittenberg *et al.* (2023) also used a phenomenological approach in a study involving 10 participants aged between 21 and 31 years of age. Findings indicated that the effort required for certain activities can result in feelings of stress and shame. Participants described the mental and emotional cost of engaging in daily activities such as making a bed or cooking a simple meal and their awareness that others would find these tasks easy. They discussed the importance of self-acceptance, understanding from their social network, and having strategies to help with occupational performance.

There is evidence that adults with DCD can have difficulties in the area of executive function (Blank *et al.*, 2019), specifically in the areas of planning and prospective memory (Mayes *et al.*, 2023). There is also evidence of atypical sensory processing. Mayes *et al.* (2024) conducted a study involving 56 participants and found haptic perception and audio-visual integration to be reduced in the DCD group ($n = 28$) as compared to the neurotypical group ($n = 28$). Gentle and colleagues (2024) conducted a study involving 226 adults, 138 assigned to the DCD group and 88 to the typically developing group. They found that the adults with DCD had greater difficulty navigating and orientating themselves in a new environment and more problems estimating distance than the typically developing peers and proposed that this was in part due to visuo-spatial deficits and visual sensitivities.

Scoping reviews are useful in answering broad questions in relation to what is known about a concept to examine the extent and nature of evidence on a topic (Tricco *et al.*, 2018). The aim of this review was to chart which assessments are being used in studies to determine whether an adult presents with DCD in relation to the three criteria that an occupational therapist can assess.

Method

Review question and objectives

The following review questions and objectives were set for a scoping review in relation to adult assessment of DCD.

Review Question: Which assessments are used in studies involving adults with DCD to determine whether those adults have DCD or probable DCD?

Objectives

To determine which assessments are being used to determine if an adult meets the following EACD criteria (Blank *et al.*, 2019) for DCD:

- Acquisition and execution of coordinated motor skills is substantially below that expected given the individual's chronological age and sufficient opportunities to acquire age-appropriate motor skills;
- Motor skills deficits significantly and persistently interfere with activities of daily living appropriate to chronological age and affects upon academic productivity, prevocational and vocational activities, leisure and work; and
- Onset of symptoms is in childhood.

The protocol used to address the review question and objectives was the PRISMA extension for scoping review (Tricco *et al.*, 2018).

Study selection

The literature search was conducted using the terms "Developmental coordination disorder" OR "dyspraxia" OR "DCD" AND "Assessment" OR "evaluation" OR "screening" OR "test", which were combined using Boolean logic to search the following data bases: Scopus, PubMed, CINAHL Ultimate, AMED and Google Scholar. The search parameters included articles published between January 2008 and April 2024. Inclusion and exclusion criteria were set for the selection of articles.

Inclusion criteria:

- Articles needed to be in peer reviewed journals;
- In the English language;
- Pertain to people aged 18 and over (adults); and
- Involve the use of an assessment method with adults to determine whether the person had DCD or probable DCD.

The following exclusion criteria were set for this review:

- The sole assessment for DCD for the adults in the study had taken place in childhood (before the age of 18); and
- The articles addressed motor assessment(s) but not specifically to assessments used in the diagnosis of DCD.

The initial search resulted in 6,433 articles. The titles and abstracts were screened, and 6,274 were omitted as they did not meet the inclusion criteria, and a further 37 were omitted as they were duplicates of other articles. The remaining 122 articles were accessed in full, and on review, a further 85 were excluded, leaving 36 articles which met the inclusion criteria.

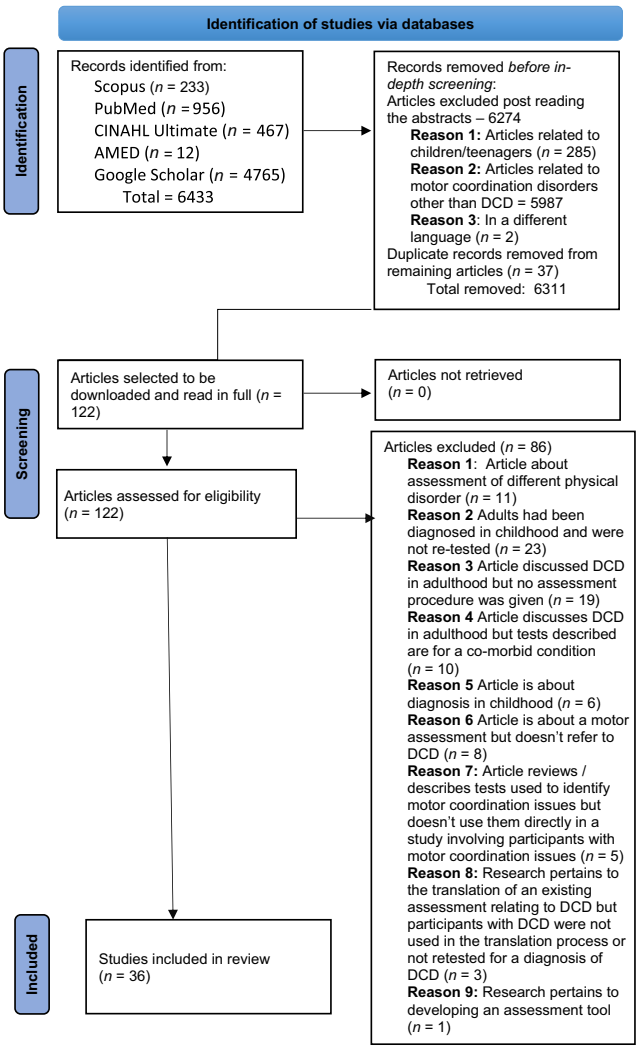
Figure 1 below provides an outline of the search strategy.

Data charting process

Data was extracted from the studies reviewed using the principles recommended in an expansion of the "Joanna Briggs Institute" scoping review guidelines (Pollock *et al.*, 2023). They recommend using a data extraction table to extract data relevant to the scoping review questions using population, concept and context, along with items relevant to the purpose of the review being conducted. The population of interest for this review was adults with DCD or probable DCD. The concept being investigated was the method used in studies to determine if an adult was assigned to the DCD group for a study pertaining to DCD in adulthood. The context of interest was the principal location of the study. The following headings were devised for the extraction table:

- Author(s), year and country of study;
- Population – number of participants and age range;
- Assessments used for level of motor skill;

Figure 1 Search strategy



Source: Tricco *et al*. (2018). Appendix figure 1 p. 482

- Assessments used re: Impact on occupational performance; and
- Assessments used re: onset of symptoms being in childhood.

Results

Research relating to DCD in adults is being carried out internationally, with the studies in this review emanating from Israel, Australia, Korea, India, Japan and across Europe. The lack of a pathway for the assessment of DCD in adults impacts this research as, in the majority of studies, participants did not have a formal diagnosis and thus can only be legitimately placed in a "probable DCD" group. The ages of the adults involved in the studies ranged from 18 to 66 years old, there were younger participants in some of the studies, but only the data relating to the assessment of participants over 18 was extracted. The following Table 1 provides a summary of the data extracted for this scoping review.

Assessments used to measure level of motor skill

Only 52% (n = 19) of the studies measured the participants level of motor skill. The most frequently used measure was the MABC-2 (Henderson *et al.*, 2007). This assessment tool provides standardised scores for people up to the age of 16 years and 11 months, and thus the percentile scores being used for the adults in the studies were those of children aged 16. In total, 10 of the studies used the MABC-2 alone to measure motor skill. Six of these studies included participants in the DCD group if they scored at or below the 16th percentile (De Oliveira and Wann, 2010, 2012; Mayes *et al.*, 2023, 2024; Suzuki *et al.*, 2020; Warlop *et al.*, 2020); one used at or below 15th percentile (Gentle *et al.*, 2021); and a further two used at or below the 5th percentile (Purcell *et al.*, 2015; Zaguri-Vittenberg *et al.*, 2023). The MABC-2 was used in another of the studies (Job *et al.*, 2019) to compare the control group with the DCD group, and thus a percentile score for inclusion was not established, but the average score for their participants was reported at the 12th percentile.

Six of the studies used both the MABC-2 and the BOT-2 Brief (Bruininks and Bruininks, 2005) to assign participants to the DCD group. The BOT-2 and BOT-2 Brief use norms up to the age of 21 years and 11 months. Inclusion criteria in relation to the BOT-2 Brief were at or below the 18th in five of the studies (Du *et al.*, 2015; Gentle *et al.*, 2016; Wilmut *et al.*, 2015; Wilmut *et al.*, 2017) and at or below the 15th percentile in one study (Gentle *et al.*, 2016). The inclusion criteria using the MABC-2 were taken as being at or below the 15th percentile in two of these studies (Gentle *et al.*, 2016; Wilmut and Byrne, 2014), at or below the 16th in one of the studies (Wilmut and Barnett, 2017) and at or below the 9th percentile in another of the studies (Wilmut *et al.*, 2017). Two of the studies used the cut off percentile as at or below the 5th percentile (Du *et al.*, 2015; Wilmut *et al.*, 2015).

Only one of the studies used the BOT-2 Brief alone (Hyde *et al.*, 2018), and an inclusion criteria of at or below the 15th percentile was used in this study. One study (He *et al.*, 2018) used the full BOT-2 assessment (Bruininks and Bruininks, 2005) and also set an inclusion criteria of at or below the 15th percentile. Tal-Saban and Kirby (2021) conducted a study using participants with a prior diagnosis of DCD and thus did not measure level of motor skill. In total, 14 of the studies did not address the measurement of motor skill at all in assigning participant to a DCD group (Baiano *et al.*, 2023; Cleaton *et al.*, 2021; Engel-Yeger, 2020, 2023; Forde and Smyth, 2022; Gentle *et al.*, 2024; Kirby *et al.*, 2010, 2013; Meachon and Alpers, 2023; Min Joo *et al.*, 2023; Tal-Saban *et al.*, 2012a, 2014a, 2014b, 2018). One of the studies stated that motor skill was measured by an occupational therapist observing the participants doing a task.

Assessments used to measure occupational performance

With the exception of one (Suzuki *et al.*, 2020) all of the studies addressed the impact of the adult's coordination difficulties on their occupational performance. The most commonly used assessment for this criteria was the ADC (Kirby *et al.*, 2010). The questionnaire contains 40 items divided into three sections relating to occupational performance: difficulties experienced as a child, "the influence of DCD on the

Table 1 Data extraction of included studies

Author(s) year and country of study	Population —— no. of participants and age range	Assessments used for level of motor skill	Assessments used re: impact on occupational performance	Assessments used re: onset of symptoms was in childhood
Baiano *et al.* (2023) Italy	334 university students aged from 18 to 34.	None	Adult developmental co-ordination disorders/dyspraxia checklist (ADC) Kirby *et al.* (2010)	ADC
Cleaton *et al.* (2021). UK	1,476 participants aged from 16 to 60.	None	ADC	ADC
De Oliveira and Wann (2010) UK	40 participants aged from 15 to 27.	Movement assessment battery for children second Edition (MABC-2) (Henderson *et al.*, 2007) –below or at the 16th percentile	Self-report	Self-report
De Oliveira and Wann (2012). UK	26 aged from 15.3 to 21.3	MABC- 2 – at or below the 16th percentile	Assessed in childhood	Assessed in childhood
Du *et al.* (2015) UK	30 Participants (mean age 25.4 years)	MABC-2 below the 5th percentile. Bruininks–Oseretsky Test of Motor Proficiency, Second Edition, Brief Form (BOT-2 Brief) (Bruininks and Bruininks, 2005) —18th percentile	ADC and a telephone interview	ADC Telephone interview
Engel-Yeger (2020) Israel	200 participants aged from 20 to 64	None	ADC	ADC
Engel-Yeger and Engel (2023) Israel	317 participants aged from 18 to 66 years	None	ADC	ADC
Forde and Smyth (2022) Ireland	85 participants aged from 18 to 63	None	AAC–Q	Demographic questions at initial intake
Gentle *et al.* (2016) UK	22 Participants aged from 18 to 32 years.	M-ABC-2 (below the 15th percentile) BOT-2 Brief (below the 18th percentile)	ADC	ADC and a telephone interview
Gentle *et al.* (2021) UK	55 participants aged from 18 to 57	MABC-2 – below the 15th percentile	ADC	ADC
Gentle *et al.* (2024) UK	226 participants aged from 18 to 55 years	None	ADC	ADC
He *et al.* (2018) UK	18 Participants aged from 18 to 30	BOT-2 scores at or below the 15th percentile	ADC	ADC
Hodgson and Hudson (2017) UK	24 participants aged from 18 to 43	None participants had been diagnosed previously.	ADC	ADC
Hyde *et al.* (2018) Australia	29 participants aged from 18 to 36	BOT-2 – Brief; at or below the 15th percentile	ADC	ADC
Job *et al.* (2019) UK	24 participants Mean age 26.33	MABC-2 – cut off score not given	ADC	Prior diagnosis and ADC

(*continued*)

Table1

Author(s) year and country of study	Population —— no. of participants and age range	Assessments used for level of motor skill	Assessments used re: impact on occupational performance	Assessments used re: onset of symptoms was in childhood
Kirby *et al.* (2010) UK and Israel	107 participants aged from 17 to 42	None	ADC The Handwriting Proficiency Screening Questionnaire (HPSQ) (Rosenblum, 2008)	ADC Demographic questionnaire
Kirby *et al.* (2013) UK	57 participants aged from 21 to 30	None	ADC	ADC
Mayes *et al.* (2023) UK	52 participants aged from 18 to 39	MABC-2 scores at or below the 16th percentile	ADC	ADC
Mayes *et al.* (2024) UK	56 participants mean age = 25.31 SD = 5.95	MABC-2 below the 16th Percentiles	ADC	ADC
Meachon and Alpers (2023). Germany	161 participants aged from 18 to 62	None	ADC	ADC
Min Joo *et al.* (2023) Korea	377 participants aged from 18 to 24	None	ADC translated into Korean	ADC translated into Korean
Purcell *et al.* (2015) UK	16 participants aged from 18 to 53	MABC – 2 at or below the 5th percentile.	Referral and history taking questionnaire ADC	Self-report ADC
Sankar *et al.* (2020) India	15 participants aged from 20 to 40	None - Prior diagnosis	Confirmed the diagnosis using AAC-Q.	Prior diagnosis
Suzuki *et al.* (2020) Japan	81 participants mean age 24.48 SD 5.33	MABC-2 at or below the 16th percentile.	None	None
Tal-Saban *et al.* (2012a, 2012b) Israel	429 participants aged from 19 to 25;	None	AAC-Q	None
Tal-Saban *et al.* (2014a, 2014b) Israel	96 Participants mean age 24 SD [SD = 1.91]	None	AAC-Q	None
Tal-Saban *et al.* (2014a, 2014b) Israel	96 participants aged from 22 to 29.	None	AAC–Q	None
Tal-Saban *et al.* (2018). Israel	2,309 participants mean age 20.68 year (standard deviation 3.42)	None	AAC–Q	None
Tal-Saban and Kirby (2021). Israel	110 participants aged from 18 to 40	Previous diagnosis	AAC-Q	Previous diagnosis
Verlinden *et al.* (2023) Belgium	Three Participants aged 51, 19, 27	None	ADC and interview	Self-report, Parent report, case notes.
Warlop *et al.* (2020). Belgium	20 participants aged from 22 to 23	MABC-2 16th percentile or below	Diagnosed in childhood	Diagnosed in childhood
Wilmut and Barnett (2017). UK	30 participants aged from 19 to 34	BOT-2 Brief at or below 18th percentile and MABC-2 at or below the 16th percentile	ADC and a telephone interview	ADC and a telephone interview
Wilmut *et al.* (2015). UK	30 participants (mean age 25.3 years, range 19.2–34.2 years)	MABC-2 scored at or below the 5th percentile BOT-2 Brief at or below the 18th percentile	ADC and a telephone interview	ADC and a telephone interview

(*continued*)

Table1

Author(s) year and country of study	Population — no. of participants and age range	Assessments used for level of motor skill	Assessments used re: impact on occupational performance	Assessments used re: onset of symptoms was in childhood
Wilmut *et al.* (2017) UK	124 participants aged from 7 to 34	MABC-2 at or below the 9th BOT-2 Brief. at or below 18th	ADC and telephone interviews	ADC and telephone interviews
Wilmut and Byrne (2014) UK	34 participants (mean age 24:09, SD = 52 months)	MABC-2, BOT-2 Brief. at or below 15th	ADC	ADC
Zaguri-Vittenberg *et al.* (2023) Israel	10 participants aged from 21 to 31	M-ABC-2 at or below 5th percentile	AAC-Q Participant interview	Participant interview

Source: Author's compilation

individual's perception of their performance" and "current feelings about their performance as reflected upon by others" (Kirby *et al.*, 2010, p. 133). The ADC can be used with any adult over 16 years of age and takes between 15 and 20 min to complete.

In total, 17 of the studies used the ADC alone to measure occupational performance (Baiano *et al.*, 2023; Cleaton *et al.*, 2021; Engel-Yeger, 2020; Engel-Yeger and Engel, 2023; Gentle *et al.*, 2016, 2021, 2024; He *et al.*, 2018; Hodgson and Hudson, 2017; Hyde *et al.*, 2018; Job *et al.*, 2019; Kirby *et al.*, 2013; Mayes *et al.*, 2023, 2024; Meachon and Alpers, 2023; Min Joo *et al.*, 2023; Wilmut and Byrne, 2014), and five combined the ADC with participant interviews (Du *et al.*, 2015; Verlinden *et al.*, 2023; Wilmut and Barnett, 2017; Wilmut *et al.*, 2015, 2017). One study (Kirby *et al.*, 2010) combined the ADC with the Handwriting Proficiency Screening Questionnaire (Rosenblum, 2008). One of the studies conducted the ADC, undertook participant interviews and used information from referral forms (Purcell *et al.*, 2015).

Seven of the studies (Forde and Smyth, 2022; Sankar *et al.*, 2020; Tal-Saban *et al.*, 2012a, 2014a, 2014b, 2018, 2021) used AAC-Q (Tal-Saban *et al.*, 2012a) alone, and one study combined the AAC-Q with participant interviews (Zaguri-Vittenberg *et al.*, 2023). The AAC-Q is a 12-item, self-report questionnaire used to screen for difficulties in adolescents and adults aged 16–35. It was designed to act as a screening tool for DCD in this population and takes 10–15 min to complete. Cut off scores are given for each gender for suspected or clinical DCD (below the 5th percentile) and borderline DCD (5th––15th percentile). Testing indicates that there is sufficient evidence of the reliability and validity of the instrument (Tal-Saban *et al.*, 2012a, 2012b).

One study accepted a self-report of occupational performance problems (De Oliveira and Wann, 2010), and two of the studies did not look at current difficulties in this area on the basis that the participants had been diagnosed with DCD in childhood (De Oliveira and Wann, 2012; Warlop *et al.*, 2020).

Assessments used to establish onset of symptoms were in childhood

The ADC contains a section on occupational performance difficulties experienced in childhood, and thus studies using this tool to measure current occupational performance problems also used it to ascertain if these problems were long-standing. Five of the studies did not elicit data about this area (Suzuki *et al.*, 2020; Tal-Saban *et al.*, 2012a, 2014a, 2014b, 2018). One used a demographic questionnaire alone (Forde and Smyth, 2022), and three took self/parent-report without any other measure (De Oliveira and Wann, 2010; Verlinden *et al.*, 2023; Zaguri-Vittenberg *et al.*, 2023). Four of the studies addressed this issue by indicating a prior diagnosis of DCD (De Oliveira and Wann, 2010; Sankar *et al.*, 2020; Tal-Saban and Kirby, 2021; Warlop *et al.*, 2020).

Discussion

DCD is a condition that can persist into adulthood, impacting not only occupational performance but also mental health, executive function, sensory processing and levels of fatigue (Blank *et al.*, 2019; Scott-Roberts and Purcell, 2018; Thomas and Christopher, 2017; Zaguri-Vittenberg *et al.*, 2023). The EACD has established four criteria for the assessment of DCD in adulthood (Blank *et al.*, 2019). The aim of this scoping review was to discover which assessments are used in studies involving adults with DCD to determine whether those adults have DCD or probable DCD in relation to the three criteria that occupational therapists can assess. The ADC was the most commonly used assessment in research to assign participants to a DCD group and has potential to be used to gather data on two of these criteria, i.e. the impact of the motor performance problems on self-care, productivity and leisure, and whether these types of problems have been present since childhood. The questionnaire has been tested for construct and concurrent validity content and for reliability. The ADC also has a section for demographic information relating to family, socio-economic status, medications, past diagnosis and any relevant interventions. It has been translated and adapted to a German version (Meachon *et al.*, 2022), Asian Uzbekistan version (Saidmamatov *et al.*, 2023), Korean version (Min Joo *et al.*, 2023) and Italian version (Zappullo *et al.*, 2023). The AAC-Q is also being used as a screening tool but only gives information on a range of current occupational performance problems and has a cut-off point of age 35, both of which limit its use diagnostically.

The measurement of motor skill is limited by the lack of a norm-referenced tool for the adult population (Mayes *et al.*, 2024). The MABC-2 and the BOT-2 Brief were the most commonly used measurements of motor competence in research, with the MABC-2 being most used. The MABC-3 was produced in 2023 (Henderson and Barnett, 2023) and the age-band now provides norms to the age of 25 years and 11 months of age, which offers more scope to assess adults for DCD than its predecessor. Normative data was co-collected between UK, Australia and New Zealand.

The BOT-2 and BOT-2 Brief have also been updated, and the third Edition – BOT-3 (Bruininks and Bruininks, 2024), is in press and due for publication in 2024. This assessment tool now also has norms up to age 25 years and 11 months. This tool is norm referenced to a US population, and thus the choice of whether to use the MABC-3 or the BOT-3 will in part be guided by context.

Limitations of this review

It is acknowledged that only articles written in the English language were sourced for this review, and thus further data on types of assessment tools used may have been missed. The research was conducted to address an issue arising from clinical practice rather than coming from a university setting and thus was limited by bias due to single author screening titles and extracting all data for this review.

Conclusion

DCD persists into adulthood, and thus there is a need to have an assessment process for the adult population. Having a diagnosis would allow the adult to have access to interventions, supports and accommodations that could facilitate optimal occupational performance. The ADC and the MABC-3 are potential assessments that could form part of an assessment pathway for adults for DCD in the European context.

Implications for practice and future research

The Royal College of Occupational Therapists UK (Royal College of Occupational Therapists, 2021) recommends that occupational therapists should contribute to the design and promotion of local pathways for the diagnosis of DCD in both children and adults. Information from this scoping review could be used in the formation of a pilot assessment pathway for assessing adults for DCD with the MABC-3 and the ADC forming part of the assessment process. It has been established that DCD persists into adulthood (Blank *et al.*, 2019), and thus the pathway could be piloted with people diagnosed in childhood to ascertain its effectiveness.

References

American Psychiatric Association (2013), *Diagnostic and Statistical Manual of Mental Disorders*, 5th ed., American Psychiatric Publishing, Arlington (VA).

Baiano, C., Zappullo, I., Cecere, R., Raimo, G. and Conson, M. (2023), "Visual and kinesthetic motor imagery in adults with different degrees of self-reported motor coordination difficulties", *Human Movement Science*, Vol. 91, pp. 103-137.

Blank, R., Barnett, A.L., Cairney, J., Green, D., Kirby, A., Polatajko, H., Rosenblum, S., Smits-Engelsman, B., Sugden, D., Wilson, P. and Vincon, S. (2019), "International clinical practice recommendations on the definition, diagnosis, assessment, intervention, and psychosocial aspects of developmental coordination disorder", *Developmental Medicine & Child Neurology*, Vol. 61 No. 3, pp. 242-285.

Bruininks, R.H. and Bruininks, D.D. (2005), *Bruininks-Oseretsky Test of Motor Proficiency, Second Edition (BOT-2)*, Pearson, MN, USA.

Bruininks, R.H. and Bruininks, D.D. (2024), *Bruininks-Oseretsky Test of Motor Proficiency, Second Edition (BOT-2)*, Pearson In press, MN, USA.

Cleaton, M.A.M., Tal-Saban, M., Hill, E.L. and Kirby, A. (2021), "Gender and age differences in the presentation of at-risk or probable developmental coordination disorder in adults", *Research in Developmental Disabilities*, Vol. 115, p. 104010.

De Oliveira, R.F. and Wann, J.P. (2010), "Integration of dynamic information for visuomotor control in young adults with developmental coordination disorder", *Experimental Brain Research*, Vol. 205 No. 3, pp. 387-394.

De Oliveira, R.F. and Wann, J.P. (2012), "Driving skills of young adults with developmental coordination disorder: maintaining control and avoiding hazards", *Human Movement Science*, Vol. 31 No. 3, pp. 721-729.

Du, W., Wilmut, K. and Barnett, A.L. (2015), "Level walking in adults with and without developmental coordination disorder: an analysis of movement variability", *Human Movement Science*, Vol. 43, pp. 9-14.

Engel-Yeger, B. (2020), "The role of poor motor coordination in predicting adults' health related quality of life", *Research in Developmental Disabilities*, Vol. 103, p. 103686.

Engel-Yeger, B. and Engel, A. (2023), "Emotional distress and quality of life among adults with developmental coordination disorder during Covid-19", *British Journal of Occupational Therapy*, Vol. 86 No. 2, pp. 130-138.

Forde, J.F. and Smyth, S. (2022), "Avoidance behavior in adults with developmental coordination disorder is related to quality of life", *Journal of Developmental and Physical Disabilities*, Vol. 34 No. 4, pp. 571-589.

Gentle, J., Barnett, A.L. and Wilmut, K. (2016), "Adaptations to walking on an uneven terrain for individuals with and without developmental coordination disorder", *Human Movement Science*, Vol. 49, pp. 346-353.

Gentle, J., Brady, D., Woodger, N., Croston, S. and Leonard, H.C. (2021), "Driving skills of individuals with and without developmental coordination disorder (DCD/dyspraxia)", *Frontiers in Human Neuroscience*, Vol. 15, p. 635649.

Gentle, J., Shakur, A., Ivanova, M. and Gilligan-Lee, K. (2024), "Navigation abilities and spatial anxiety in individuals with and without developmental coordination disorder (DCD/dyspraxia)", *Research in Developmental Disabilities*, Vol. 146, p. 104672.

He, J.L., Fuelscher, I., Enticott, P.G., Teo, W., Barhoun, P. and Hyde, C. (2018), "Interhemispheric cortical inhibition is reduced in young adults with developmental coordination disorder", *Frontiers in Neurology*, Vol. 9, p. 179.

Henderson, S.E. and Barnett, A. (2023), *Movement Assessment Battery for Children-Third Edition (Movement ABC-3)*, Pearson Education Inc, London.

Henderson, S.E., Sugden, D.A. and Barnett, A. (2007), *Movement Assessment Battery for Children-Second Edition (Movement ABC-2)*, The Psychological Corporation, London.

Hodgson, C. and Hudson, J.M. (2017), "Atypical speech lateralization in adults with developmental coordination disorder demonstrated using functional transcranial doppler ultrasound", *Journal of Neuropsychology*, Vol. 11 No. 1, pp. 1-13.

Hunt, J., Zwicker, J., Godecke, E. and Raynor, A. (2023), "Assessing children to identify developmental coordination disorder: a survey of occupational therapists in Australia", *Australian Occupational Therapy Journal*, Vol. 70 No. 4, pp. 420-433.

Hyde, C., Fuelscher, I., Williams, J., Lum, J.A.G., He, J., Barhoun, P. and Enticott, P.G. (2018), "Corticospinal excitability during motor imagery is reduced in young adults with developmental coordination disorder", *Research in Developmental Disabilities*, Vol. 72, pp. 214-224.

Job, X.E., Bradya, D., De Fockerta, J.W., Di Bernardi Luft, C., Elisabeth, L.E.L. and Van Velzena, J. (2019), "Adults with probable developmental coordination disorder selectively process early visual, but not tactile information during action preparation. An electrophysiological study", *Human Movement Science*, Vol. 66, pp. 631-644.

Kirby, A., Edwards, L., Sugden, D. and Rosenblum, S. (2010), "The development and standardisation of the adult developmental coordination disorders/dyspraxia checklist (ADC)", *Research in Developmental Disabilities*, Vol. 31 No. 1, pp. 131-139.

Kirby, A., Williams, N., Thomas, M. and Hill, E.L. (2013), "Self-reported mood, general health, wellbeing and employment status in adults with suspected DCD", *Research in Developmental Disabilities*, Vol. 34 No. 4, pp. 1357-1364.

Mayes, W.P., Jansari, A. and Leonard, H.C. (2023), "Exploring executive functioning of adults with probable developmental coordination disorder using the Jansari assessment of executive functions", *Developmental Neuropsychology*, Vol. 48 No. 7, pp. 315-334.

Mayes, W.P., Gentle, J., Ivanova, M. and Violante, I.R. (2024), "Audio-visual multisensory integration and haptic perception are altered in adults with developmental coordination disorder", *Human Movement Science*, Vol. 93, pp. 1-14.

Meachon, E.J. and Alpers, G.W. (2023), "How are you getting by? Coping in developmental coordination disorder versus attention-deficit/hyperactivity disorder", *British Journal of Occupational Therapy*, Vol. 86 No. 1, pp. 42-52.

Meachon, E.J., Beitz, C., Zemp, M. and Wilmut, K. (2022), "The adult developmental coordination disorders/dyspraxia checklist – German: adapted factor structure for the differentiation of DCD and ADHD", *Research in Developmental Disabilities*, Vol. 126, p. 104254.

Min Joo, K., Soo Mi, N., Byeol, K., Ilhyeok, P., Jaebum, P. and Shim, J.K. (2023), "Anthropometric, physical activity, and psychological characteristics of Korean adults with and without developmental coordination disorder (DCD)", *Frontiers in Human Neuroscience*, Vol. 17, p. 1280356.

Pollock, D., Peters, M.D.J., Khalil, H., McInerney, P., Alexander, L., Tricco, A.C., Evans, C., Brandão de Moraes, E., Godfrey, C.M., Pieper, D., Saran, A., Stern, C. and Munn, Z. (2023), "Recommendations for the extraction, analysis, and presentation of results in scoping reviews", *JBI Evidence Synthesis*, Vol. 21 No. 3, pp. 520-532.

Purcell, C., Scott-Roberts, S. and Kirby, A. (2015), "Implications of DSM-5 for recognising adults with developmental coordination disorder (DCD)", *British Journal of Occupational Therapy*, Vol. 78 No. 5, pp. 295-302.

Rosenblum, S. (2008), "Development, reliability, and validity of the handwriting proficiency screening questionnaire (HPSQ)", *The American Journal of Occupational Therapy*, Vol. 62 No. 3, pp. 298-307.

Royal College of Occupational Therapists (2021), *A Quick Guide for Occupational Therapists: Diagnosis of Developmental Coordination Disorder in Children and Adults*, Royal College of Occupational Therapists rcot.co.uk

Saidmamatov, O., Jammatov, J., Sousa, C., Barros, R., Vasconcelos, O. and Rodrigues, R. (2023), "Translation and adaptation of the adult developmental coordination disorder/dyspraxia checklist (ADC) into Asian Uzbekistan", *Sports*, Vol. 11 No. 7, p. 135.

Sankar, U.G., Monisha, R., Amalraj Vakkaba Doss, C. and Palanivel, R.M. (2020), "Relationship between sensory responsivity, loneliness, and anxiety among Indian adults with developmental coordination disorder (DCD)", *Biomedical and Pharmacology Journal*, Vol. 13 No. 2, pp. 895-898.

Scott-Roberts, S. and Purcell, C. (2018), "Understanding the functional mobility of adults with developmental coordination disorder (DCD) through the international classification of functioning (ICF)", *Current Developmental Disorders Reports*, Vol. 5 No. 1, pp. 26-33.

Suzuki, K., Kita, Y., Shirakawa, Y., Egashira, Y., Mitsuhashi, S., Kitamura, Y., Okuzumi, H., Kaga, Y. and Inagaki, M. (2020), "Reduced Nogo-P3 in adults with developmental coordination disorder (DCD)", *International Journal of Psychophysiology*, Vol. 153, pp. 37-44.

Tal-Saban, M. and Kirby, A. (2021), "Friendships and socialization with developmental coordination disorder: comparing experiences in late adolescence and adulthood", *The Israeli Journal of Occupation Therapy*, Vol. 30 No. 3, pp. 42-61.

Tal-Saban, M., Zarka, S., Grotto, I., Ornoy, A. and Parush, S. (2012a), " The functional profile of young adults with suspected developmental coordination disorder (DCD)", *Research in Developmental Disabilities*, Vol. 33 No. 6, pp. 2193-2202.

Tal-Saban, M.T., Ornoy, A., Grotto, I. and Parush, S. (2012b), "Adolescents and adults coordination questionnaire: development and psychometric properties", *American Journal of Occupational Therapy*, Vol. 66 No. 4, pp. 406-413.

Tal-Saban, M.T., Ornoy, A. and Parush, S. (2014a), " Executive function and attention in young adults with and without developmental coordination disorder – a comparative study", *Research in Developmental Disabilities*, Vol. 35 No. 11, pp. 2644-2650.

Tal-Saban, M.T., Ornoy, A. and Parush, S. (2014b), "Young adults with developmental coordination disorder: a longitudinal study", *The American Journal of Occupational Therapy*, Vol. 68 No. 3, pp. 307-316.

Tal-Saban, M.T., Ornoy, A. and Parush, S. (2018), "Success in adults with probable developmental coordination disorder using structural equation modelling", *The American Journal of Occupational Therapy*, Vol. 72 No. 2, p. 7202205010.

Thomas, M. and Christopher, G. (2017), "Fatigue in developmental coordination disorder: an exploratory study in adults", *Fatigue: Biomedicine, Health & Behavior*, Vol. 6 No. 1, pp. 1-11.

Tricco, A.C., Lillie, E., Zarin, W., O'Brien, K.K., Colquhoun, H., Levac, D., Moher, D., Peters, M.D.J., Horsley, T., Weeks, L., Hempel, S., Akl, E.A., Chang, C., McGowan, J., Stewart, L., Hartling, L., Aldcroft Wilson, A.M.G., Garritty, C., Lewin, S., Godfrey, C.M., Macdonald, M.T., Langlois, E.V., Soares-Weiser, K., Moriarty, J., Clifford, T., Tunc, O. A. and Straus, S.E. (2018), "PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation", *Annals of Internal Medicine*, Vol. 169 No. 7, pp. 467-485.

Verlinden, S., De Wijngaert, P. and Van den Eynde, J. (2023), "Developmental coordination disorder in adults: a case series of a condition that is underdiagnosed by adult psychiatrists", *Psychiatry Research Case Reports*, Vol. 2 No. 2, pp. 1-7.

Warlop, G., Vansteenkiste, P., Lenoir, M., Van Causenbroeck, J. and Deconinck, F.J.A. (2020), "Gaze behaviour during walking in young adults with developmental coordination disorder", *Human Movement Science*, Vol. 71, p. 102616.

Wilmut, K. and Barnett, A.L. (2017), "When an object appears unexpectedly: foot placement during obstacle circumvention in children and adults with developmental coordination disorder", *Experimental Brain Research*, Vol. 235 No. 10, pp. 2947-2958.

Wilmut, K. and Byrne, M. (2014), "Grip selection for sequential movements in children and adults with and without developmental coordination disorder", *Human Movement Science*, Vol. 36, pp. 272-284.

Wilmut, K., Du, W. and Barnett, A.L. (2015), "How do I fit through that gap? Navigation through apertures in adults with and without developmental coordination disorder", *Plos One*, Vol. 10 No. 4, p. e0124695, doi: 10.1371/journal.pone.0124695.

Wilmut, K., Gentle, J. and Barnett, A.L. (2017), "Gait symmetry in individuals with and without developmental coordination disorder", *Research in Developmental Disabilities*, Vol. 60, pp. 107-114.

Zaguri-Vittenberg, S., Weintraub, N. and Tal-SabanIt, M. (2023), 'It feels as though I need to exert more effort than others': the experience of daily participation of young adults with developmental coordination disorder (DCD) – a qualitative study", *Disability and Rehabilitation*, Vol. 46 No. 15, pp. 1-10.

Zappullo, I., Conson, M., Baiano Cecere, R., Raimo, G. and Kirby, A. (2023), "The relationships between self-reported motor functioning and autistic traits: the Italian version of the adult developmental coordination disorders/dyspraxia checklist (ADC)", *International Journal of Environmental Research and Public Health*, Vol. 20 No. 2, p. 1101.

Corresponding author

Dorothy Armstrong can be contacted at: dorothy@dorothyarmstrongconsultantot.com