A Mixed-Methods Systematic Review and Meta-Analysis of the Multidimensional Profile of Developmental Coordination Disorder (DCD) in Children Aged 7–11 Years: Protocol

1. Administrative information and protocol governance

1.1 Review title and registration

The title of this review is *A Mixed-Methods Systematic Review and Meta-Analysis of the Multidimensional Profile of Developmental Coordination Disorder (DCD) in Children Aged 7–11 Years*. The review has been registered with the International Prospective Register of Systematic Reviews (PROSPERO). The initial registration submission was made on 13th of October 2026, and the registration was published on 15th of October 2026 (PROSPERO registration reference: CRD420261537863.

The review started on 13th of October 2026, with an anticipated completion date of 3rd of June 2029. The review protocol has been developed with reference to the Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (PRISMA-P) statement (Moher et al., 2015) and the PRISMA-S extension (Rethlefsen et al., 2021) for reporting literature searches. The completed review will be reported in accordance with the PRISMA 2020 guidelines (Page et al., 2021).

1.2 Review team and organisational affiliations

The review will be conducted by a research team based within the School of Human and Social Sciences at the University of West London, United Kingdom.

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1.3 Institutional governance, funding and declarations

The systematic review has received approval from the University of West London Research Ethics Committee, and the wider doctoral research project has been approved by the University Research Degrees Sub-Committee. The research is supported through a postgraduate PhD scholarship provided by the University of West London. No external commercial, industry or other grant funding has been received for the conduct of this review. The authors declare that they have no potential or actual conflicts of interest relating to the conduct, analysis or reporting of this systematic review.

2. Rationale and background

2.1 Clinical definition of Developmental Coordination Disorder

Developmental Coordination Disorder (DCD) is a neurodevelopmental condition characterised primarily by difficulties in the acquisition and execution of coordinated motor skills. These difficulties are substantially below the level expected for the child's chronological age and opportunities for learning and skill acquisition. The motor difficulties interfere with activities of daily living, participation in play and leisure activities, and/or academic functioning. They are not better explained by an intellectual disability, visual impairment or neurological condition affecting movement (American Psychiatric Association, 2022).

Within the school environment, DCD may be associated with difficulties in handwriting, fine motor activities, participation in ball games and organised sports, and other everyday activities requiring motor coordination (Blank et al., 2019; Magalhães et al., 2011). These difficulties may affect children's ability to complete motor-based classroom tasks and participate in school activities alongside their peers (Blank et al., 2019).

Although motor difficulties are central to the identification and diagnosis of DCD, their functional consequences do extend beyond motor performance (Tamplain et al., 2024). These broader difficulties are important when considering the experiences and needs of children with DCD within primary school settings.

2.2 Middle childhood and the multidimensional functional profile

Diagnostic frameworks, including the Diagnostic and Statistical Manual of Mental Disorders (DSM-5-TR) and the International Classification of Diseases (ICD-11), identify motor coordination difficulties as the defining feature of DCD (American Psychiatric Association, 2022; World Health Organisation, 2022). However, an increasing body of empirical research indicates that children with DCD may also experience difficulties across cognitive, psychosocial, educational, health and communication domains (Tamplain et al., 2024; Reynolds et al., 2024).

These difficulties may be particularly relevant during middle childhood, when children encounter increasing academic, social and physical demands. During this period, children are expected to develop greater independence, manage increasingly complex classroom tasks, participate in structured physical activities and develop peer relationships. Research indicates that children with DCD may experience difficulties with educational achievement, school participation and social inclusion, which may influence their experiences and participation within the school environment (Harrowell et al., 2018; Izadi-Najafabadi et al., 2019; O'Dea et al., 2021).

Despite the potential significance of these broader characteristics, the evidence remains distributed across several research disciplines, including developmental psychology, clinical research, occupational therapy, education, speech and language research and paediatric health. Previous systematic reviews have frequently concentrated on outcomes,

specific interventions or individual co-occurring conditions rather than examining the wider functional profile of children with DCD across multiple developmental domains.

Consequently, there remains a need for a systematic synthesis that brings together evidence relating to the different characteristics associated with DCD within a single multidimensional framework. The present review will address this gap by examining empirical evidence across six predefined functional domains: motor, cognitive, psychosocial, educational, health and communication.

2.3 Rationale for the development of a teacher awareness framework

The purpose of examining DCD across these six domains is to establish a more comprehensive understanding of the characteristics and functional difficulties reported in children aged 7.0–11.9 years. The six domains have been selected to reflect areas of functioning that may be relevant to children's experiences within primary education. The motor domain will encompass fine and gross motor performance, balance, manual dexterity, movement coordination and motor efficiency. The cognitive domain will include executive functioning, working memory, processing speed, attentional control and spatial reasoning. The psychosocial domain will consider emotional symptoms, anxiety, depression, self-esteem, self-efficacy, peer relationships and social adjustment. The educational domain will examine academic achievement, curriculum engagement, classroom participation and performance in reading, writing and mathematics. The health domain will include health-related quality of life, fatigue, physical activity, physical fitness, body mass index and physical injuries. Finally, the communication domain will examine speech production, structural language, verbal fluency and pragmatic communication.

The findings will be used to establish the range, frequency, magnitude and consistency of characteristics associated with DCD across these domains. Quantitative and

qualitative evidence will be considered together to identify characteristics that are supported by empirical findings and may have relevance to children's functioning within the primary school environment. The resulting evidence will inform the development of an empirical conceptual framework to support candidate item generation for a Key Stage 2 Teacher Awareness Scale. The subsequent development and psychometric evaluation of this scale will form part of the wider doctoral research programme and will be undertaken separately from the present systematic review.

3. Research question, objectives and key words

3.1 Review question

What are the common characteristics of DCD in 7–11-year-old children across motor, cognitive, health, psychosocial, communication and educational/academic domains?

3.2 Primary objective

- To establish and synthesise the multidimensional profile of Developmental Coordination Disorder (DCD) and probable DCD (p-DCD) across motor, cognitive, psychosocial, educational, health, and communication domains in children aged 7-11 years.

3.3 Secondary objectives

- To quantify the magnitude and consistency of differences between children with DCD/p-DCD and neurotypical or other clinical comparison groups across each functional domain.
- To examine the impact of co-occurring conditions (e.g., ADHD, autism, dyslexia, DLD) on non-motor, cognitive, and communication outcomes through pre-specified subgroup analyses.

- To synthesise review findings across domains into an empirical conceptual framework that identifies and operationalises key DCD characteristics to inform scale item generation for subsequent research (Note: Scale construction, psychometric validation, and field testing will be conducted in a separate subsequent study and do not constitute an outcome of this review).

3.4 Keywords

Children; Developmental coordination disorder; DCD; Dyspraxia; Motor Coordination; Probable Developmental coordination disorder; Characteristics; Schools; Special educational needs and disabilities; SEND; Motor; Psychosocial; Education; Cognitive; Communication; Health

4. Eligibility criteria and operational definitions

The eligibility criteria have been developed using the Population, Exposure, Comparator and Study Design framework, with outcomes considered across the six predefined functional domains. As this is an observational review rather than an evaluation of treatment effectiveness, an intervention is not required for study inclusion.

4.1 Population and age criteria

The target population will comprise children aged 7.0-11.9 years at the time of assessment. This age range broadly corresponds to the UK Key Stage 2 educational stage.

Studies involving participants across a wider age range will be eligible where data relating specifically to children aged 7.0-11.9 years are reported separately. Where age-specific data cannot be obtained, studies may also be considered eligible where the mean age of the sample falls strictly between 7.0 and 11.9 years and at least 20% of the total sample comprises children within the specified age range. Studies involving exclusively younger or

older participants will be excluded where no separately identifiable data are available for the target population.

4.2 Diagnostic and operational classification framework

Eligible participants must have either a formal clinical diagnosis of DCD or meet predefined criteria for probable DCD (p-DCD). As the identification of DCD varies across the literature, a three-tier classification framework will be applied to determine eligibility and facilitate comparison between studies.

Table 1 Diagnostic eligibility and classification

Tier	Diagnostic classification	Motor assessment criteria	Functional impact requirement
Tier 1	Formally diagnosed DCD	Clinical diagnosis based on DSM-IV, DSM-5 or DSM-5-TR, ICD-10 or ICD-11 criteria.	Clinical assessment must establish that the motor difficulties are not better explained by another neurological, visual or intellectual condition, consistent with the relevant diagnostic exclusion criteria.
Tier 2	Probable DCD (moderate risk)	Performance at or below the 15th percentile on a validated motor assessment, such as the MABC, MABC-2, MABC-3, BOT, BOT-2, or BOT-3 where applicable.	Functional impact must be supported by parent, teacher or other relevant informant report, such as the Developmental Coordination Disorder Questionnaire (DCDQ).

Tier 3	Probable DCD (severe or high risk)	Performance at or below the 5th percentile on a validated motor assessment, such as the MABC, MABC-2, MABC-3, BOT, BOT-2, BOT-3 where applicable.	Participants may be considered eligible without an explicit informant measure where the study provides sufficient evidence of severe motor impairment and functional impact can reasonably be inferred from the assessment and study classification.

For Tier 1, eligibility will be based on a reported clinical diagnosis rather than the retrospective application of diagnostic criteria by the review team. For Tiers 2 and 3, the operational definition of probable DCD must be sufficiently clear to establish that the motor assessment and functional impact requirements have been met. The review recognises that Criterion D is not established through a single universal motor assessment instrument. Rather, it requires clinical consideration of whether the observed motor difficulties are better explained by another condition. Where the information provided by a primary study is insufficient to establish the relevant diagnostic classification, the study will not automatically be assigned to a diagnostic tier. Such cases will be considered against the full eligibility criteria and documented accordingly. The diagnostic tier assigned to each study will be recorded during data extraction. Where possible, findings from formally diagnosed DCD and probable DCD samples will be considered separately in subgroup or sensitivity analyses.

4.3 Intervention and exposure

The exposure of interest is Developmental Coordination Disorder or appropriately defined probable Developmental Coordination Disorder. Studies using historical or alternative terminology, including Clumsy Child Syndrome, Motor Coordination Disorder

and Specific Developmental Disorder of Motor Function, will be considered where the operational definition corresponds sufficiently to the diagnostic and classification criteria specified above. The review will examine the characteristics and functional outcomes associated with DCD rather than evaluate the effectiveness of therapeutic interventions. Where randomised controlled trials or other intervention studies report baseline characteristics before an intervention has commenced, these data will be eligible for inclusion. Post-intervention findings will not be included in the primary synthesis.

4.4 Comparator and control groups

Eligible comparator groups may include typically developing children, children without DCD, age-matched controls, sex-matched controls, age- and sex-matched controls, population-based comparison groups or other relevant clinical comparison groups. A comparator group will not be required for study inclusion. Single-group studies will be eligible where they provide relevant descriptive, observational or qualitative evidence relating to at least one of the six predefined functional domains. Where comparator data are available, information concerning recruitment procedures, matching criteria, participant characteristics and exclusion criteria will be extracted. These factors will be considered when assessing the comparability of study populations and interpreting differences between groups.

4.5 Co-occurring conditions and exclusion criteria

Studies involving children with DCD and co-occurring neurodevelopmental conditions will be eligible where DCD has been independently established and relevant outcomes can be identified. The prespecified co-occurring conditions of interest are ADHD, ASD, DLD and dyslexia. Where sufficient information is available, subgroup analyses will examine differences between children with DCD alone and children with DCD alongside one or more of these conditions. Studies investigating Childhood Apraxia of Speech (CAS) will

not be included unless participants also have an established diagnosis or classification of DCD. Similarly, studies examining other neurodevelopmental conditions associated with motor difficulties will be excluded where a primary diagnosis or classification of DCD or probable DCD has not been established. Studies will be excluded where motor difficulties are primarily attributable to intellectual disability (IQ below 70), cerebral palsy, muscular dystrophy, progressive neurological disorders, acquired brain injury, stroke or physical trauma. Studies will also be excluded where a primary visual or hearing impairment prevents valid motor assessment. Mixed diagnostic samples will be excluded where DCD-specific outcomes cannot be identified separately. Other exclusion criteria will include studies involving participants exclusively outside the specified age range, studies without an adequate method of identifying DCD or probable DCD, and studies that do not report at least one outcome relevant to the predefined functional domains.

Non-empirical publications, including editorials, commentaries, opinion papers, protocols and narrative reviews, will be excluded from the primary evidence synthesis. Dissertations and theses will also be excluded. Conference abstracts will be excluded where insufficient methodological or outcome information is available to establish eligibility and evaluate the findings. Animal studies and laboratory-only studies without relevant human functional outcomes will not be included. Studies published in languages other than English, or for which an English-language version cannot be accessed, will also be excluded. Relevant systematic reviews will not be included in the primary evidence synthesis. However, their reference lists will be examined to identify additional potentially eligible primary studies.

4.6 Study designs and research settings

The review will include empirical cross-sectional, cohort, case-control, longitudinal observational, qualitative and mixed-methods studies. Baseline data from randomised

controlled trials and other intervention studies will be eligible where the assessments were conducted before the intervention commenced and meet the specified population and outcome criteria. Post-intervention data will not be included. For longitudinal studies, data from the baseline assessment or the earliest assessment point meeting the age criteria will be extracted. Studies conducted in educational, clinical, home, laboratory or community settings will be considered eligible, irrespective of geographical location.

5. Information sources and search strategy

5.1 Database selection and platforms

A systematic search will be undertaken across six electronic bibliographic databases to identify relevant empirical research. The databases selected for the review are PubMed, CINAHL Complete, APA PsycINFO, APA PsycArticles, Academic Search Elite and ERIC. PubMed will be searched through the National Center for Biotechnology Information platform. CINAHL Complete, APA PsycArticles, Academic Search Elite and ERIC will be accessed through EBSCOhost. APA PsycINFO will be accessed through the available institutional platform.

The selection of databases reflects the multidisciplinary nature of DCD research and the need to identify literature across clinical, psychological, educational, developmental and health-related disciplines. The inclusion of education-specific and psychology-specific databases is particularly important given the review's focus on the wider functional profile of children with DCD. Embase, Web of Science and Scopus will not be included in the primary database search because access to these databases is restricted by the institution. This represents a potential limitation of the search strategy. To reduce the likelihood of relevant studies being missed, supplementary backward and forward citation searching will be undertaken.

5.2 Search limits and restrictions

5.2 Search limits and restrictions

The primary search covered studies published or indexed from 1 January 1994 to the latest date available through the automated date-limit functionality in PubMed at the time of searching. The PubMed interface displayed an upper date boundary of 2027/2028, which was retained as provided by the database. This was an automated system-generated date limit rather than a manually specified search endpoint. As the initial searches were conducted in October 2026, the actual retrieval of records was necessarily limited to publications and indexing information available at that time. For consistency across the other databases, an upper search date limit of 31 December 2028 was applied as an operational search boundary, as a specified end date was required to execute the searches. This did not imply that publications from 2027 or 2028 were available at the time of the initial searches. Rather, it provided a consistent upper date limit across databases while accommodating differences in their search functionality and date-limit settings. An updated search will be undertaken immediately before final data synthesis to identify any additional eligible studies published or indexed since the initial searches.

Searches will be restricted to English-language publications. Where available, database-specific filters will be applied to identify peer-reviewed academic journal publications and exclude preprints and other publication types outside the scope of the review. These filters will be selected with consideration of the indexing practices and functionality of each database to improve the relevance of retrieved records while maintaining sufficient search sensitivity. Where equivalent filters are unavailable, publication characteristics will instead be assessed during the screening process. The search will not rely solely on database age filters to determine eligibility. Instead, the age criteria specified in

Section 4.1 will be applied during screening to ensure that included studies meet the target age range of 7.0-11.9 years, as database age classifications may be broad and may not correspond precisely to the review's eligibility criteria.

5.3 Search strategy development

A two-concept search structure will be used, combining terms relating to the target population with terms relating to Developmental Coordination Disorder. The first concept will identify children and school-aged populations. It will include relevant controlled vocabulary, such as Child, Schools and Students, alongside free-text terms including child*, school age*, schoolage*, school-age*, primary school*, elementary school*, student*, middle school*, pupil*, girl*, boy*, pediatric* and paediatric*. The second concept will identify DCD and related diagnostic terminology. Controlled vocabulary will include relevant subject headings such as Motor Skills Disorders and Developmental Coordination Disorder, where available within the individual databases. Free-text terms will include developmental coordination disorder, developmental co-ordination disorder, DCD, developmental motor coordination disorder, Specific Developmental Disorder of Motor Function, dyspraxi*, motor coordination disorder, Clumsy Child Syndrome, probable DCD, p-DCD and pDCD. The use of alternative terminology is intended to improve the sensitivity of the search by capturing studies published under different diagnostic classifications or historical terminology. The two concepts will be combined using the Boolean operator AND, with alternative terms within each concept combined using OR. Database-specific subject headings and field codes will be adapted to the indexing structure of each database.

Studies involving children with cerebral palsy, muscular dystrophy or intellectual disability will be excluded from the review, as these conditions fall outside the scope of the present investigation. Thus, the Boolean NOT operator will be incorporated into the database

search strategies to exclude records containing references to these conditions. This approach will ensure that the search remains focused on children with Developmental Coordination Disorder (DCD) or probable DCD (p-DCD), consistent with the predefined eligibility criteria.

5.4 Search strategy piloting and validation

The search strategy was developed iteratively and piloted against a predefined set of 20 relevant empirical papers identified before the formal database searches.

The purpose of the piloting process was to assess whether the proposed search terms, subject headings and Boolean combinations were sufficiently sensitive to retrieve studies already known to be relevant to the review. The search strategy was refined through comparison of the retrieved records against the benchmark set. The final pilot search successfully retrieved all 20 benchmark papers, representing 100% retrieval of the predefined validation set. This provided an indication that the search strategy could identify the known relevant literature before formal database searching commenced.

5.5 Database search strategies and initial record yields

The complete database-specific search strategies, including the search dates, search platforms, exact search strings, applied filters and initial record yields, are provided in Appendix 1. The initial searches across the six databases identified a combined total of 21,468 records. All search procedures and reporting details have been documented in accordance with PRISMA-S standards (Rethlefsen et al., 2021). Any subsequent search updates will be documented and reported separately.

5.6 Supplementary search methods

Supplementary search methods will be used to identify potentially eligible studies that may not have been retrieved through the primary database searches. Backward citation

searching will involve examining the reference lists of included primary studies and relevant systematic reviews. Forward citation searching will be undertaken to identify subsequent publications citing the included studies. Google Scholar and available citation-indexing resources will be used for this purpose. Where necessary, primary study authors or relevant experts will be contacted to obtain missing numerical information, clarify diagnostic or methodological details, or identify additional relevant research. All supplementary searching activities will be documented, including the source searched, the date of searching and the number of additional records identified.

5.7 Record management and deduplication

All records retrieved from the six bibliographic databases have been exported into Cadima for reference management, deduplication and study screening. The initial combined database yield was 21,468 records. Duplicate records will be identified using Cadima's automated deduplication procedures and subsequently checked through manual verification to reduce the likelihood of duplicate publications or records being retained. The number of records identified, duplicates removed and records remaining for screening will be reported in the PRISMA 2020 flow diagram (Page et al., 2021).

6. Study selection and screening

6.1 Screening procedures

Study selection will be undertaken in two stages using the Cadima platform. During the first stage, titles and abstracts of the deduplicated records will be screened against the predefined eligibility criteria by the primary investigator. A second reviewer will independently screen a randomly selected sample of 10% of the records to assess consistency in the application and interpretation of the inclusion criteria. Any disagreements will be discussed to clarify the eligibility criteria and promote consistency in subsequent screening

decisions. Records considered potentially eligible, or for which eligibility cannot be established from the title and abstract alone, will proceed to full-text assessment.

During the second stage, the full texts of potentially eligible studies will be assessed against the complete eligibility criteria by the primary investigator. A second reviewer will independently assess a randomly selected sample of 10% of the full-text articles to evaluate the consistency and reliability of eligibility decisions. Inter-rater agreement will be assessed using Cohen's kappa coefficient (κ), as described in Section 6.2. Any disagreements will be resolved through discussion and consensus, with a third reviewer consulted where necessary. The final eligibility decisions will be made following application of the predefined criteria and resolution of any disagreements between reviewers.

6.2 Inter-rater agreement and disagreement resolution

Inter-rater agreement at both title/abstract and full-text screening stages will be assessed independently using Cohen's kappa coefficient (κ). A value of $\kappa \geq 0.70$ will be considered an acceptable level of agreement for monitoring the consistency of eligibility decisions (Landis & Koch, 1977). Where agreement falls below this threshold, reviewers will discuss discrepancies and clarify the interpretation and application of the eligibility criteria before proceeding with further screening. Where disagreements cannot be resolved through discussion, a third reviewer will independently assess the study and determine the final eligibility decision. Reasons for exclusion at the full-text stage will be recorded and reported in the PRISMA 2020 flow diagram.

6.3 Reporting of study selection

The study selection process will be presented using a PRISMA 2020 flow diagram. The diagram will report the number of records identified through database and supplementary

searches, the number of duplicates removed, the number of records screened, the number of full texts assessed, and the number of studies included in the final synthesis.

7. Data collection, extraction and multi-domain allocation

7.1 Data extraction procedures

Data will be extracted by the primary investigator using a standardised data extraction form developed before the commencement of formal extraction. The form will be piloted and refined where necessary to ensure that the required information can be recorded consistently across the different study designs and outcome domains. Completed extraction records will be checked by the two supervisors for accuracy and completeness. Any discrepancies identified during the checking process will be discussed and resolved through consensus. Where necessary, a further reviewer will be consulted. The extraction form will capture information relating to study characteristics, participant characteristics, DCD identification, co-occurring conditions, outcome measures and relevant findings. Study characteristics will include the first author's name, year of publication, country, study design and research setting. Participant characteristics will include sample size, mean age, standard deviation, age range, sex distribution, ethnicity, socioeconomic status and educational stage, where reported. Information relating to DCD identification will include the diagnostic framework or classification criteria used, the motor assessment administered, the version of the assessment, the percentile threshold applied and whether functional impact was confirmed through parent, teacher or other informant report. Information about co-occurring conditions will include the presence and type of ADHD, ASD, DLD and dyslexia, together with details of whether relevant subgroup data are reported separately. For quantitative outcomes, the review will extract the assessment instrument, informant source, sample size, means, standard deviations, relevant test statistics, p-values and reported effect sizes, where available. Where necessary,

additional numerical information will be sought from study authors. For qualitative studies, extracted information will include the research methodology, participant characteristics, analytical approach, reported themes and subthemes, and relevant illustrative participant quotations.

7.2 Multi-domain data extraction and unit-of-analysis considerations

Where an included study reports outcomes across more than one functional domain within the same participant cohort, the relevant findings will be extracted into separate domain-specific extraction tables. For example, a study reporting motor performance, executive functioning, psychosocial adjustment and academic achievement will contribute information to the corresponding four domain-specific evidence tables.

Each outcome will be allocated according to the primary construct measured by the assessment instrument and the predefined allocation rules outlined in Section 7.3. This approach will allow the multidimensional findings of individual studies to be represented across the review without treating the same participant sample as independent across separate studies. However, within any individual domain-specific meta-analysis, the same participant sample will not contribute multiple dependent effect sizes as though they were independent observations. Where studies report multiple outcomes assessing the same or substantially overlapping construct, the prespecified measurement and informant hierarchy will be applied to identify the primary outcome for the main analysis. Where appropriate and statistically justified, composite effect sizes may be calculated to represent related outcomes. Where sufficient data are available, multilevel random-effects meta-analysis or robust variance estimation may be considered to account for dependence between effect sizes. The approach selected will depend on the structure of the available data, the number of studies and the

degree of dependence between reported outcomes. The method applied to each synthesis will be documented and justified.

7.3 Predefined allocation of outcomes across functional domains

To improve consistency and reduce reviewer subjectivity, predefined rules will be applied when allocating outcomes that may reasonably relate to more than one functional domain. Allocation will be determined by the principal construct assessed and the context in which the outcome is measured.

7.3.1 Handwriting

Handwriting outcomes will be assigned to the motor domain where they are evaluated through direct fine-motor performance assessments or motor speed measures, including relevant MABC/ BOT subtests (MABC; Henderson and Sugden, 1992; Henderson et al., 2007; Henderson et al., 2024) and the Bruininks–Oseretsky Test of Motor Proficiency (BOT; Bruininks, 1978; Bruininks and Bruininks, 2005, 2024) and Detailed Assessment of Speed of Handwriting (DASH; Barnett et al., 2007; DASH-2; Barnett et al., 2024) execution tasks. Where handwriting is evaluated through teacher academic rubrics, written composition quality ratings or classroom legibility assessments, the outcome will be assigned to the educational domain.

7.3.2 Attention and executive functioning

Attention and executive functioning will be assigned to the cognitive domain when assessed using direct neuropsychological performance tasks, including Stroop, Flanker, N-back and Trail Making Test measures. Behavioural rating scales, including relevant BRIEF and SDQ subscales, will also be allocated to the cognitive domain where the primary construct being assessed is attention or executive functioning.

7.3.3 Sensory processing and integration

Sensory outcomes will be allocated to the motor domain for the purposes of this review, reflecting their relevance to sensory-motor functioning and motor performance. Relevant assessment instruments may include the Sensory Profile, Tactual Performance Tests, Developmental Test of Visual Perception, Developmental Test of Visual-Motor Integration, Test of Visual Perceptual Skills and Ayres Southern California Sensory Integration Test. Where an instrument measures a distinct visual, perceptual or cognitive construct, its classification will be considered in relation to the primary construct and reported explicitly.

7.3.4 Participation.

Participation in non-school leisure and extracurricular activities will be allocated to the psychosocial domain where assessed through home-based measures, child or parent questionnaires, or interviews. Participation in school attendance, classroom activities, school clubs and other school-based activities will be allocated to the educational domain where assessed through school records, teacher reports, child reports or other school-based measures.

7.3.5 Physical education.

Physical education outcomes will be allocated according to the principal construct being measured. Attendance and participation in physical education as part of the school curriculum will be allocated to the educational domain. Motor performance assessed through standardised gross-motor tasks will be allocated to the motor domain. Physical activity levels, fitness, obesity and injuries associated with physical activity will be allocated to the health domain. Where an outcome could reasonably be assigned to more than one domain, the primary construct and assessment context will determine its allocation. The rationale for any allocation requiring interpretation will be documented during extraction.

7.4 Measurement instrument and informant priorities

To minimise measurement error and improve consistency across heterogeneous primary studies, predefined criteria will be used to determine the preferred measurement instrument and informant source for each outcome. Where multiple measures assess the same or substantially overlapping construct, the measure meeting the highest applicable priority within the relevant hierarchy will be selected for the primary meta-analysis.

For motor and cognitive outcomes, direct objective assessments administered by trained researchers or qualified clinicians will generally be prioritised over proxy-reported measures. This reflects the preference for direct performance-based assessment where the construct can be measured through standardised procedures.

For educational and psychosocial outcomes, teacher-reported measures will generally be prioritised when the outcome relates to classroom functioning, academic engagement or school-based participation. Parent-reported measures will be prioritised when the outcome concerns functioning within the home environment and everyday independence. Child self-report will generally be prioritised for subjective emotional outcomes, including anxiety and self-efficacy, where the child's age and developmental level make self-report appropriate.

For communication outcomes, direct standardised speech and language assessments administered by speech and language professionals or trained researchers will be prioritised for core language and speech outcomes. For pragmatic and functional social communication, teacher-reported measures will generally be prioritised where outcomes relate to classroom and peer interactions, followed by parent-reported measures for communication within the home and wider social environment.

For health outcomes, child self-report will generally be prioritised for subjective experiences, including health-related quality of life and fatigue, where developmentally

appropriate. Parent or caregiver reports, clinical records and contemporaneous study-specific logs will generally be prioritised for observable health-related outcomes, including physical activity, sports participation, falls and physical injuries.

Across all domains, standardised and psychometrically validated multi-item instruments will generally be prioritised over ad hoc measures, study-specific questionnaires and single-item ratings where multiple measures of the same construct are available. Where several eligible measures remain after application of the relevant hierarchy, selection will be based on the measure that most directly corresponds to the prespecified outcome construct and functional domain. The hierarchy will be applied consistently and independently of the direction or statistical significance of study findings.Where alternative informant data are available, these will be retained for descriptive reporting and, where sufficient data permit, secondary sensitivity analyses. This will allow potential differences between informants and assessment contexts to be considered without introducing unnecessary duplication into the primary meta-analysis.

8. Critical appraisal and methodological quality assessment

8.1 Quantitative studies

The methodological quality and risk of bias of quantitative studies will be assessed using the relevant Joanna Briggs Institute (JBI) Critical Appraisal Tools (Barker et al., 2023; Barker et al., 2025; Moola et al., 2020). The appraisal tool will be selected according to the study design, including the relevant checklists for analytical cross-sectional, cohort, and case-control studies (Barker et al., 2023; Moola et al., 2020). Where baseline data from randomised controlled trials are included, the suitability of the relevant JBI tool will be considered in relation to the design and the outcomes being assessed (Barker et al., 2023). The assessment will consider relevant methodological characteristics, including the

appropriateness of participant selection, measurement of exposures and outcomes, identification and management of potential confounding factors, completeness of follow-up where applicable, and the suitability of the statistical analyses.

8.2 Qualitative studies

Qualitative studies will be appraised using the Critical Appraisal Skills Programme (CASP) Qualitative Checklist (2024).

The appraisal will consider the clarity of the research aims, appropriateness of the methodology and research design, recruitment strategy, data collection procedures, relationship between researchers and participants, ethical considerations, rigour of the analysis, clarity of findings and contribution of the research. A strong focus will be given to methodological limitations, credibility, reflexivity and the relevance of the findings to the review question.

8.3 Use of appraisal findings

Methodological quality assessments will not be used as an automatic exclusion criterion. Instead, the findings will inform the interpretation and weighting of the evidence. Where appropriate, sensitivity analyses will examine whether the removal or separate consideration of studies with substantial methodological limitations changes the direction, magnitude or consistency of the findings.

9. Risk of bias across studies and certainty assessment

9.1 Reporting Bias

The potential for selective outcome reporting will be examined by comparing the outcomes, assessment instruments and subscales described in the methods sections of included studies with those subsequently reported in the results. A focus will be given to

whether studies report all relevant outcomes that were identified in their stated methods, and whether the omission of measures or subscales may influence the interpretation of the findings. Formal statistical assessments of small-study effects will not be routinely undertaken because the evidence base is expected to include substantial clinical, methodological and statistical variation across the six functional domains. Such variation may make the interpretation of funnel plot asymmetry difficult. Where a specific meta-analysis includes at least 10 sufficiently homogeneous studies, exploratory funnel plot inspection may be undertaken. Egger's regression test may also be considered where the assumptions of the method are met. Any evidence of asymmetry will be interpreted cautiously and will not be treated as definitive evidence of publication bias.

9.2 Quantitative certainty assessment

For quantitative outcomes that can be meaningfully synthesised, the certainty of evidence will be assessed using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) framework (Guyatt et al., 2008; Balshem et al., 2011). The assessment will consider the five established domains of risk of bias, inconsistency, indirectness, imprecision and publication bias. The certainty of evidence will be considered for each relevant outcome, considering the design and methodological limitations of the contributing studies. Where appropriate, the findings will be categorised as high, moderate, low or very low certainty. The rationale for any downgrading or other judgement will be documented.

9.3 Qualitative certainty assessment

Where sufficient qualitative evidence is available, confidence in the qualitative synthesis findings will be assessed using the GRADE-CERQual approach (Lewin et al., 2018). The assessment will consider methodological limitations, coherence, adequacy of data

and relevance. These components will be used to determine the extent to which the qualitative findings provide a reasonable representation of the experiences and perspectives reported across the included studies. Confidence in each synthesised qualitative finding will be considered separately, and the reasons for the resulting judgements will be documented.

10. Data synthesis strategy: a three-stage convergent mixed-methods framework

The review will adopt a convergent mixed-methods approach to integrate quantitative and qualitative evidence. This approach has been selected to allow the findings from different empirical research designs to contribute to a common understanding of the multidimensional functional profile of children with DCD. The synthesis will proceed in three stages, beginning with descriptive evidence mapping, followed by domain-specific synthesis and concluding with an integrated multidimensional interpretation.

10.1 Stage 1: Descriptive evidence mapping

The first stage will involve characterising the included studies according to their research design, geographical location, sample size, participant characteristics, age, DCD diagnostic classification, comparator group, outcome domain, measurement instruments and methodological quality. The distribution of evidence across the six predefined domains will be summarised using structured evidence tables and appropriate descriptive statistics. The process will also identify the extent to which studies include formally diagnosed DCD or probable DCD samples, whether co-occurring neurodevelopmental conditions are reported, and the extent to which outcomes are assessed through direct performance measures, standardised questionnaires or qualitative methods. This stage will provide an overview of the characteristics and distribution of the available evidence and will inform decisions about the feasibility and appropriateness of subsequent quantitative synthesis.

10.2 Stage 2: Domain-specific quantitative and qualitative synthesis

Quantitative synthesis and meta-analysis

Quantitative findings will be synthesised separately within each of the six functional domains. The decision to undertake meta-analysis will depend on the clinical, methodological and statistical comparability of the available studies. Where studies report sufficiently comparable populations, DCD classifications, comparator groups, outcome constructs and measurement approaches, quantitative pooling using random-effects meta-analysis will be considered. For continuous outcomes, Hedges' g will primarily be used to estimate standardised mean differences between children with DCD or probable DCD and the relevant comparison groups. Hedges' g incorporates a correction for small-sample bias and will be used where studies employ different measurement instruments assessing the same or substantially similar construct (Hedges, 1981). Where studies use the same measurement scale, mean differences may be calculated where appropriate.

Binary outcomes will be summarised using odds ratios or risk ratios, depending on the study design and the available data. Where sufficient comparable descriptive data are available, prevalence estimates may also be synthesised using appropriate proportion meta-analysis methods, with transformations selected according to the distribution of the data. Random-effects models will be used to account for anticipated variation between primary studies (Deeks et al., 2019). The restricted maximum-likelihood estimator (REML) will be used to estimate between-study variance (τ^2), where appropriate (Deeks et al., 2019; Langan et al., 2019). Statistical heterogeneity will be examined using I^2 and τ^2 statistics, alongside 95% confidence intervals. Where sufficient studies and appropriate data are available, 95% prediction intervals will also be reported to indicate the anticipated distribution of effects across comparable settings (Deeks et al., 2019). Meta-analysis will not be undertaken solely because two or more studies report an outcome with a similar general label. Pooling will

require sufficient similarity in the populations, diagnostic classifications, outcome constructs, assessment procedures and study designs.

Where substantial clinical or methodological differences prevent meaningful quantitative pooling, findings will be synthesised narratively. Narrative synthesis will follow the principles of the Synthesis Without Meta-analysis (SWiM) reporting framework (Campbell et al., 2020) and established approaches to the systematic synthesis of quantitative findings without meta-analysis. The direction, magnitude and consistency of findings will be considered, alongside the methodological quality and limitations of the contributing studies. Structured evidence tables will be used to support comparisons between studies and across the six domains. Where a study contributes multiple dependent effect sizes to the same domain, these will not be treated as independent observations. The prespecified measurement hierarchy will be used to identify a primary outcome where appropriate. Alternatively, composite effect sizes, multilevel meta-analysis or robust variance estimation may be considered where the available data and study structure support their use.

Qualitative synthesis

Qualitative findings will be synthesised using thematic synthesis, following the approach developed by Thomas and Harden (2008). The analysis will involve three stages. First, findings from the included qualitative studies will be examined and coded line by line to identify concepts and recurring patterns relevant to the review question. Second, related codes will be organised into descriptive themes that represent the findings reported across the primary studies. Third, analytical themes will be developed to provide a higher-level interpretation of the evidence and contribute to understanding the broader experiences and characteristics associated with DCD. Where reported, particular attention will be given to the experiences and perspectives of children with DCD, alongside those of parents, teachers and

other relevant informants. The synthesis will consider both areas of agreement and differences between informants and across home, educational and clinical settings. Qualitative findings will be organised in relation to the six functional domains where the reported data permit. Findings that do not fit clearly within a single domain will be retained and considered within the wider integrated synthesis rather than excluded solely because of their cross-domain nature.

10.3 Stage 3: integrated multidimensional synthesis and conceptual framework development

In the final stage, quantitative and qualitative findings will be considered together within the predefined multidimensional framework. The integration will examine areas of convergence, inconsistency and divergence between quantitative and qualitative evidence. It will also consider the extent to which findings are consistent across different study designs, diagnostic classifications, informants and assessment settings. Potential relationships between functional domains will be identified and mapped where multiple studies report relevant associations. For example, associations between motor performance and executive functioning, academic achievement or psychosocial adjustment may be considered where sufficient empirical evidence is available. These relationships will be interpreted cautiously. Associations between domains will not be presented as evidence of causal developmental pathways or developmental cascades unless supported by appropriate longitudinal or theoretically informative evidence. The integrated synthesis will be used to identify characteristics that may be particularly relevant to understanding the presentation of DCD within the primary school environment. The findings will inform the development of an empirical conceptual framework to support the subsequent generation of candidate items for the Key Stage 2 Teacher Awareness Scale.

Empirical criteria for inclusion in the conceptual framework

Two complementary criteria will be used to identify characteristics that may have practical relevance to the school context. Firstly, where descriptive prevalence or frequency data are available, a characteristic will be considered for inclusion where it is reported to affect at least 20% of children with DCD or probable DCD. Secondly, where comparative data are available, a characteristic will be considered for inclusion where children with DCD or probable DCD demonstrate a statistically significant difference from the relevant comparison group, with a minimum effect size of Hedges' g = 0.20, representing a small, standardised difference.

These criteria will be used as operational indicators to guide candidate characteristic selection rather than as diagnostic thresholds or definitive indicators of clinical importance. The number of studies supporting each characteristic, the consistency of the findings, methodological quality and certainty of evidence will also be considered. Characteristics that do not meet either threshold may nevertheless be retained for consideration where qualitative evidence indicates that they are relevant to children's experiences or where the findings identify an important but under-researched aspect of functioning. The final conceptual framework will therefore reflect the overall strength, consistency and relevance of the evidence rather than relying exclusively on numerical thresholds.

11. Additional outcomes and planned subgroup analyses

In addition to the primary domain-specific outcomes, the review will examine the magnitude of differences between children with DCD or probable DCD and comparator groups, the reported frequency, severity and prevalence of functional difficulties, and the relationships between motor and non-motor outcomes. Where sufficient data are available, differences between formally diagnosed DCD and probable DCD samples will be explored.

The review will also examine whether outcomes differ between children with DCD alone and those with co-occurring ADHD, ASD, DLD or dyslexia.

Subgroup analyses will be undertaken only where there are sufficient studies and relevant data to support meaningful comparison. Potential subgroup differences will be interpreted cautiously, particularly where sample sizes are small or diagnostic classifications and assessment methods differ substantially. Where appropriate, sensitivity analyses will examine the influence of methodological quality, diagnostic classification, outcome measurement and informant source on the main findings.

12. Protocol amendments and transparency

Any substantive amendments to the eligibility criteria, search strategy, outcome definitions, data extraction procedures or planned synthesis methods will be documented. The reason for each amendment, the date on which it was made and its potential implications for the review will be recorded. Where applicable, amendments will also be reflected in the PROSPERO registration and reported transparently in the final publication. The review will distinguish between methods specified prospectively in this protocol and any analytical decisions made after examination of the included evidence.

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Appendix 1

Search strategy

Search strategies were adapted to the search functionality and indexing capabilities of each database. Wherever available, title and abstract fields were searched together. Where combined searching was unavailable, title and abstract searches were conducted separately. For APA PsycINFO and ERIC, accessed through their respective platforms, title and abstract searches were conducted separately because the interfaces did not permit the required combined-field search. The abstract search results were exported for both databases, as they produced a greater retrieval yield. A comparison of the retrieved records indicated that the publications identified through the title searches were also captured by the abstract searches. Therefore, only the abstract search results were retained for export and subsequent deduplication.

Database classification and search specifications

The six databases were organised into four core databases and two supplementary databases.

Core databases: PubMed (NLM), APA PsycINFO (EBSCOhost), CINAHL Complete (EBSCOhost) and ERIC (EBSCOhost).

Supplementary databases: APA PsycArticles (EBSCOhost) and Academic Search Elite (EBSCOhost).

The four core databases were selected to provide coverage of the biomedical, psychological, clinical and educational literature. APA PsycArticles and Academic Search Elite were included as supplementary sources to extend the retrieval of relevant publications.

Database-specific search limits

APA PsycINFO: Searches were conducted using Index Terms and Abstract fields. The Childhood (birth–12 years) and Adolescence (13–17 years) age filters were applied, alongside the peer-reviewed journal filter and publication date limits of 1994–2028. Both age categories were included to maximise retrieval of potentially eligible studies involving the target age group and mixed-age samples.

ERIC: Searches were conducted separately using the available Descriptor and Abstract fields. The abstract search results were exported, as described above. The peer-reviewed and Primary/Elementary Education filters were applied, alongside the English-language restriction and publication date limits of 1994–2028.

CINAHL Complete: Searches used the available subject headings (MM) and text-word fields (XB). The peer-reviewed, All Child and English-language filters were applied, with publication dates restricted to 1994–2028.

PubMed: Searches used Medical Subject Headings (MeSH) and Title/Abstract fields. English-language and publication date restrictions (1994–2027/2028) were applied.

APA PsycArticles: As a supplementary database, searches used the available subject descriptors and text-word fields. The peer-reviewed and Childhood (0–12 years) filters were applied, with publication dates restricted to 1994–2028. The Adolescence filter used in APA PsycINFO was not applied.

Academic Search Elite: Searches used the available text-word fields (XB). The peer-reviewed and Children (0–12 years) filters were applied, alongside publication date restrictions of 1994–2028.

Exclusion terminology: The Boolean NOT operator was incorporated into the database-specific search strategies to exclude records relating to cerebral palsy, muscular dystrophy and intellectual disability, consistent with the predefined exclusion criteria. The relevant search fields and syntax were adapted to the functionality of each database. See table 2 below for exact search strings.

Table 2 Search strings

Search number	Date of search	Database & platform	Exact search syntax	Applied filters	Record yield (n)
#1	13th October 2026	PubMed (NLM)	(("child"[MeSH Terms] OR "schools"[MeSH Terms] OR "child*"[Title/Abstract] OR "school age*"[Title/Abstract] OR "primary school*"[Title/Abstract] OR "student*"[Title/Abstract] OR "pediatric*"[Title/Abstract]) AND ("motor skills disorders"[MeSH Terms] OR "developmental coordination	English language; Exclude Preprints; Dates: 1994 – latest 2027/2028	3,179

			disorder"[Title/Abstract] OR "DCD"[Title/Abstract] OR "dyspraxi*"[Title/Abstract] OR "probable DCD"[Title/Abstract])) NOT ("cerebral palsy"[Title/Abstract] OR "muscular dystrophy"[Title/Abstract] OR "intellectual disability"[Title/Abstract])		
#2	19th October 2026	APA PsycINFO (APA PsycNet) Search used.	(Index Terms: (Students OR Schools) OR Abstract: (child* OR "school age*" OR schoolage* OR "school-age*" OR "primary school*" OR "elementary school*" OR student* OR "middle school*" OR pupil* OR girl* OR boy* OR pediatric* OR paediatric*) AND (Index Terms: Developmental Coordination Disorder OR Abstract: ("developmental coordination disorder" OR "developmental co-ordination disorder" OR DCD OR "developmental motor coordination disorder" OR "specific developmental disorder of motor function" OR dyspraxi* OR "motor coordination disorder" OR	Peer-Reviewed Journals; English language; Childhood (birth – 12) & Adolescence (13 – 17); 1994 –2028	4,800

			"clumsy child syndrome" OR "probable DCD" OR "p-DCD" OR "pDCD")) NOT Abstract: ("cerebral palsy" OR "muscular dystrophy" OR "intellectual disability")		
-	19th October 2026	APA PsycINFO (APA PsycNet) Title Search not used	(Index Terms: Students OR Index Terms: Schools OR Title: (child* OR "school age*" OR schoolage* OR "school-age*" OR "primary school*" OR "elementary school*" OR student* OR "middle school*" OR pupil* OR girl* OR boy* OR pediatric* OR paediatric*) AND (Index Terms: Developmental Coordination Disorder OR Title: ("developmental coordination disorder" OR "developmental co-ordination disorder" OR DCD OR "developmental motor coordination disorder" OR "specific developmental disorder of motor function" OR dyspraxi* OR "motor coordination disorder" OR "clumsy child syndrome" OR "probable DCD" OR "p-DCD" OR "pDCD")) NOT Title: ("cerebral palsy" OR	Peer-Reviewed Journals; English language; Childhood (birth – 12) & Adolescence (13 – 17); 1994 –2028	4683

			"muscular dystrophy" OR "intellectual disability")		
#3	14th October 2026	CINAHL Complete (EBSCOhost)	MM (Child) OR MM (Schools) OR XB (child* OR "school age*" OR schoolage* OR "school-age*" OR "primary school*" OR "elementary school*" OR student* OR "middle school*" OR pupil* OR girl* OR boy* OR pediatric* OR paediatric*) AND MM ("motor skills disorders") OR XB ("developmental coordination disorder" OR "developmental co-ordination disorder" OR DCD OR "developmental motor coordination disorder" OR "specific developmental disorder of motor function" OR dyspraxi*) OR XB ("motor coordination disorder" OR "clumsy child syndrome") OR XB ("probable DCD" OR "p-DCD" OR "pDCD") NOT XB ("cerebral palsy" OR "muscular dystrophy" OR "intellectual disability")	Peer-Reviewed; All Child; English; 1994 –2028	6,961
#4	14th October 2026	ERIC (EBSCOhost)	DE (children) OR DE (schools) OR AB (child* OR "school age*" OR schoolage*	Peer-Reviewed; Primary	3,999

		(Abstract search used)	OR “school-age*” OR "primary school*" OR "elementary school*" OR student* OR "middle school*" OR pupil* OR girl* OR boy* OR pediatric* OR paediatric*) AND DE (neurodevelopmental disorders) OR AB ("developmental coordination disorder" OR "developmental co-ordination disorder" OR DCD OR "developmental motor coordination disorder" OR "specific developmental disorder of motor function" OR dyspraxi*) OR AB ("motor coordination disorder" OR "clumsy child syndrome") OR AB ("probable DCD" OR "p-DCD" OR "pDCD") NOT AB (“cerebral palsy” OR “muscular dystrophy” OR “intellectual disability”))	Education /Elementary Education, Grade 2, Grade 3, Grade 4, Grade 5, Grade 6; 1994–2028	
-	14th October 2026	ERIC (EBSCOhost) (Title search Not used)	DE (children) OR DE (schools) OR TI (child* OR "school age*" OR schoolage* OR “school-age*” OR "primary school*" OR "elementary school*" OR student* OR "middle school*" OR pupil* OR girl*	Peer-Reviewed; Primary Education /Elementary Education, Grade 2, Grade 3,	3,963

			OR boy* OR pediatric* OR paediatric*) AND DE (neurodevelopmental disorders) OR TI ("developmental coordination disorder" OR "developmental co-ordination disorder" OR DCD OR "developmental motor coordination disorder" OR "specific developmental disorder of motor function" OR dyspraxi*) OR TI ("motor coordination disorder" OR "clumsy child syndrome") OR TI ("probable DCD" OR "p-DCD" OR "pDCD") NOT TI (“cerebral palsy” OR “muscular dystrophy” OR “intellectual disability”)	Grade 4, Grade 5, Grade 6; 1994–2028	
#5	15th October 2026	APA PsycArticles (EBSCOhost)	DE ("Students") OR DE ("Schools") OR XB (child* OR "school age*" OR schoolage* OR "school-age*" OR "primary school*" OR "elementary school*" OR student* OR "middle school*" OR pupil* OR girl* OR boy* OR pediatric* OR paediatric*) AND DE ("developmental coordination disorder") OR XB ("developmental coordination	Peer-Reviewed; Childhood (0-12 yrs); 1994–2028	763

			disorder" OR "developmental co-ordination disorder" OR DCD OR "developmental motor coordination disorder" OR "specific developmental disorder of motor function" OR dyspraxi*) AND XB ("motor coordination disorder" OR "clumsy child syndrome") AND XB ("probable DCD" OR "p-DCD" OR "pDCD") NOT XB ("cerebral palsy" OR "muscular dystrophy" OR "intellectual disability")		
#6	15th October 2026	Academic Search Elite (EBSCOhost)	XB (child* OR "school age*" OR schoolage* OR "school-age*" OR "primary school*" OR "elementary school*" OR student* OR "middle school*" OR pupil* OR girl* OR boy* OR pediatric* OR paediatric*) AND XB ("developmental coordination disorder" OR "developmental co-ordination disorder" OR DCD OR "developmental motor coordination disorder" OR "specific developmental disorder of motor function" OR dyspraxi*) OR XB ("motor coordination disorder" OR "clumsy child	Peer-Reviewed; Children (0-12 yrs); 1994–2028	1,766

			syndrome") OR XB ("probable DCD" OR "p-DCD" OR "pDCD") NOT XB ("cerebral palsy" OR "muscular dystrophy" OR "intellectual disability")		
Total		All Databases	Combined bibliographic yield across 6 databases	Deduplication in progress	21,468