International clinical practice recommendations on the definition, diagnosis, assessment, intervention, and psychosocial aspects of developmental coordination disorder: pocket version

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DURATION OF THE VALIDITY

These international clinical practice recommendations were written and received consent in 2017. They are valid until the next revision, at the latest until 31 December 2022. A revision is planned about every 5 years by the international representative group. If new knowledge or

experience have considerable influences on the current recommendations, the representative group will quickly disseminate the latest information.

INTRODUCTION

The present document is the pocket version of the international clinical practice recommendations (CPR) for developmental coordination disorder (DCD).

The pocket version contains the most important information, algorithms, and recommendations from the CPR–DCD long version.[1] For all background information, methods, and explanations see the long version.[1]

The terminology in this document is consistent with that of the International Classification of Functioning, Disability and Health (ICF).[2] The current classification systems, the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5),[3] and the International Statistical Classification of Diseases and Related Health Problems, 10th Revision (ICD-10),[4] use different terminology to describe the population of concern. The term ‘developmental coordination disorder’ is used throughout this document.

Since children and adults tend to be treated by different specialists in different contexts, these recommendations are presented in two sections: (1) children (section A) and (2) adolescents and adults (section B). Within these two sections, the recommendations are specific for these target groups.

As a clinical practice guideline, the international CPR–DCD are not designed as a rule explaining what to do or how to act in a legal situation. These recommendations cannot be a basis for legal sanctions.

Flowchart assessment, treatment indication and planning

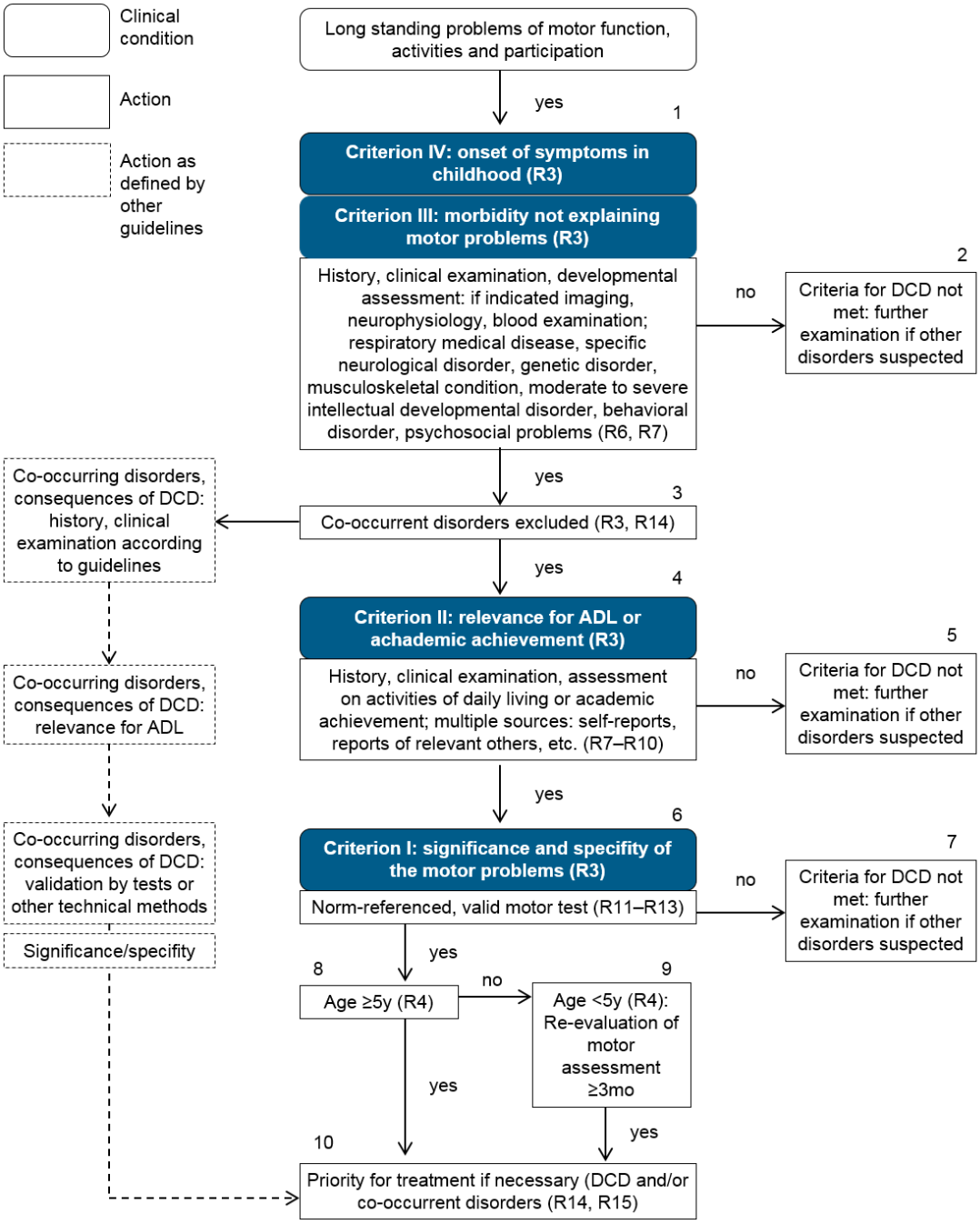

Figure 1: Flowchart assessment, treatment indication, and planning. DCD, developmental coordination disorder; ADL, activities of daily living; R, recommendation.

A Children

1 Definition and terminology

R1 We recommend the use of the term Developmental Coordination Disorder (DCD) for individuals fulfilling the DCD criteria (Recommendation 3) in all research publications.
For clinical and educational purposes we recommend the term DCD in countries which adhere to the DSM-5 classification (315.4).
In countries where ICD-10 has legal status, we also recommend the term Specific Developmental Disorder of Motor Function (SDDMF) (F82, ICD-10).

GCP ⇑⇑

2 Diagnosis and assessment

2.1 Definition and criteria

R2 We recommend that the diagnosis of DCD is made by a medical professional or a multi-professional team* suitably qualified to assess the individual according to the specified criteria.

GCP ⇑⇑

R3 We recommend the following criteria for the diagnosis of DCD. These criteria follow closely those proposed in DSM-5 with some minor changes, including the order of criteria III and IV:

GCP ⇑⇑

I. 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.
II. The motor skills deficit described in criterion I significantly and persistently interferes with the activities of everyday living appropriate to chronological age (e.g. self-care and self-maintenance and mobility) and impacts upon academic/school productivity, prevocational and vocational activities, leisure, and play.
III. The motor skills deficits are not better accounted for by any other medical, neurodevelopmental, psychological, social condition, or cultural background.

*In some countries the diagnosis can only be made by a medical doctor. This means that the multi-professional team must include a medical doctor.

IV. Onset of symptoms in childhood (although not always identified until adolescence or adulthood).

Comment:

- Criterion I: The symptoms of DCD may include slowness and/or inaccuracy of motor skills performed in isolation or in combination.
- Criterion III: This addresses issues of aetiology with regard to DCD and is designed to facilitate differential diagnosis.
  Examples of conditions which may rule out or influence the diagnosis of DCD are:
  (1) Medical conditions: movement disorders with known aetiologies (e.g. cerebral palsy, muscular dystrophy, childhood arthritis), side effects of drugs (e.g. neuroleptics, chemotherapy, sedatives), sensory problems (e.g. substantial visual impairments or impairments of the vestibular organ)
  (2) Other neurodevelopmental disorders (e.g. severe intellectual disabilities) or other psychological disorders (e.g. anxiety, depression), or other psychological conditions (e.g. attentional problems) as primary causes of motor problems
  (3) Social conditions (e.g. deprivation, cultural diversity)

  Note: It may be difficult to differentiate between conditions that may be causal and those that may co-occur.* For example, a child from a culture, which limits physical activity or which provides little opportunity for motor learning may present like a child with DCD (at least initially). A child with ADHD might appear to have movement problems, which are in fact caused by impulsivity and/or inattention. Especially in unclear cases, multiprofessional or repeated assessments can be helpful to differentiate.
- Criterion IV: The onset of symptoms is usually evidenced in infancy and childhood.

The following recommendations are designed to offer guidance as to how to arrive at an accurate diagnosis of DCD. Instead of being listed according to the criteria I to IV they are given in the opposite order which is in line with how a medical professional would usually proceed with his/her examination. Thus, the process starts with: (1) considering the age and context of the child (criterion IV),

*The term 'co-occurring' has been used throughout these recommendations in preference to 'comorbid' to reflect that two or more conditions are present but a common aetiology is not known and that this term is consistent with concurrent or overlapping.

(2) ruling out other medical conditions causing motor problems (criterion III), (3) taking into account the impact on activities and participation (criterion II), (4) quantifying the motor impairment (criterion I).

It should be noted, however, that there are other pathways to diagnosis. For example, a child might be identified as having difficulties within a school system and be first assessed by a therapist or educational psychologist. Their assessments may show the child meets criteria I, II, and IV and only then might the child be referred to a medical doctor to exclude other conditions.

R4 The symptoms of DCD are usually apparent in the early years. However, due to the large variability in normal motor development, we recommend that a formal diagnosis of DCD under the age of 5 years is only made in cases of severe impairment. In such instances, the decision to make a diagnosis should be based on the findings from at least two motor assessments carried out at least 3 months apart. GCP⇑⇑⇑

Comment: Based on the persistence and the extent to which the motor problems interfere with daily life (criterion II), and after excluding other conditions that may explain the motor problems (criterion III), it should be decided whether any form of intervention should be recommended at this stage. Options will include formal intervention, the provision of opportunities for motor learning in a less formal setting, or advice plus clinical supervision.

R5 For countries using ICD-10: for motor problems in individuals who do not meet criteria for DCD but where criterion III is fullfilled, we recommend the ICD-10 categories of R26, R27, or R29 be applied if appropriate. GCP⇑⇑⇑

2.2 The process of assessment

R6 To begin any assessment process, we recommend careful history taking to support the application of all four criteria. GCP⇑⇑⇑

Comment: Children: history should include the following aspects:

(1) Parental report
- Reasons for referral and presenting problems.
- Family history – to include information about the presence

of developmental disorders or other genetic conditions (e.g. muscular disorders in family members).

- Medical history – to include information about major accidents, diseases, neurological disorders, relevant or associated psychological problems, sensory problems (e.g. documented in previous assessments, new symptoms arising), medication regime where relevant.
- Developmental history – to include information about pregnancy, birth, milestones – motor and non-motor; history of motor engagement (e.g. family habits, home environment, access to motor activities), social competences, and ability to interact with others.
- Educational history – educational progress through nursery, preschool, kindergarten, and grade school, and information about any measures of academic achievement.
- Impact of the condition – including impact on ADL and participation.
- Contextual factors – including amount and type of previous and current intervention/support; description of current family structure, social network and relationship status (e.g. social support, living with family, extended relatives, guardians, friends or others), social-economic status, personal resources.

(2) Sources other than parents

- Formal documents and reports from relevant professionals and significant others (e.g. nursery, pre-school, kindergarten and school teachers, educational psychologists, therapists). These might include:
  (i) Written information or interview data from other family members or significant adults if appropriate and consent is given.
  (ii) Reports about motor functions from physical education teachers or therapists as well as other areas of interest (as per the ICF): participation and levels of physical activity, environmental factors, support systems, individual/personal factors, etc.
  (iii) Reports concerning cognitive functions (e.g. IQ data, scores on working memory, attention, other tests).
  (iv) Reports concerning academic achievement.
  (v) Reports concerning behaviour that might bear on differential diagnosis and/or possible dual diagnosis (e.g. ADHD, ASD, learning disorders).

(3) Child
- Self-reports
- Adapted questionnaires (see below)

2.2.1 Criterion III and II: Clinical examination

R7 We recommend problem-oriented clinical observation and examination. GCP⇑⇑

Comment: The clinical observation/examination should include an evaluation of the following.
- Neurological status (e.g. exclusion of other movement disorders or neurological dysfunctions, a rapid change or deterioration in motor functioning).
- Medical status (e.g. obesity, hypothyroidism, genetic syndromes, malnutrition, joint problems).
- Sensory status (e.g. vision, audition, tactile and proprioceptive functioning, vestibular functioning).
- Other neurodevelopmental disorders and psychological status (e.g. ASD-type behaviours, self-esteem, depression, anxiety).
- Cognitive status (e.g. attention, memory, verbal and non-verbal reasoning, executive functioning), especially if there is a history of learning difficulties at school.
- Observation of motor activities (e.g. playing, drawing, dressing, undressing).

2.2.2 Criterion II: Specific history and questionnaires

R8 We recommend that the complete assessment considers ADL (e.g., self-care and self-maintenance), academic/school productivity, prevocational or vocational activities, leisure, sports, and play. We recommend that this information be gathered from multiple sources such as: self-reports, reports of parents, health care/educational professionals, and relevant others. GCP⇑⇑

Comment: Because language is involved, handwriting and keyboarding are areas of motor competence that should be assessed separately.

R9 We recommend that, if possible, the measure(s) used to collect GCP⇑⇑

information on the DCD related characteristics of an individual, has appropriate standardization. These measures (e.g., questionnaires, observational assessment tools) may be completed by parents, teachers, the child himself/herself, or significant others in the child's life.

R10 We suggest that that the DCDQ-R* is used in a clinical setting as supplementary information in the diagnosis of children with DCD. LOE 2, level B

Comment: Athough many questionnaires (e.g. MABC-2-C, Motor Observation Questionnaire for Teachers, DCDDaily Questionnaire) are available, the DCDQ's psychometric properties have been studied most extensively and therefore can be suggested as offering supplementary information on motor-related problems.
The DCDQ-R has been shown to be a useful adjunct in studies using clinical samples. However, the DCDQ-R should not be used in population-based screening as it has been shown that the sensitivity is too low to identify children with DCD in the general population.

2.2.3 Criterion I: Objective assessment of motor proficiency

R11 We recommend the use of an appropriate motor test that measures different areas of motor competence, has good reliability and validity, and has population-based standardization (appropriately norm-referenced). The test should measure different types of motor skills to describe one's motor competence or difficulties. GCP⇑⇑

Comment: Because language is involved, handwriting and keyboarding are areas of motor competence that should be assessed separately with standardized and psychometrically sound measures.

R12 We suggest criterion I be satisfied by using the MABC-2 or the BOT-2. LOE 2, level B

Comment: At present there are no biological markers that provide definitive cut-off points for diagnosing DCD (or any other developmental disorder). Consequently, statistically defined criteria must suffice.
In the absence of generally accepted cut-offs for identifying DCD, and in addition to the other criteria being satisfied, it is

*The term 'DCDQ-R' is used throughout this document and is consistent with the term DCDQ'07, which is also used to refer to the revised version of the DCDQ.

recommended that when using the MABC-2 or other equivalent objective measures, the 16th centile (1 SD) for the total score (standard score of 7 or less) should be used as a cut-off.
Scores at or below the fifth centile should be considered as unequivocal evidence of DCD, provided the child meets all other criteria.

R13 If there are clear indications of increased risk for DCD from the history and clinical examination (criteria IV, III, and II), and the results of one standardized motor test are above specified cut-off criteria, we recommend the use of a second standardized motor test or a second examination by another expert. GCP⇑⇑

Comment: All studies confirm that the currently available motor tests have a sensitivity below 90%. That means at least 10% of children with relevant motor problems are missed by one test (e.g. the MABC-2). If there are clear clinical signs, a second assessment should take place with a different test (e.g. BOT-2) along with examination.

Research note 1 Further studies of reliability and validity on the clinical reference standard are required.

2.3 Co-occurring disorders

R14 Owing to the high degree of co-occurrence among developmental disorders, we recommend that dual or multiple diagnoses including DCD and any other disorder be given when appropriate. To ensure that this is done properly, appropriate assessments should be undertaken and interpreted according to established clinical guidelines. GCP⇑⇑

Comment: To ensure that co-occurrence is not missed when assessing a person referred for problems in the motor domain, difficulties in other areas of development and educational attainment should be recorded and any necessary further assessment and intervention planned.

2.4 Psychosocial issues

S1 Research evidence shows that, for many children with DCD, substantial psychosocial difficulties often have an impact on engagement, participation, psychosocial well-being, and quality of life. Individual and environmental factors will work together, influencing both the expression and management of these associated issues. GCP⇑⇑⇑

Flowchart treatment planning, intervention, and evaluation

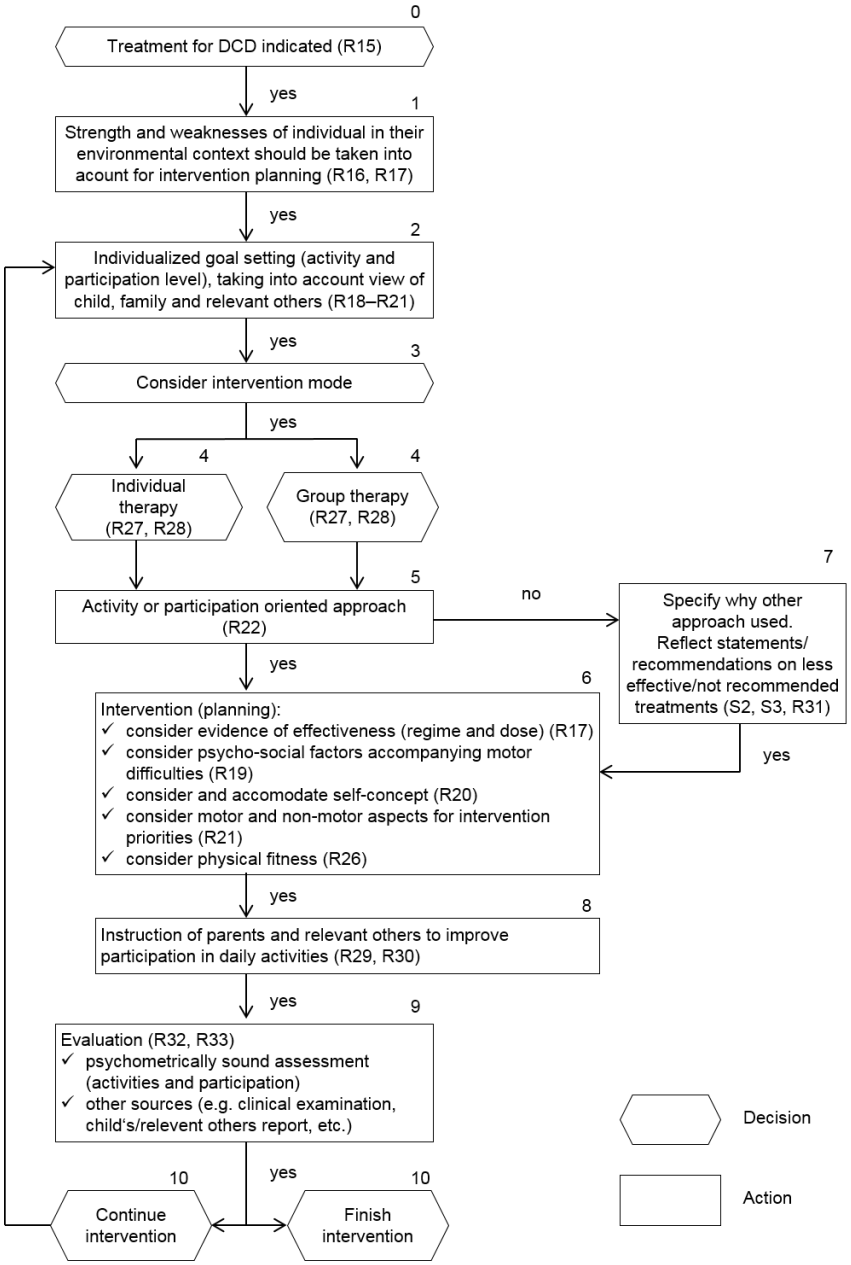

Figure 2: Flowchart treatment planning, intervention, and evaluation. DCD, developmental coordination disorder; R, recommendation; S, statement.

3 Intervention

3.1 Intervention: general principles

R15	Children with the diagnosis DCD should receive intervention if current indications are present.	LOE 1, level A
R16	When planning a programme of intervention, we recommend that both the strengths and weaknesses of the individual in their environmental context should be taken into account in order to improve motor function, activity, and participation. Comment: The environment in which the individual functions (e.g. family, school, community) should be considered so that the specific programme of intervention is consistent with the individual's goals and opportunities for learning. In some children with DCD, compensatory and environmental support with follow-up may be sufficient. Information sources for planning a programme of intervention include history, clinical examination, motor test results, and, if possible, parents' reports, self-report, teachers' reports, report of relevant others, and, if available, validated questionnaires.	GCP⇑⇑
R17	When planning intervention, evidence of effectiveness including regime and dose should be considered. In case of co-occurring disorders, we recommend that priorities for intervention are set according to the type and severity of each disorder, and in consultation with the child and the family. The question of which problem has the most severe impact on the individual's functioning, activity, and participation must be addressed. However, if motor difficulties are not considered at one point in time, they may have an impact at a later date. Thus, priority setting should be reviewed over time as they may change.	GCP⇑⇑
R18	For intervention planning, individualized goal setting is essential. We recommend setting goals that address the levels both of activities and participation. We recommend taking into account the child's and family's viewpoint and the viewpoint of relevant others for goal setting.	GCP⇑⇑
R19	When planning intervention, psychosocial factors that may accompany a child's motor difficulties should be considered. Where appropriate, standardized and validated assessments of these factors	GCP⇑⇑

should be used, with referral to relevant and additional services made if needed.

Comment: Monitoring and surveillance of psychosocial factors should be integral throughout intervention.

R20	We recommend that self-concept be assessed and accommodated in treatment (planning). Self-concept may be assessed through child-reported rating scales.	GCP⇑⇑
R21	We recommend intervention priorities be established by considering both motor and non-motor aspects of the individual's functioning. Comment: Individual dispositions and psychosocial factors (e.g. motivation, presence of psychiatric disorders) may limit the effectiveness of treatment. Compensatory techniques (e.g. equipment, environmental adjustments) and social support may enhance the treatment effects.	GCP⇑⇑

3.2 Therapeutic approaches

R22	If an intervention is to be provided then we recommend that activity-oriented and participation-oriented approaches be used as a means to improve general, fundamental, and specific motor skills in individuals with DCD. Comment: Activity-oriented or participation-oriented approaches are interventions that focus on ADL (including personal care, play, leisure/sports, arts and crafts, and academic, prevocational, and vocational tasks) within the intervention process. Intervention must also aim to generalize to daily function, activity, and participation across environmental contexts in which the child needs to perform. Activity-oriented or participation-oriented approaches should involve family, teacher, significant others, and/or environmental support to cascade and promote essential opportunities for practice and generalization. This is necessary to give enough opportunity for motor learning and consolidation of skills. Formally investigated activity-oriented or participation-oriented approaches, based on this and the previous review, include but are not limited to task-specific training, NTT, and cognitive orientation to daily occupational performance approach (CO-OP).	LOE 1, level A

R23	If handwriting problems are present in children with DCD, we suggest activity-oriented and participation-oriented intervention (including ways to self-evaluate performance) to improve the quality of the handwriting.	LOE 2, level B
R24	If handwriting problems are present in children with DCD, in addition to activity-oriented and participation-oriented handwriting intervention, we suggest teaching keyboarding from early on, to improve the legibility and neatness of schoolwork.	GCP⇑⇑⇑
S2	Some interventions that aim to improve body functions and structures may be effective, but there is limited evidence whether body-function-oriented interventions are effective in improving activity and participation in children with DCD.	GCP⇑⇑⇑
S3	The following interventions cannot be recommended as empirical support, because their effectiveness is inconclusive, absent, or negative: (1) the evidence is inconclusive for the effectiveness of sensory integration therapy as an intervention for children with DCD; (2) the evidence is inconclusive for the effectiveness of kinesthetic sensitivity training for children with DCD. Other approaches used in children with DCD (e.g. brain-gym, complementary and alternative therapies) have not been systematically evaluated so cannot be recommended.	GCP⇑⇑⇑
R25	Active video games may be recommended as a useful adjunct to more traditional activity-oriented and participation-oriented interventions in children with DCD, in supervised settings or group intervention.	LOE 2, level B
R26	We recommend that physical fitness (e.g. strength, endurance, flexibility) is considered as part of intervention planning.	GCP⇑⇑⇑

3.3 Interventions delivery mode: (group) settings

R27	We recommend considering small group intervention because it can be effective.	GCP⇑⇑⇑
R28	We suggest considering carefully if and when a group setting is appropriate for a child. Comment: We suggest considering the level of anxiety and movement skills of the children when composing groups (and their	GCP⇑⇑⇑

size) for group-based intervention. The optimum staff to child ratio has yet to be ascertained.

3.4 Interventions: intensity and scheduling

S4	Current information on the effectiveness of intervention does not allow clear recommendations on intensity, duration, and timing because comparison studies are lacking. Mean duration of new effective studies was 10 weeks (range 2–18wk). Overall, long training protocols (20–30h) do not seem to be more effective than shorter ones (10–15h) when measured using standardized tests assessing body function/activity. However, these tests may not capture the transfer of skills to complex situations and the level of automaticity needed in everyday life.	GCP⇑⇑
Research note 2	Additional comparison studies on types of intervention, intensity, and duration are required. Group versus individual approaches must also be evaluated.	

3.5 The role of environmental factors

R29	We recommend that individuals with DCD are given ample opportunity to practise movement skills in order to learn them and to participate in daily activities (e.g. at home, school, in community and leisure settings, and in sports). Comment: Once they have learned the basic skills through targeted intervention (which provided them with appropriate feedback and strategies), individuals with DCD should also be given additional opportunities and time to practise these required skills in context, to develop an adequate level of competency. This is particularly true of skills that are complex in nature or that require high levels of planning. We recommend professionals support parents, teachers, significant others, and other stakeholders to encourage the children to participate in relevant activities at home and school, and in the community (e.g. games that require diverse movement activities, extracurricular sports, cultural events, etc.) to promote their practice and newly acquired motor skills.	GCP⇑⇑
R30	We suggest that involved professionals give parents and relevant others (teachers, etc.) advice on the specific abilities and the	GCP⇑⇑

problems of the child with DCD and how to help them improve their motor functions and participation in daily activities (at home, school, leisure, sport, and cultural activities).

Research note 3	There is a lack of studies reporting outcomes on motor skills after systematic intervention conducted at the school or parent level. There is only extrapolated evidence to show that it may work at the school level.	

3.6 Somatic interventions: drugs, additives

R31	We do not suggest fatty acids + vitamin E to improve motor functions as there is no evidence for an effect on motor functions.	LOE 2, level B negative
S5	Where there is co-occurring DCD and ADHD, it is known that methylphenidate in combination with further intervention is helpful in overcoming functional problems. Methylphenidate has been shown to improve some aspects of apparent motor function. The effectiveness of other medications and/or supplements has not been systematically evaluated.	GCP⇑⇑

3.7 Monitoring

R32	We recommend that ongoing behavioural observation be performed during the period of intervention to provide information about the necessity of adjustments to a treatment plan and/or to facilitate the adaptation of an individual's intervention goals.	GCP⇑⇑
R33	We recommend that formal standardized outcome measures are used for assessment, and are repeated at the end of intervention or at least every 3 months if intervention is longer, to evaluate the effects of an intervention programme and goal attainment and to determine whether further intervention is required. We recommend to evaluate intervention effects using psychometrically sound outcome assessment tools that capture the levels of both activities and participation. We also recommend other evaluation sources including clinical examination, the child's self-report, family report, teacher/kindergarten reports, questionnaire information, activity monitoring, etc.	GCP⇑⇑

B Adolescents and adults

1 Terminology, diagnosis, and assessment

R34 We recommend the following criteria for the diagnosis of DCD. These criteria follow closely those proposed in DSM-5 with some minor changes, including the order of criteria III and IV. GCP⇑⇑⇑

I. 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.

I. The motor skills deficit described in criterion I significantly and persistently interferes with the activities of everyday living appropriate to chronological age (e.g. self-care, self-maintenance, and mobility) and affects academic productivity, prevocational and vocational activities, leisure, and work.

II. The motor skills deficits are not better accounted for by any other medical, neurodevelopmental, psychological, social condition, or cultural background.

V. Onset of symptoms in childhood (although not always identified until adolescence or adulthood).

Comment:

- Criterion I: the symptoms of DCD may include slowness and/or inaccuracy of performance of motor skills in isolation or in combination.
- Criterion III: this criterion addresses issues of aetiology with regard to DCD and is designed to facilitate differential diagnosis.
  Examples of conditions that may rule out or influence the diagnosis of DCD are:
  (1) Medical conditions: movement disorders with known aetiologies (e.g. cerebral palsy, muscular dystrophy, childhood arthritis), side effects of drugs (e.g. neuroleptics, chemotherapy, sedatives), sensory problems (e.g. substantial visual impairments or impairments of the vestibular organ).
  (2) Other neurodevelopmental disorders (e.g. severe intellectual disabilities) or other psychological disorders (e.g. anxiety, depression), or other psychological conditions (e.g. attentional problems) as primary causes of motor problems.

(3) Social conditions (e.g. deprivation, cultural constraints).
(4) Acquired motor difficulties (e.g. trauma or Parkinson disease, Huntingdon chorea, multiple sclerosis, stroke, brain tumours, arthropathies).
Note: it may be difficult to differentiate between conditions that may be causal and those that may co-occur. For example, an adult with ADHD might appear to have movement problems, which are in fact caused by impulsivity and/or inattention. Especially in unclear cases, multi-professional assessments can be helpful in differentiating motor from attentional problems.

- Criterion IV: the onset of symptoms is usually evidenced in infancy and childhood.

The following recommendations are designed to offer guidance for arriving at an accurate diagnosis of DCD. Instead of being listed according to the criteria I to IV, they are given in the opposite order, which is in line with how a medical professional would usually proceed with the diagnostic process. Thus, the process starts with (1) considering the age and context of the individual (criterion IV), (2) ruling out other medical conditions causing motor problems (criterion III), (3) taking into account the impact on activities and participation (criterion II), (4) quantifying the motor impairment (criterion I).
It should be noted, however, that there are other pathways to diagnosis. For example, an adult may be identified as having difficulties in employment or education and be first assessed by an occupational therapist, psychologist, or an educational psychologist.

R35 It is noted that some motor performance tests are currently being used to help identify and describe DCD in adolescence and adulthood. These include the BOT-2 and the MABC-2. These have been recommended for use with children with DCD but further work is needed to establish their use with adults. LOE 2, level B
The ADC has been most widely used in research with adults with DCD, and other, shorter screening tools are available (e.g. Adolescents and Adults Coordination Questionnaire, Functional Difficulties Questionnaire). Further work is needed with these instruments to establish their psychometric properties.

Research note 4: There is a lack of standardized assessments for adults with DCD at present.

Comment: History, examination, and criterion-referenced assessments are required to gain a complete picture. Differentiating motor difficulties that are acquired in adulthood need to be checked where possible before a diagnosis of DCD can be made.

2 Intervention

Research note 5	There is a lack of research on interventions in adolescents and adults with DCD.	
Research note 6	Longitudinal studies are needed to obtain more information about the developmental course of DCD in adolescence and adulthood. Age-appropriate standardized assessments are needed for diagnosis and evaluation of intervention of DCD in adolescence and adulthood.	
S6	It is acknowledged that access to services for adolescents and adults varies both within and between countries and is often very limited. However, it is recognized that most young people and adults with DCD benefit from individualized support to (1) learn specific motor skills for ADL, education, or vocational activities (e.g. using tools, keyboarding, driving); (2) deal with associated problems (e.g. psychological/psychiatric disorders); (3) address the impact of DCD on psychosocial skills and participation in various activities; (4) minimize the risk of longer-term problems (e.g. weight gain, physical inactivity).	GCP⇑⇑

EVIDENCE AND METHODOLOGICAL BASIS

For detailed information about the evidence and medodological basis, see the CPR–DCD long version.[1]

Good clinical practice (GCP) recommendations

The vast majority of the CPRs are based on group consensus of international experts, as well as with other processes. All GCP recommendations received strong consent (>90% consensus; ⇑⇑).

Recommendations based on evidence (LOE)

Five established working groups (mechanisms, assessments, interventions, psychosocial issues, adolescents and adults) reviewed the literature and new studies published since the previous CPR–DCD[5] to prepare recommendations on the basis of evidence.

Original papers addressing key question 2 (assessment) were categorized according to the Oxford Levels of Evidence system[6] (Table I). Intervention studies were classified using an adapted version of the Scottish Intercollegiate Guidelines Network[7] (Table I). Therefore only original studies related to the specific key questions of the recommendations were included in the systematic analysis of the literature. For more information about the literature search, methodological background, and the evidence tables on mechanisms and assessments, see Appendices S2 and S3 (online supporting information), and Tables SI to SXV (online supporting information).

Each recommendation is based on the highest level of available evidence; a group of original papers or systematic reviews (if applicable) were summarized giving an overall level of evidence (LOE) using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) system (Table I) where possible. These GRADE levels (LOE) were transferred into CPRs (Tables II and III). The levels and strength of recommendations correspond directly to the GRADE LOE.

The CPR–DCD includes eight recommendations based on evidence from systematic literature searches in the sections on assessments and interventions. The GRADE levels of these recommendations could directly be transformed to the corresponding recommendation level (e.g. GRADE level 1 has led to strong recommendation [A], GRADE level 2 to a [moderate] recommendation [B], and lower GRADE levels to an inconclusive recommendation [0]).[8]

For information about systematic literature searches and evidence tables of the other three working groups, with no LOE recommendations, underlying mechanisms, psychosocial issues, and adolescents and adults, see Appendices S4, S5, and S6 (online supporting information), and Tables SXVI, SXVII, and SXVIII (online supporting information). For a comparison of the current CPRs with the 2012 CPRs see Table SXIX (online supporting information).

The whole process was supervised by the AWMF (regional association; members: 177 specialist societies). The AWMF represents Germany in the Council for International Organizations of Medical Sciences (see www.awmf.de for further information).

Table I: Classification of the body of evidence

Level of Evidence (GRADE)	Body of evidence	Oxford level	Oxford definition (diagnostic studies)[5]	Adapted[a] SIGN criteria[6]
1 (high)	Evidence from a meta-analysis or systematic review of randomized controlled or other well-controlled studies with homogenous findings; homogeneity of the results. Very good quality of the results (e.g. validity and reliability measures >0.8)	I a	Systematic review (with homogeneity) of Level 1 diagnostic studies; CDR with 1b studies from different clinical centres	1++ High quality meta-analyses, systematic reviews of RCTs, or RCTs with a very low risk of bias
	Evidence from at least two RCTs (intervention studies) or well-controlled trials with well-described sample selection (diagnostic study);[b] confirmatory data analysis, good standards. Very good quality of the results (e.g. validity and reliability measures >0.8)	I b	Validating cohort study with good reference standards or CDR tested within one clinical centre	1+ Well conducted meta-analyses, systematic reviews of RCTs, or RCTs with a low risk of bias
		I c	Absolute SpPins and Absolute SnNouts[c]	1– Meta-analyses, systemtic reviews or RCTs, or RCTs with a high risk of bias
2 (moderate)	Evidence from at least two well-designed, controlled studies without randomization from different working groups. Sufficient standards; homogeneity of the results. Good quality of the results (e.g. validity and reliability measures >0.6)	II a	Systematic review (with homogeneity) of Level >2 diagnostic studies	2++ High quality systematic reviews of case control or cohort studies *or* High quality case-control or cohort studies with a very low risk of confounding bias, or chance and a high probability that the relationship is causal
	Evidence from at least one well-designed other type of quasi-experimental study (non-randomized, non-controlled). Good quality of the results (e.g. validity and reliability measures >0.6)	II b	Exploratory cohort study with good reference standards. CDR after derivation, or validated only on split-sample or databases	2+ Well-conducted case control or cohort studies with a low risk of confounding, bias, or chance and a moderate probability that the relationship is causal
3 (low)	Evidence from well-designed non-experimental descriptive or observational studies (e.g. correlational studies, case-control-studies). Moderate homogeneity of the results. Moderate quality of the results (e.g. validity and reliability measures >0.4)	III a	Systematic review (with homogeneity) of 3b and better studies	2– Case control or cohort studies with a high risk of confounding, bias, or chance and a significant risk that the relationship is not causal
		III b	Non-consecutive study or without consistently applied reference standards	3 Non-analytic studies, e.g. case reports, case series
4 (very low)	Evidence from expert committee reports or experts	IV/V	Case-control study, poor or non-independent reference standard/expert opinion without explicit critical appraisal, or based on physiology, bench research or 'first principles'	4 Expert opinion

[a]Only original studies related to the specific key questions of the recommendations were included in the systematic analysis of the literature. [b]The expert panel agreed to require at least two well-controlled studies from different study groups in order to reduce bias. [c]An 'Absolute SpPin' is a diagnostic finding whose specificity is so high that a positive result rules-in the diagnosis. An 'Absolute SnNout' is a diagnostic finding whose sensitivity is so high that a negative result rules-out the diagnosis. CDR, Clinical Decision Rule; RCT, randomized controlled trial.

Table II: Levels of recommendations

Level of evidence (GRADE)	Recommendation for/against	Recommendation level[a]
1	'should', 'should not', or 'is not indicated'	A
2	'may' / 'suggest' or 'may not' / 'not suggest'	B
3 or 4	'may be considered' or 'do not know'	0

LOEs for recommendations are based on the analysis of the literature and transferred into detailed wording in the clinical recommendations with defined levels of recommendations.

Table III: Description of the levels of recommendations in relation to the strength of the evidence

Strength of recommendation	Description	Criteria
A (A–)	Strongly recommended that clinicians (do not) routinely provide the intervention/the assessment to eligible individuals	Good quality of evidence and substantial net benefits or costs
B (B–)	Recommended that clinicians (do not) routinely provide the intervention/the assessment to eligible individuals	Fair quality of evidence and substantial net benefit or costs or Good quality of evidence and moderate net benefit or costs or Fair quality of evidence and moderate net benefit or costs
0	No recommendation for or against routine provision of the intervention/the assessment	Good quality of evidence and small net benefit or costs or Fair quality of evidence and small net benefit or costs
	Insufficient evidence for recommendation of the intervention/the assessment	Poor quality of evidence (conflicting results; balance between benefits and risks difficult to determine; and poor study design)

Adaptation from the Canadian Guide to Clinical Preventive Health Care and from US Preventive Services Resources.[5]

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A full disclosure of interests document is provided online (Appendix S7, online supporting information). The authors have stated that they had no interests that might be perceived as posing a conflict or a bias.

SUPPORTING INFORMATION

The following additional materials may be found online:

Appendix S1: International clinical practice recommendations on the definition, diagnosis, assessment, intervention, and psychosocial aspects of developmental coordination disorder: pocket version [this document]

Appendix S2: Mechanisms: strategy used to search for, select, and appraise the evidence.

Appendix S3: Assessments: strategy used to search for, select, and appraise the evidence.

Appendix S4: Interventions: strategy used to search for, select, and appraise the evidence.

Appendix S5: Psychosocial issues: strategy used to search for, select, and appraise the evidence.

Appendix S6: Adolescents/adults: strategy used to search for, select, and appraise the evidence.

Appendix S7: Disclosures of interest form

Table SI: Mechanisms: evidence table—study results for the internal modelling task category.

Table SII: Mechanisms: evidence table—study results for the ecological–dynamic category.

Table SIII: Mechanisms: evidence table—study results for the postural control task category.

Table SIV: Mechanisms: evidence table—study results for the handwriting task category.

Table SV: Mechanisms: evidence table—study results for the gait task category.

Table SVI: Mechanisms: evidence table—study results for the motor learning task category.

Table SVII: Mechanisms: evidence table—study results for the catching dynamics task category.

Table SVIII: Mechanisms: evidence table—study results for the oculomotor task category.

Table SIX: Mechanisms: evidence table—study results for the praxis task category.

Table SX: Mechanisms: evidence table—study results for the executive function task category.

Table SXI: Mechanisms: evidence table—study results for the sensory–perceptual factors task category.

Table SXII: Mechanisms: evidence table—study results for the multimodal integration task category.

Table SXIII: Mechanisms: evidence table—study results for the neuroimaging category.

Table SXIV: Assessments: evidence table on standardized tests/assessments.

Table SXV: Assessments: evidence table on questionnaires.

Table SXVI: Interventions: evidence table.

Table SXVII: Psychosocial issues: evidence table.

Table SXVIII: Adolescents/adults: evidence table.

Table SXIX: Clinical practice recommendations 2019 and 2012 in comparison.

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