EACD RECOMMENDATIONS
for Best-Evidence Clinical Practice

on

DEFINITION, DIAGNOSIS, ASSESSMENT and TREATMENT of

Developmental Coordination Disorder (DCD)

/ Specific developmental disorder of motor functions (SDDMF)

Blue: suggested country-specific modifications
Organisations and representatives

The EACD recommendations are also part of the German-Swiss Clinical Practice Guidelines coming out 2011. The recommendations were approved at two Consensus Conferences in Maulbronn (Germany) (26\textsuperscript{th}/27\textsuperscript{th} March 2010 and 15\textsuperscript{th}/16\textsuperscript{th} July 2010) with representatives from the following German and Swiss medical and therapeutic societies supervised by the Association of the Scientific Medical Societies in Germany (AWMF, reg. assoc., members: 154 Specialty Societies). The AWMF represents Germany in the Council for International Organizations of Medical Sciences CIOMS (further information under www.awmf.de).

Medical societies:
Neuropediatric Society for German speaking countries (leading society)
German Society of Child and Adolescent Medicine
German Society of Social Pediatrics and Adolescent Medicine
German Society of Child Psychiatry and Psychotherapy
Swiss Society for Developmental Pediatrics
Forum Praxispädiatrie, Switzerland

Therapist societies:
German Association of Occupational Therapists
Zentralverband Physiotherapie (Germany)
German Association of Motopäden
Swiss Association of Occupational Therapists
Swiss Association of Physiotherapists

Parent representative:
A. Mundt (SEHT e. V.)

The recommendations were approved by a European panel of experts at the EACD meeting in Brusselles 26\textsuperscript{th} May 2010 and on further DELPHI rounds.

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A. Kirby (GB, not present but taking part of the Delphi rounds)

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Secretary: M. Haag, Child Centre Maulbronn, Germany

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“Consequences”, “Comorbidity”, “Definition and assessment”: R. Blank (D)
“Treatment”: B. Smits-Engelsman (NL)

Writing groups:
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The full guideline process was \textbf{consistently advised by international experts} in the field: R. Geuze (NL), H. Polatajko (CAN), B. Smits-Engelsman (NL), P. Wilson (AUS) (alphabetical order).
**Introduction**

The recommendations were made on the basis of the level of evidence (LOE) obtained by systematic literature searches from January 1995 to February 2010. On critical issues when literature search was not applicable the recommendations were based on the votings of the experts and the representatives of the professional organisations mentioned above (GOOD CLINICAL PRACTICE = GCP). All GCPs could be met with strong consensus (>95% of votes).

On the basis of the level of evidence (LOE) a recommendation levels has been decided as follows:

**Levels of recommendations**

<table>
<thead>
<tr>
<th>Strength of evidence</th>
<th>Recommendation for / against an intervention</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>High</td>
<td>&quot;should&quot;, &quot;should not&quot;, &quot;is not indicated&quot;</td>
<td>A</td>
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<tr>
<td>Moderate</td>
<td>&quot;may&quot;, &quot;may not&quot;</td>
<td>B</td>
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<tr>
<td>Low</td>
<td>&quot;do not know&quot;</td>
<td>0</td>
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</table>
The levels of evidence have been made on the basis of the Oxford classification and the criteria proposed in SIGN (1999).

***Levels of evidence
Evaluation of the published peer-reviewed literature according to the scientific evidence levels of evidence (modified Oxford Centre for evidence-based Medicine (March 2009) and SIGN 1999, hierarchy of evidence proposed by the United Kingdom National Institute for Health and Clinical Excellence) using the GRADE system.

<table>
<thead>
<tr>
<th>Level of EVIDENCE</th>
<th>GRADE</th>
<th>Oxford level</th>
<th>Oxford definition (diagnostic studies)</th>
<th>Oxford definition (intervention studies)</th>
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<tr>
<td>1 (high)</td>
<td>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 &gt;0.8)</td>
<td>I a</td>
<td>Systematic review or metaanalysis of well-controlled studies with homogenous findings</td>
<td>Evidence from a meta-analysis or systematic review of randomized controlled trials (with homogeneity)</td>
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<td>Evidence from at least one randomized controlled trial (intervention study) or well-controlled trial with well-described sample selection (diagnostic study); confirmatory data analysis, good standards (e. g. QUADAS rating &gt;10) Very good quality of the results (e. g. validity and reliability measures &gt;0.8); Pedro &gt;7</td>
<td>I b</td>
<td>Validating cohort study with good reference standard; clinical decision rule tested within on clinical centre. E. g. randomised / representative or consecutive sample; confirmatory statistics; or prospective cohort study with good follow-up (&gt;80%)</td>
<td>Evidence from at least one randomized controlled trial</td>
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<tr>
<td>2 (moderate)</td>
<td>Evidence from at least one well-designed, controlled study without randomization sufficient standards (e. g. QUADAS rating &gt;7); homogeneity of the results; Good quality of the results (e. g. validity and reliability measures &gt;0.6)</td>
<td>II a</td>
<td>Systematic review of level I or II studies</td>
<td>Evidence from systematic review of cohort studies (with homogeneity) or Evidence from at least one controlled study without randomization</td>
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<td></td>
<td>Evidence from at least one well-designed other type of quasi-experimental study (non-randomised, non-controlled) Good quality of the results (e. g. validity and reliability measures &gt;0.6) Pedro &gt;5</td>
<td>II b</td>
<td>At least one exploratory cohort study with good reference standards; clinical decision rule after derivation or validated on split-sample or databases or retrospective cohort study with consecutive sample</td>
<td>Individual cohort study (incl. low quality randomised studies e. g. &lt;80% follow-up) Evidence from at least one other type of quasi-experimental study</td>
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<td>3 (low)</td>
<td>Evidence from well-designed non-experimental descriptive or observational studies (e. g. correlational studies, case-control-studies QUADAS rating &gt;4; Moderate homogeneity of the results; Moderate quality of the results (e. g. validity and reliability measures &gt;0.4) Pedro &gt; 2</td>
<td>III</td>
<td>Non-consecutive cohort study or studies without consistently applied reference standards or descriptive study</td>
<td>Evidence from case-control studies or Evidence from observational studies</td>
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4 (very low) Evidence from expert committee reports or experts IV / V Evidence from expert committee reports or experts

Grading / Scorings adopted from the German S3-Guideline for Childhood Obesity (2009), and from the GRADE Working group (published in BMJ 2004;328:1490, Doi:10.1136/bmj.328.7454.1490, Grading quality of evidence and strength of recommendations)
## 2. Recommendations

Recommendations for the DEFINITION of DCD (SDDMF) (inclusion and exclusion criteria)

<table>
<thead>
<tr>
<th>Nr.</th>
<th>Recommendations and Comments (summary)</th>
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<tr>
<td>1.</td>
<td><strong>Recommendation 1.:</strong> The term Developmental Coordination Disorder abbreviated as DCD should be used to refer to children with developmental motor problems in countries which adhere to the DSM classification. In countries where ICD 10 has legal status, the term Specific developmental disorder of motor function (SDDMF) (F82 (ICD 10)) should be used. <strong>Comment:</strong> In the English text, the term DCD is used because it is well recognized in the English language literature. The term Developmental Coordination Disorder (DCD) is taken from the DSM classification. However, in a number of European countries, the ICD-10 has legal status; the terminology of the ICD-10 must therefore be used in those countries. Accordingly, the term SDDMF is added, in brackets, throughout this document for the purposes of countries using ICD-10 terminology. Further, the recommendations that follow have been created in relation to the ICD-10. Where these differ with respect to the DSM, separate recommendations are provided (see Recommendations 2a and 5a).</td>
<td>GCP</td>
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| 2.  | **Recommendation 2.:** Criteria for the diagnosis of F82 (ICD 10)(SDDMF) (13/13): **I:** Motor performance that is substantially below expected levels, given the child's chronological age and given appropriate opportunities of skill acquisition. The poor motor performance may manifest as:  
- poor balance, clumsiness, dropping or bumping into things, or  
- marked delays in achieving developmental motor milestones (e.g. walking, crawling, sitting), and  
- persistent difficulties in the acquisition of basic motor skills (e.g. catching, throwing, kicking, running, jumping, hopping, cutting, colouring, printing, hand writing)  
**II:** The disturbance in Criterion I significantly interferes with activities of daily living or academic achievement (e.g. self-care and self-maintenance; academic/school productivity, pre-vocational and vocational activities, and leisure and play)  
**III:** An impairment in the development of motor coordination that is not solely explicable in terms of general intellectual retardation. The disturbance cannot be explained by any specific congenital or acquired neurological disorder or any severe behavioural problems, e.g. severe attentional problems or autistic spectrum disorders or severe psychosocial problems (e.g. deprivation). **Key statement:** The Clinical Practice Guideline for DCD aims to minimize differences in interpretation and classification between ICD 10 and DSM IV | GCP |
as the disorders are considered to represent similar conditions. Criterion III is largely consistent with Criterion C and D in the DSM IV (the exception is the exclusion of autistic spectrum disorders, see recommendation 5)

**Comment:** Clarification of Criterion III:
- DCD (SDDMF) should **not** be diagnosed:
  - if motor performance cannot be measured by a motor test e.g. because of mental retardation or a medical disorder or
  - if after a comprehensive assessment, including a clinical history, examination, and consideration of teacher and parent reports, the motor dysfunction can be explained by another medical condition including a neurological or psychosocial disorder or severe mental retardation.

In the comments of F82 (ICD 10), it is mentioned that some children with DCD (SDDMF) may show marked “neurodevelopmental immaturities” such as choreiform movements of unsupported limbs or mirror movements and other associated motor features. According to the literature and the clinical practice, these findings are neither indicative of, nor do they speak against, a diagnosis of DCD (SDDMF). The roles of these features in DCD are still largely unclear and need further evaluation.

- DCD (SDDMF) and mental retardation:
  Applying a specific IQ below which the diagnosis of DCD (SDDMF) is precluded seems artificial. Given the complexities of arbitrating between cut-offs and determining discrepancy scores, it is recognised that categorical decision (above or below a specific IQ level) may be extremely difficult. Moreover, enforcing these diagnostic decisions may not be useful based on what is currently known about neurocognitive development.

- DCD (SDDMF) and coexisting diagnoses:
  It is widely recognised that children with DCD (SDDMF) often have coexisting diagnoses. It should be considered that ADHD, autism spectrum disorders or conduct disorders may interfere with motor performance and testing, as well as with activities of daily living, thus making the motor assessment of children with DCD (SDDMF) difficult (see recommendation 5)

### Recommendation 3.
The diagnosis DCD (SDDMF) should be made within a diagnostic setting

**Background:** This may require a multidisciplinary approach

### Recommendation 4.
Diagnostic criteria for DCD (SDDMF) can be satisfied by performance deficits in one or more of the specific areas of motor performance, e.g., gross motor dysfunctions or fine motor dysfunctions (manipulative skills) suffice, both are not necessary (F82.0 or F82.1). (Level I for countries using the ICD-10).

**Background:** For countries using the ICD-10: Grapho-motor disorders are specified as a subtype of DCD (SDDMF) by the ICD-10 and are classified on the basis of disturbed fine motor functions (F82.1). (Expressive writing disorders are classified under F81.8 according to the ICD-
### Recommendation 5.
A dual diagnosis of DCD (SDDMF) and other developmental or behavioural disorders (e.g. autism spectrum disorders, learning disorders, ADHD) should be given if appropriate and priorities for intervention should be determined in keeping with the dysfunctions present.

Key comment for countries using DSM classification: recommendation 5a*)

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<th>5. Recommendation 5.</th>
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### Recommendation 6.
If co-morbidity is suspected then it should be carefully diagnosed and treated according to established clinical guidelines (e.g. ADHD, autism, dyslexia, developmental speech and language disorder)

Comment: Children with DCD (SDDMF) may have attention, speech and reading difficulties that may not reach diagnostic thresholds but may be considered appropriate for services

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### Recommendation 7.
The onset of DCD (SDDMF) is usually apparent in the early years but would not typically be diagnosed before 5 years of age (B).

If a child between 3 and 5 years of age shows a marked motor impairment, even though there has been adequate opportunity for learning and other causes of motor delay have been excluded (e.g. child abuse, genetic syndromes, neurodegenerative diseases), a diagnosis of DCD (SDDMF) may be made based on findings from at least two assessments, carried out at a sufficiently long intervals (at least 3 months).

Comment: The guidelines group sees considerable problems in diagnosing DCD (SDDMF) in younger (under 5) children.

- Young children may have, to some extent, delayed motor development and will catch up spontaneously due to the variable speed of motor development.
- The cooperation and motivation for reliable testing is variable. Test performance may therefore be variable and may result in poor predictive validity.
- The rate of acquisition of activities of daily living skills is highly variable in children at the kindergarten age, making it difficult to evaluate Criterion II of the diagnostic criteria in children under 5.
- Finally, there are no reliable data on the value of early intervention in preventing DCD (SDDMF).

Comment: The guidelines group also sees the diagnosis of DCD (SDDMF) (first identification of DCD (SDDMF)) after 16 years of age problematic. It is likely that the criteria have to be reconsidered for adults. See country specific recommendation.

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Comment: The guidelines group also sees the diagnosis of DCD (SDDMF) (first identification of DCD (SDDMF)) after 16 years of age problematic. It is likely that the criteria have to be reconsidered for adults. See country specific recommendation.
**Additional statement for countries ascribing to the DSM classification**

**Recommendation 2a:**

The diagnosis of DCD should be given if the following criteria are met:

A. Motor performance is substantially below expected levels, given the child's chronological age.

The poor motor performance may manifest as:
- poor balance, clumsiness, dropping or bumping into things, or
- marked delays in achieving developmental motor milestones (e.g. walking, crawling, sitting) and
- persistent difficulties in the acquisition of basic motor skills (e.g. catching, throwing, kicking, running, jumping, hopping, cutting, colouring, printing, handwriting)

B. The disturbance in Criterion A significantly interferes with activities of daily living or academic achievement (e.g. self-care and self-maintenance; academic/school productivity, pre-vocational and vocational activities, and leisure and play)

C. If the disturbance is not due to a general medical or specific neurological disorder (e.g., cerebral palsy, hemiplegia, or muscular dystrophy) (acc. to DSM IV)

D. If mental retardation is present the motor difficulties are in excess of those usually associated with it (acc. to DSM IV).

The disturbance cannot be explained by severe behavioural problems, e.g. severe attentional problems or autistic spectrum disorders or severe psychosocial problems (e.g. deprivation)

**Comment:** Clarification for Criteria C and D:
- DCD should not be diagnosed if a motor test cannot be administered and if after a comprehensive assessment (including a clinical history, examination, and consideration of teacher and parent report) the motor dysfunction can be explained by another medical condition, psychosocial disorder or severe mental retardation.

- Though not diagnostic, some children with DCD show marked “neurodevelopmental immaturities” such as choreiform movements of unsupported limbs or mirror movements and other associated motor features, as well as signs of impaired fine and gross motor coordination.

- Applying a specific IQ below which the diagnosis of DCD (SDDMF) is precluded seems artificial. Given the complexities of arbitrating between cut-offs and determining discrepancy scores, it is recognised that categorical decision (above or below IQ level) may be extremely difficult. Moreover, enforcing these diagnostic decisions may not be useful on the basis of what is currently known about neurocognitive development.

- It is widely recognised that children with DCD (SDDMF) often have coexisting diagnoses. It should be considered that ADHS, autism spectrum
disorders or conduct disorders may interfere with motor performance and testing, as well as with activities of daily living, thus making the motor assessment of children with DCD (SDDMF) difficult (see recommendation 5).

- In contrast to the DSM IV TR Criterion C, the guidelines group does not exclude a combined diagnosis of autism spectrum disorder and DCD as there are no data supporting a specific subtype of motor disturbance in autism spectrum disorders or a specific coexistence being different from other children with DCD (see also recommendation 5a).

| 5a | **Recommendation 5a**  
A dual diagnosis of DCD and other developmental or behavioural disorders (e.g. autism spectrum disorders, learning disorders, ADHD) should be given if appropriate and priorities for intervention should be determined in keeping with the dysfunctions present.  

**Key comment (only for countries using DSM classification)**  
In contrast to the DSM IV TR Criterion C the guidelines group does not exclude a combined diagnosis of autism spectrum disorders and DCD as there are no data supporting a specific subtype of motor disturbance in children with autism spectrum disorder or a specific coexistence being different from other children with DCD (see also recommendation 2a). | LOE 0  
(for exclusion of autism)  
A |
Recommendations for the ASSESSMENT of DCD (SDDMF) for the purposes of screening and diagnosis of DCD (SDDMF)

<table>
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<tr>
<th>Nr.</th>
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<tr>
<td>8.</td>
<td><strong>Recommendation 8.</strong> Concerning Criterion I: An appropriate, valid, reliable and standardized motor test (appropriately norm-referenced) should be used.</td>
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<td><strong>Comment concerning Criterion I:</strong> Evidence from a standardised norm-referenced test is necessary to establish that motor performance substantially ‘below expected levels’. Ideally, the evidence is derived from a test with culturally relevant developmental norms. Otherwise, this criterion cannot be reliably met. The use of standardized measures notwithstanding, the diagnosis of DCD (SDDMF) should NOT be made only on the basis of a standardised motor test. It requires careful a history, clinical examination and confirmation using valid tests and questionnaires (see chapter 11.1 clinical practice guideline))</td>
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<td>9.</td>
<td><strong>Recommendation 9.</strong> In the absence of a gold standard test for establishing Criterion I, the literature supports the recommendation of the Movement Assessment Battery for Children (MABC2) (level B). Where available the Bruininks-Test, 2nd version (BOTMP2) is also recommended. However, no German translation and standardisation of the BOTMP2 is currently available. In the absence of generally accepted cut-offs for identifying DCD (SDDMF), it is recommended that when using the MABC, or other equivalent objective measures, the 15th percentile for the total score be used as a cut-off.</td>
<td>LOE 2 Tests: B</td>
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<td>Remarks: The MOT4-6 may be considered for 4-6year old children and the Zürich Neuromotor Assessment Battery (ZNA) may be considered for children of all age groups in German speaking countries. However, these studies are not yet validated for the diagnosis of DCD.</td>
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<td>Concerning the use of the MABC2 with German and Swiss children, the applicability of the Dutch norms with the Dutch standardization studies may be considered until further research has been done on the MABC2 in Germany.</td>
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<td><strong>Research note:</strong> Given the weaknesses of the MABC2, the BOTMP2 and other tests, the following need to be addressed in further research: 1. Discontinuity particularly between age bands in the MABC2 (e.g. age band 1 to age band 2) and therefore problems with longitudinal measurements e. g. at 6 and 7 years.</td>
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</table>
2. Need for reliability testing within each age band (e.g. MABC2, BOTMP2).
3. Possible floor effects\(^1\) of the MABC2, particularly in age band 1 should be further examined.
4. The role of motor capacity measures in DCD (SDDMF) has to be further examined, e.g. the BOTMP2 included motor capacity items while the MABC2 test is mainly restricted to motor coordination items.
5. Further data on discriminate validity e.g. sensitivity and specificity are needed.

Based on the limitations of available instrumentation, classification of specific domains of dysfunction e.g., gross motor or fine motor dysfunction (ICD-Nr. F82.0 and F82.1), can be made on the basis of clinical judgement.

We suggest the use of gross motor or fine motor items of standardised assessments may be recommended alongside observation and reports of difficulties across relevant gross motor or fine motor and/or grapho-motor tasks.

The guideline group suggests the 5th percentile cut-off of the fine motor subdimension (e.g. MABC2, BOTMP2) be used for the diagnosis F82.1 if criteria II and III are met.

If all criteria I, II and III are met and if fine motor function is within the normal range then the diagnosis F82.0 can be made.

**Comment:** It should be noted that the clinical relevance of subscales (MABC2, BOTMP2 and other tests) is not yet established by systematic research. Accordingly, the diagnosis of a grapho-motor disorder cannot be made on the basis of the MABC2 and other motor tests alone. Where available, tests with country-specific standardisation may be recommended e.g. for handwriting (e.g. DASH, BHK/SOS).

**Comment:** If a child shows particular difficulties, i.e., performs below the 5th percentile on one domain but performs above the 15\(^{th}\) percentile on other domains, the child should be considered to have a domain specific DCD (SDDMF) (e.g., fine motor, gross motor). In case of doubt, repeated testing or an additional motor test may be used to support the diagnosis.

### 11. Recommendation 11.
For children between the age of 3 and 5 years, if the diagnosis is to be made (e.g. for treatment purposes) a cut-off of \(\leq 5^{th}\) percentile is recommended for the total score on the M-ABC, or equivalent objective measures.

### 12. Recommendation 12.
Concerning Criterion II: The assessment **should** include consideration of activities of daily living (e.g. self-care and self-maintenance; academic/school productivity, pre-vocational and vocational activities, and leisure and play) and the views of the child, parents, teachers and relevant others.

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\(^1\) Analogue to the Ceiling effect, the Floor effect means that in 6 out of 10 tasks in age band 1 the scoring values start with standard values above 5 points. Lower values are not possible because of the construction of the test items. Thus, the precision of the measurement at the lower end is rather limited in children in age band 1. Only, the dexterity tasks show sufficient scaling (German standardisation).
### Comments concerning Criterion II:

- By definition, activities of daily living imply cultural differences. When applying this criterion, it is therefore crucial to consider the context in which the child is living and whether the child has had appropriate opportunities to learn and to practice activities of daily living (see Criterion I “previous opportunities of skill acquisition”).
- Establishing a direct link between poor motor coordination and academic achievement is complex. However, the specific skill of hand writing is usually affected, and is known to adversely affect academic achievement and should therefore be assessed.
- Assessment should reflect culturally relevant developmental norms.

#### Recommendation 13.
Observational checklists and standardized parent and teacher questionnaires should be used to support and operationalize Criterion II

**Comment:** At present, questionnaires may only be useful for populations at risk (see Recommendation 15). However, currently there are no validated checklists or questionnaires for DCD (SDDMF) for German speaking countries as well as a number of other countries. Thus, the implementation of this recommendation is dependent on further research.

#### Recommendation 14.
The parent-report questionnaire DCDQ-R may be recommended for use in those countries where it is culturally relevant (level B).

**Research note:** A reliable method of operationalizing Criterion II is urgently needed.

#### Recommendation 15.
The use of questionnaires (e.g. DCDQ, MABC-Checklist) is not recommended for population-based screening for DCD.

**Comment:** Present studies of DCD (SDDMF) questionnaires suggest that the sensitivity is very low when applied in the general population, e.g. regular schools. **That does not mean to skip ADL-screening in preschool children.**

#### Recommendation 16.
Careful history taking is essential to support the application of Criterion I, II, III.

#### Recommendation 17.
Appropriate clinical examination with respect to medical, neurological and behavioural problems is necessary to verify that the disturbance is not due to a general medical, neurological or behavioural condition.

The clinical examination should include:
- Medical status (e.g. dysmorphological syndromes (Gibbs, J et al, ADC 2007 – differential diagnosis), bruises etc.)
- Neuromotor status (exclusion of other movement disorders or neurological dysfunctions)
- Sensory status (e.g. vision, vestibular function)
- Emotional and behavioural status (e.g. attention, autistic behaviour, self-esteem)

See implementation strategy for each European country
## Recommendations for ASSESSMENT of DCD (SDDMF) for the purposes of treatment planning and monitoring

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<tr>
<th>Nr.</th>
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<tr>
<td>18.</td>
<td><strong>Statement:</strong> If the test criteria for the diagnosis of DCD (SDDMF) are not met but problems exist in the performance of everyday living tasks, educational and social support strategies for participation across environmental contexts should be implemented. This may be particularly useful for children below the age of 5 years. Children with DCD older than 5 years, besides the appropriate treatment, should be helped in choosing pleasurable activities which can offer positive social experience to support their self-esteem and motivation for activities of daily living.</td>
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<td>19.</td>
<td><strong>Recommendation 19.</strong> In determining if treatment is indicated, an account of personal factors, environmental factors, burden of disease and participation should be taken into consideration. Sources of information include: history (incl. previous diagnostic and therapeutic history), clinical examination, parent report and if possible self-report, teacher / kindergarten reports, questionnaire information, motor test results.</td>
<td>GCP</td>
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<td>20.</td>
<td><strong>Recommendation 20.</strong> If treatment is indicated, information on personal factors, environmental factors and the burden of disease concerning participation should be used for planning the treatment. <strong>Comment:</strong> In addition, when planning treatment, evidence of treatment efficacy (including regime and/or dose) should be considered.</td>
<td>GCP</td>
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<td>21.</td>
<td><strong>Recommendation 21.</strong> For treatment planning, individual goal setting should be used, goals focused at the level of activities and participation as per the ICF-CY should be given priority and the child’s viewpoint should be taken into account. <strong>Research Note:</strong> Further evidence on treatment regime and/or dose, defining ‘goal setting’ with respect to the outcome of DCD (SDDMF) is urgently needed.</td>
<td>GCP</td>
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<td>22.</td>
<td><strong>Recommendation 22.</strong> To evaluate treatment effects, measures that capture the level of activities and participation as per the ICF-CY should be used. Sources for evaluation include course, clinical examination, parent report, teacher / kindergarten reports, questionnaire information, motor test results.</td>
<td>GCP</td>
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</table>
23. **Recommendation 23.**
If testing is performed during the intervention period it should serve the purpose of adjusting treatment through adaptation of individual goal setting.

**Comment:** The MABC may also be useful for therapy evaluation. Attention should be paid to possible repeated testing effects (e.g. intervals less than 4 weeks). But MABC can be used for evaluation of intervention over longer periods (e.g. 12 weeks).
# Recommendations on TREATMENT of DCD

<table>
<thead>
<tr>
<th>Nr.</th>
<th>Recommendations and statements (summary)</th>
<th>Level of recommendation**</th>
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| 24  | **Recommendation 24.** Children with the diagnosis DCD according to Criteria I, II and III should receive intervention  
Comment: *There is sufficient evidence that physiotherapy or occupational therapy intervention is better than no intervention for children with DCD.*  
2,14,15,18,19,20,24,31,32,36 | (LOE 1)  
A |
| 25  | **Recommendation 25.** Process oriented (Task-oriented) approaches  
We recommend using task-oriented interventions to improve motor tasks or to improve selected activities based on goal setting.  
Comment: There is strong evidence that children with DCD benefit the most from specific skill interventions. Specific skill interventions work on teaching essential activities of daily living and other skills that stimulate participation of the child in house, school, leisure and sports.  
It is shown that specific skill interventions are effective in treating children with DCD.  
6,14,15,20,22,23,24,25,37 | (LOE 1)  
A |
| 26  | **Recommendation 26.** Process oriented (Task-oriented) methods:  
We suggest Cognitive Orientation of Occupational Performance Training (CO-OP)  
2,5,29 and Neuromotor Task Training (NTT)  
20,32,33,34,35 as interventions in children with DCD  
Key statement for general abilities approaches (body function oriented approaches):  
Interventions that aim at improving body functions and structures may be effective but it seems that they are less effective in improving activities in children with DCD  
than task-oriented approaches | (LOE 2)  
B |
|     | Statement for general abilities approaches (body function oriented approaches):  
Perceptual Motor Therapy (PMT) may be an effective intervention method for children with DCD  
19,21 | (LOE 2) |
|     | Statement for general abilities approaches (body function oriented approaches):  
We do not know whether Sensory Integration Therapy (SIT) is effective.  
Comment: The evidence is inconclusive for the effectiveness of Sensory Integration Therapy (SIT) as an intervention for children with DCD.  
37,19 (9/10) | (LOE 3) |
|     | Statement for general abilities approaches (body function oriented approaches):  
We do not know whether Kinesthetic Therapy (KT) is effective.  
Comment: There is inconclusive evidence for the effectiveness of Kinesthetic Therapy (KT)  
19,21,30. | (LOE 3) |
| 27  | **Statement on Motor Imagery (MI)**  
We do not know if MI is effective in children with DCD  
24 | (LOE 3)  
0 |
Deficits in motor imagery and motor planning are evident in DCD suggesting that motor imagery might be useful. However, we do not yet know if motor imagery is effective in DCD. The new therapy needs further research (research note)

### Recommendation 28.
We suggest professional instruction to educate and coach parents and teachers to stimulate a supportive attitude of parents and teachers so that they recognize and understand the specific problems of the child with DCD and may help the children with DCD to get the opportunity to improve their motor abilities and their participation in daily activities (house, school, leisure, sports)

**Research note:** Studies are urgently required to support the notion of parent and teacher instruction.

### Statement:
Children with DCD need ample opportunity to learn and practice movements and their participation in daily activities (house, school, leisure, sports). Therefore support from parents and teachers and other related persons is important for regular everyday practice (home exercises in addition to professional treatment)

### Recommendation 29. Concerning specific treatment methods:
In children with poor handwriting, we suggest a task-oriented self-instruction method to improve the quality of the handwriting. There is moderate evidence for handwriting therapy based on NTT.

**Research note:** Further studies are urgently needed to support this recommendation.

**Background text:** Children in special schools without dysgraphia can also use the task-oriented self-instruction method to improve their level of proficiency over a course of six months. There is no evidence that using non-task-specific training methods (e.g., keyboard training) improve graphomotor function in children with DCD.

### Recommendation 30.
Prewriting exercises for children with poor handwriting may be considered (Smits-Engelsman, Niemeijer van Galen, 2001)

### Recommendation 31. Concerning medical treatment methods:
We do not suggest fatty acids + vitamin E to improve motor functions as there is no evidence for an effect on motor functions

### Recommendation 32. Concerning medical treatment methods:
Methylphenidate may be applied in children with DCD and comorbid ADHD to improve attention and fine motor performance (handwriting). We suggest Methylphenidate in children with ADHD and DCD in combination with further treatment and support to overcome functional problems like writing and drawing (B)

**Background text:** It is possible that that this medication may help ameliorate some fine-motor issues in cases of attention deficit disorder and comorbid DCD. However, further support is needed to overcome functional problems like writing and drawing.
**Statement:**
It is **possible** that training of gross motor functions and strength exercises may help in a group of children to achieve motor competence. (LOE 3)

<table>
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<tr>
<th>33. Recommendation 33. Concerning treatment setting:</th>
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<tr>
<td>We <strong>suggest</strong> considering carefully if a <strong>group setting</strong> is appropriate for a child (B).</td>
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<tr>
<td><strong>It is not suggested</strong> as part of the treatment that children with DCD should receive a non-specific group motor skill program, e. g. teaching general abilities (B negative).</td>
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<tr>
<td><strong>Statement:</strong></td>
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<td>We suggest to consider group treatment if the child has not a severe DCD (e. g. 5th to 15th percentile on standardized motor test) or if group training is expected to help the child to strengthen self-esteem. Group therapy is further suggested in specific subgroups of children with DCD, e. g. isolated graphomotor problems or DCD with motor performance between the 5th and 15th percentile of a norm-referenced test 14,21, 25,31,38. In children with DCD and in children with behavioural co-morbidities occupational group therapy can be a method to achieve a positive effect on self-esteem. Individual therapy may be more often the choice in children with severe problems (motor functions &lt; 5th percentile of a norm-referenced test) 21,39.</td>
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<th>34. Recommendation 34.</th>
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<tr>
<td><strong>There is no evidence that manualmedical intervention is effective on the core symptoms of DCD.</strong></td>
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<tr>
<td>Manualmedical intervention may be <strong>considered</strong> as additional treatment in children with <strong>motor problems</strong> and musculo-skeletal dysfunctions.</td>
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(LOE 3)

Reference lists can be obtained from the authors.