

Dyspraxia Developmental Co-ordination Disorder

Professor Amanda Kirby



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Take **one day**

What does not require movement?

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5Cs' of DCD

- Clumsy
- Common
- Chronic
- Co-occur
- Consequences

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Individuals may vary in how their difficulties present and in severity

COMMON

1.8% severe in the population
3% moderate difficulties

(Lingham et al, 2009)

Gender 2:1

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DCD been
called
different
things...

- 1949- Minimal Brain Dysfunction (MBD)
- 1963 - "minimal cerebral palsy": "minimal cerebral dysfunction" (Bax & MacKeith)
- 1965- Perceptual-motor dysfunction (Ayres)
- 1967- Visuo-motor disability in school children (Brenner)
- 1968/70 - Clumsy child syndrome (Illingworth)
- 1970s - 'motor morons'
- 1975- Developmental apraxia (Gubbay)
- 1982- Developmental dyspraxia (Denckla)
- 2013 - Developmental Brain Dysfunction Moreno (De-Luca et al)
- 2016- Developmental Co-ordination Disorder (DSM-5)
- 2018- ICD11

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DSM-5 Criteria

- A. The acquisition and execution of coordinated motor skills is substantially below that expected given the individual's chronological age and opportunity for skill learning and use. Difficulties are manifested as clumsiness (e.g. dropping or bumping into objects) as well as slowness and inaccuracy of performance of motor skills (e.g. catching an object, using scissors or cutlery, handwriting, riding a bike, or participating in sports).
- B. The motor skills deficit in Criterion A significantly and persistently interferes with activities of everyday living appropriate to chronological age (e.g., self-care and self maintenance) and impacts academic/school productivity, prevocational and vocational activities, leisure, and play.
- C. Onset of symptoms is in the early developmental period.
- D. The motor skills deficits are not better explained by intellectual disability (intellectual developmental disorder) or visual impairment and are not attributable to a neurological conditions affective movement e.g. cerebral palsy, muscular dystrophy, degenerative disorder).

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DCD descriptor

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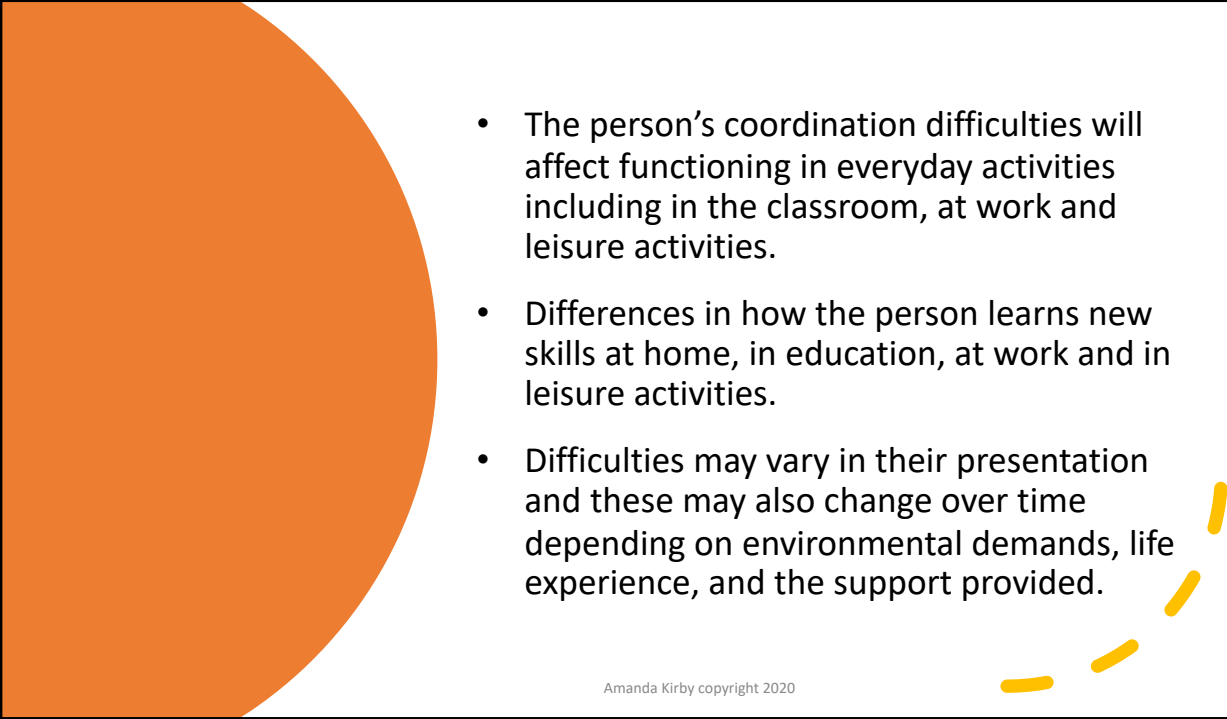
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Developmental Coordination Disorder (DCD) (also known as Dyspraxia in the UK)

- **Common** disorder affecting movement and coordination in children, young people and adults.
- **Distinct** from other motor disorders such as cerebral palsy and stroke
- Occurs across the range of intellectual abilities.
- **Lifelong** condition
- **Recognised by international organisations** including the World Health Organisation, American Psychiatric Association


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- 
- The person's coordination difficulties will affect functioning in everyday activities including in the classroom, at work and leisure activities.
 - Differences in how the person learns new skills at home, in education, at work and in leisure activities.
 - Difficulties may vary in their presentation and these may also change over time depending on environmental demands, life experience, and the support provided.

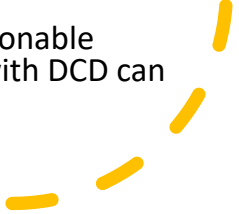
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- Although **motor** difficulties persist throughout life, **non-motor** difficulties may become more prominent as expectations and demands change over time.
- **A range of co-occurring non-motor difficulties** which can have a substantial adverse impact on daily/work life.
 - social and emotional difficulties
 - time management
 - planning and personal organisation,
- With appropriate recognition, reasonable adjustments and support people with DCD can be very successful in their lives.

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History of 'clumping'

- **Minimal Brain Dysfunction (MBD)** Clements & Peters(1962) characterized school aged children with a broad array of cognitive and motor difficulties as having damaged or *dysfunctional* brains.
- **Minor Neurological Dysfunction (MND)** (Hadders-Algra et al. 1988) focused more narrowly on the relationship between developmental 'soft' signs (e.g. involuntary movements, dysrhythmia, overflow, mirror movements) and motor dysfunction.
- **Deficits in Attention, Motor control and Perception (DAMP)**(Gillberg, 1998).
- **Atypical Brain Development (ABD)** (Gilger and Kaplan, 2001) developmental variation of the brain (and subsequent brain-based skills)-ultimately, individual differences are the result of the complex interplay of genes and the environment. ABD encompasses brain development that yields exceptionally high skills as well as impairments.

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Basis of the guidelines for clinical practice

- **European/International DCD Guidelines (2016;2019)**

- **UK Guidelines (2017)**



Eacd Recommendations | [Open Access](#) |

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

Rainer Blank, Anna L Barnett, John Cairney, Dido Green, Amanda Kirby, Helene Polatajko, Sara Rosenblum, Bouwien Smits-Engelsman, David Sugden, Peter Wilson, Sabine Vinçon

First published: 22 January 2019 | <https://doi.org/10.1111/dmcn.14132>

A pocket version of these guidelines is available as Appendix S1 (<https://onlinelibrary.wiley.com/doi/full/10.1111/dmcn.14132#support-information-section>)

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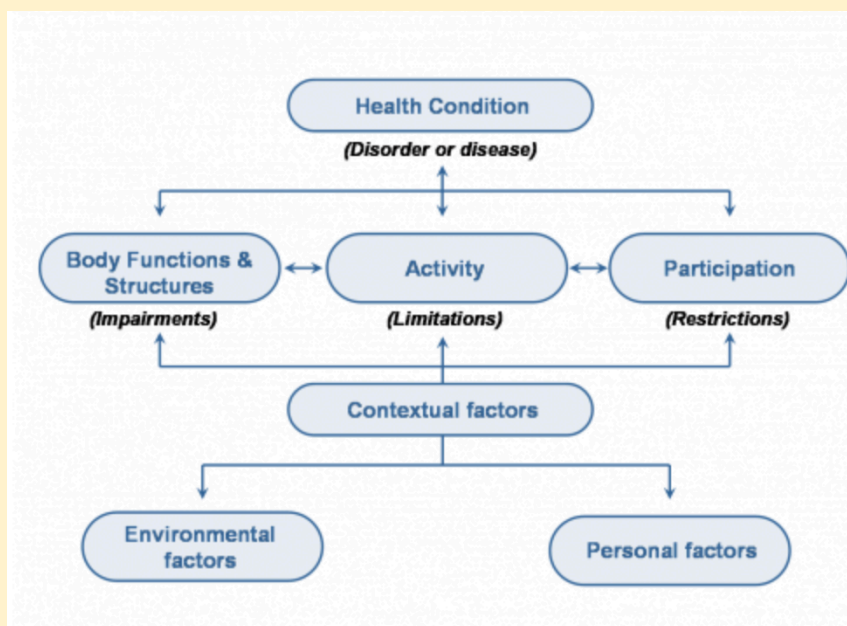
Kirby, A., & Drew, S. (1999, October).
Is DCD a diagnosis that we should be using for adults? Is clumsiness the issue in adults and adolescents? Paper presented at the 4th Biennial workshop on children with Developmental coordination. From Research to Diagnostics and Intervention, Groningen, The Netherlands

**60-70% individuals continue to have
some but varied difficulties into
adulthood.**

Menkes and Menkes, 1967; Losse et al, 1991; Cantell et al, 1998; Van Dellen and Gueuze, 1988; Rasmussen and Gillberg, 2000; Cousins and Smyth, 2003, Kirby et al, 2008; Missiuna et al, 2008,

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Co-occurs

- ❖ **Comorbidity**- 'existing simultaneously with and usually independently of another medical condition'.
- ❖ **Co-occurrence**- they are simply happening together, and may not be causally related.

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Co-occurrence patterns: DCD+

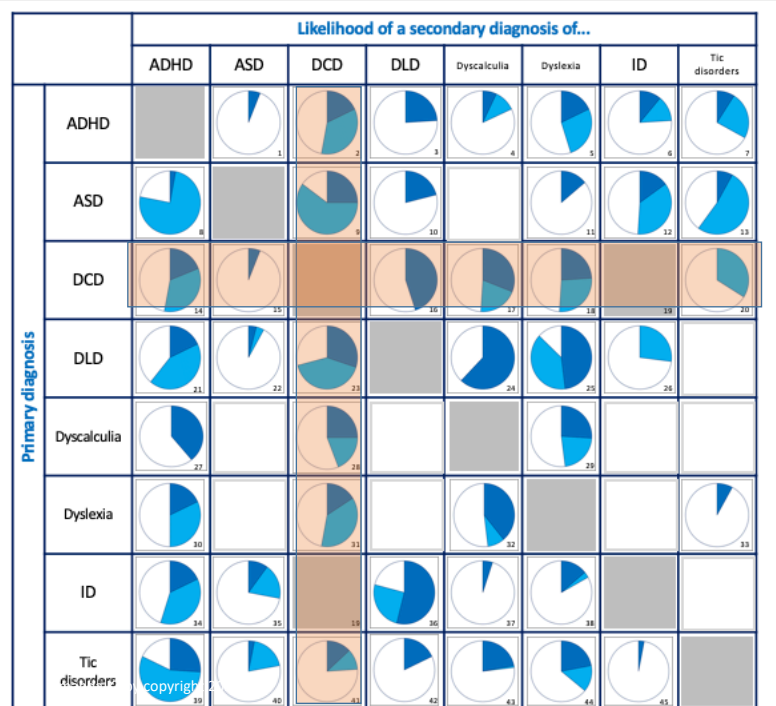
- Maths (Luo, Jose, Huntsinger, & Pigott, 2007; Pagani, Fitzpatrick, Archambault, & Janosz, 2010; Pieters, Desoete, Roeyers, Vanderswalmen, & Van Waelvelde, 2012).
- Reading/Dyslexia (Cheng, Chen, Tsai, Chen, & Cherng, 2009; Fletcher-Flinn, Elmes, & Strugnell, 1997; Lingam et al., 2010)
- ADHD (Rasmussen et al; Salmon and Kirby, 2008)
- ASD (Kaplan et al, 1998)
- DLD- 70% with DLD have motor difficulties

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Overlap is the rule
rather than the
exception

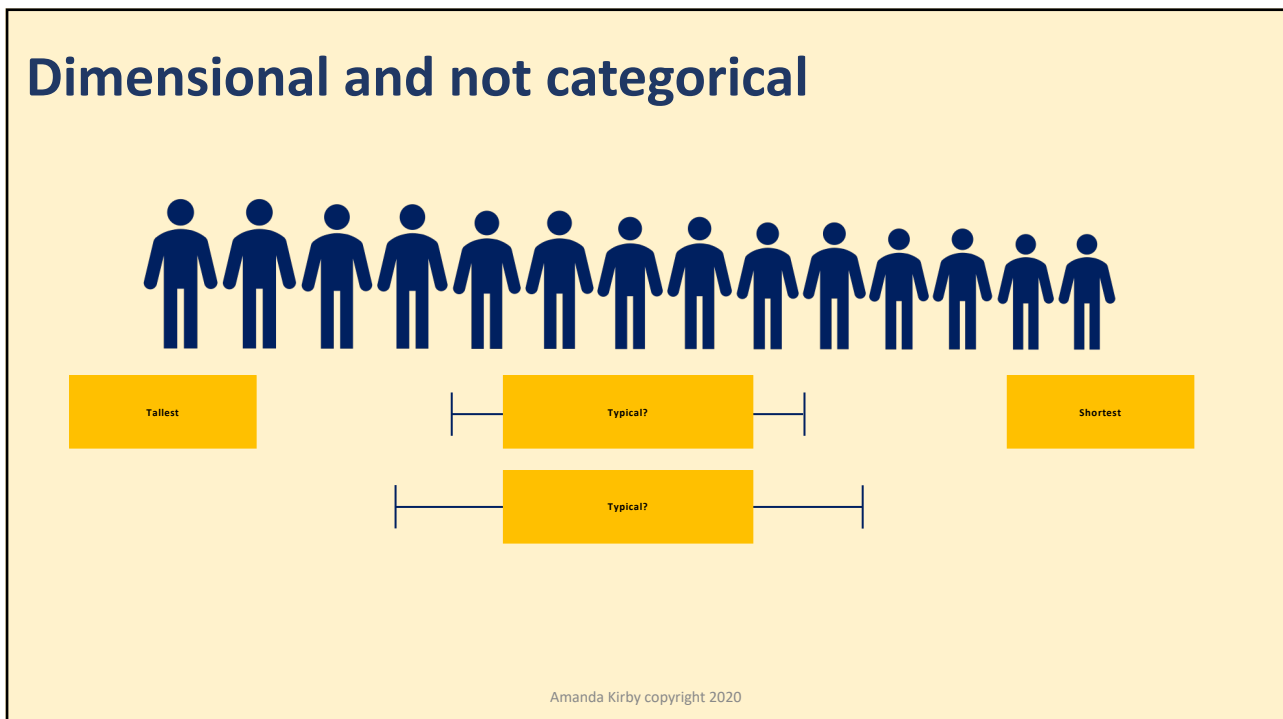
The dark blue segments show the lowest estimated proportion with a given secondary diagnosis; the dark blue and light blue segments combined show the highest estimated proportion with a given secondary diagnosis.



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Conditions	Other commonly co-occurring condition(s)	
	Psychological	Physical
ASD	Anxiety disorders, eating disorders, gender dysphoria, mood disorders, OCD, personality disorders, schizophrenia, substance use disorders, Tourette's syndrome, tic disorders. ¹	Allergies, ear infections, epilepsy or seizures, gastrointestinal disorders, hearing impairment, immune disorders, intellectual disability, metabolic disorders, neurotransmitter disorders, overweight and obesity, sleep disorders. ²
ADHD	Anxiety disorders, gender dysphoria, mood disorders, OCD, personality disorders, schizophrenia, substance use disorders, Tourette's syndrome, tic disorders. ³	Allergies, asthma, epilepsy or seizures, gastrointestinal disorders, headaches or migraine, hearing impairment, overweight and obesity, vision impairment, sleep disorders ⁴
DCD	Anxiety disorders, mood disorders, personality disorders, substance use disorders, tic disorders. ⁵	Epilepsy or seizures, joint hypermobility syndrome, overweight and obesity, sleep disorders ⁶
DLD	Anxiety disorders, mood disorders, OCD, personality disorders, schizophrenia. ⁷	Epilepsy or seizures. ⁸
Dyscalculia	Mood disorders, schizophrenia. ⁹	Epilepsy or seizures. ¹⁰
Dyslexia	Anxiety disorders, mood disorders, schizophrenia. ¹¹	Epilepsy or seizures. ¹²

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Consider the differential diagnosis for DCD

- **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).
- **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.
- **Social conditions** (e.g., deprivation, cultural constraints).
- **Acquired motor difficulties** (e.g. trauma or Parkinsons, Huntingtons Chorea, Multiple Sclerosis, Stroke, Brain tumours, Arthropathies).
- NOTE: It may be difficult to differentiate between conditions that may be causal and those that may be co-occurring.

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Differential diagnosis

As a child

Associated

- BECCTS
- Joint Hypermobility Syndrome

Differential

- Cerebral Palsy
- Muscular Dystrophy
- NF1
- CVA
- Klinefelter's syndrome
- Fragile X
- Williams

As an adult

- Multiple Sclerosis
- Cerebral tumour
- Parkinson's
- Genetic conditions emerging in adulthood e.g. Huntingdon's Chorea
- CVA
- Arthropathies
- Joint Hypermobility Syndrome (JHS)

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Red flags

- Pain
- Deterioration or loss in functioning
- Tremor
- Gait disturbance
- Asymmetry of tone or movement
- Visual disturbance
- Neuromas/café au lait spots
- History of genetic disorders
- Extreme prematurity
- Disturbance in focus/concentration



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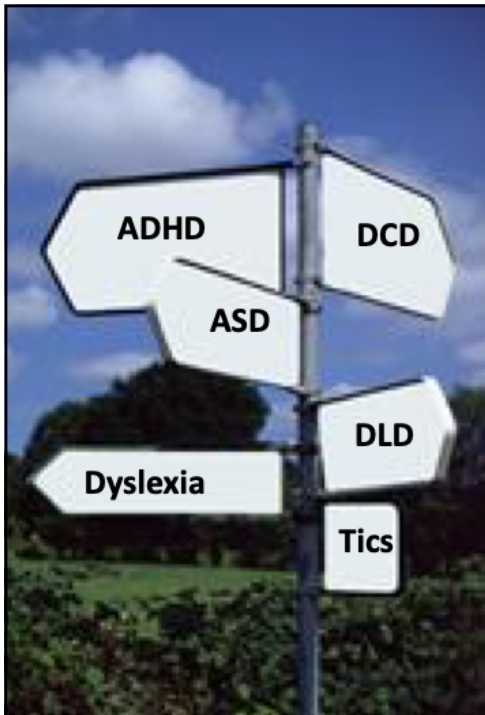
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Masking of motor skills

- Girls may be more able to mask their gross motor difficulties, because of gender stereotypes producing lower expectations for girls in sports (Slater and Tiggemann, 2010; Wetton *et al.*, 2013).
- Gender stereotypes mean greater expectation for girls to write neatly (Burr, 2002); being less able to mask these fine motor difficulties might motivate girls to practice this skill more.

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When do we identify children with movement difficulties?

- Late walkers
- Late talkers
- Parent also has DCD/Dyspraxia... he's like me!
- At school – difficulties writing, playing ball games
- Someone has been on a training course and spots some signs
- Have another diagnosis.. e.g. Dyslexia
- If the opportunity for screening happens

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Early identification issues



Some children may be 'late bloomers'



Standardised tests in under 5s are unreliable- need more than one measure

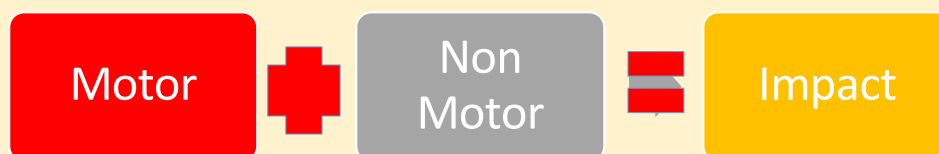
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What sort of challenges
do children, young
people and adults have
with DCD?

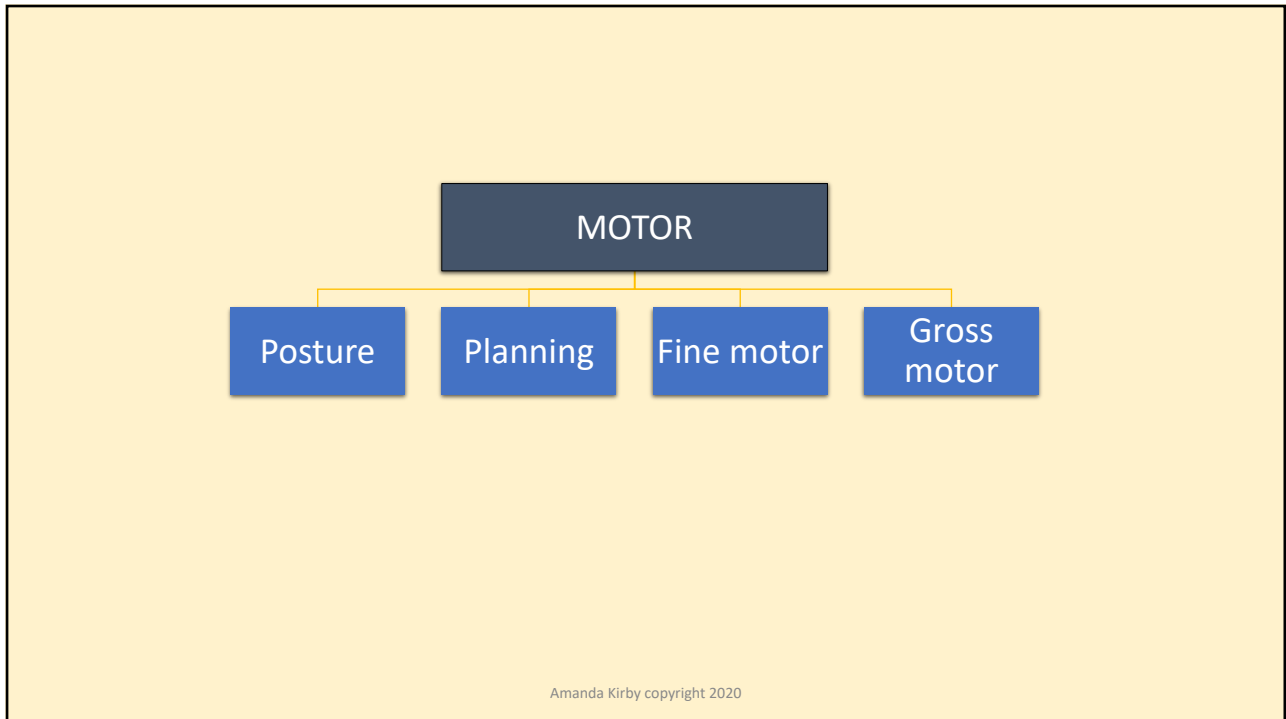
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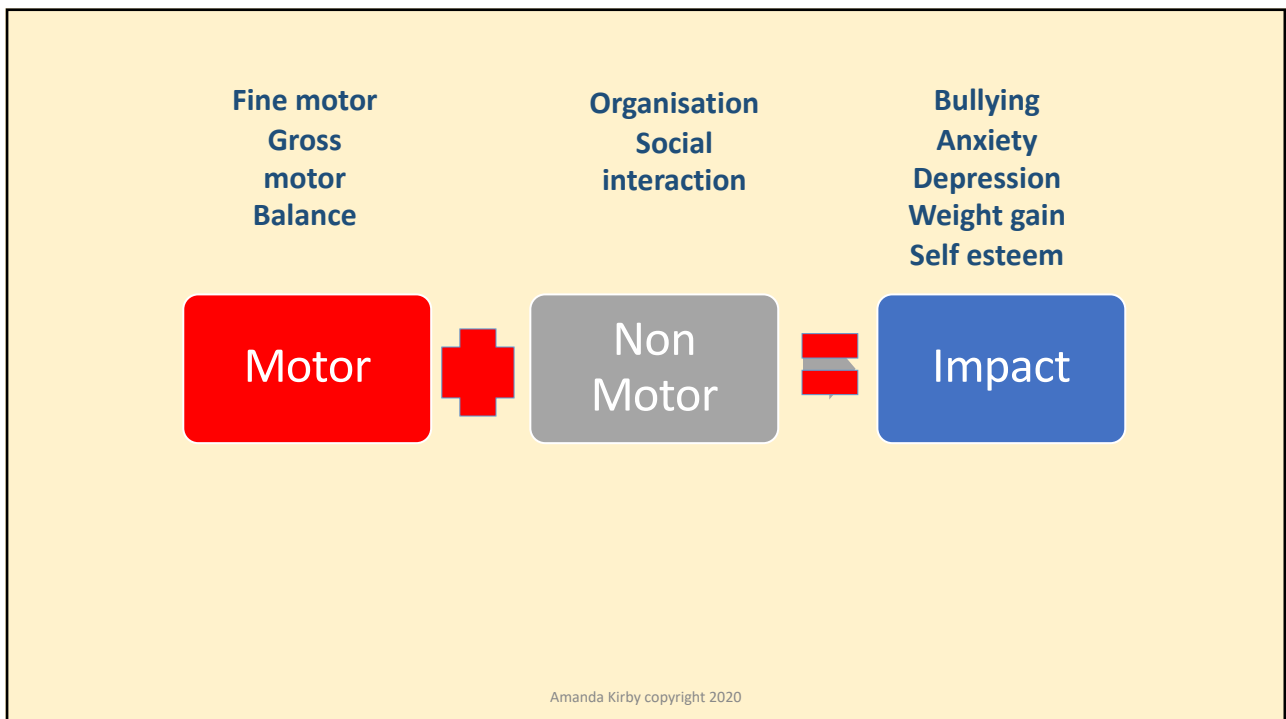


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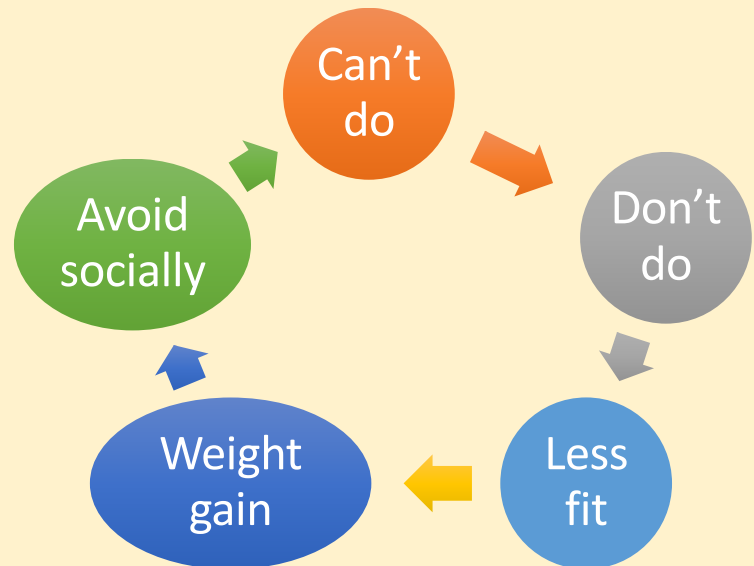


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“A negative involvement cycle”



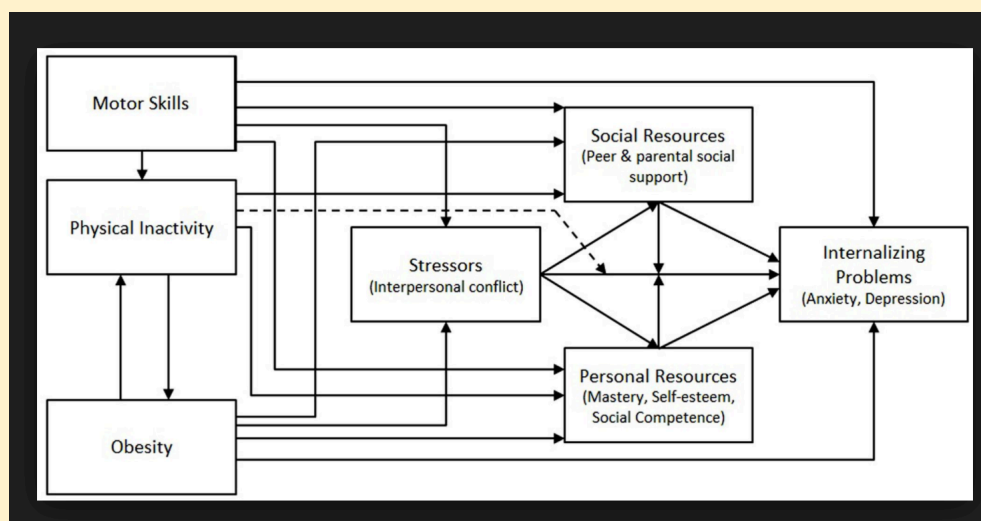
(Keogh, Griffin, & Spector, 1981)

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Environmental Stress Hypothesis

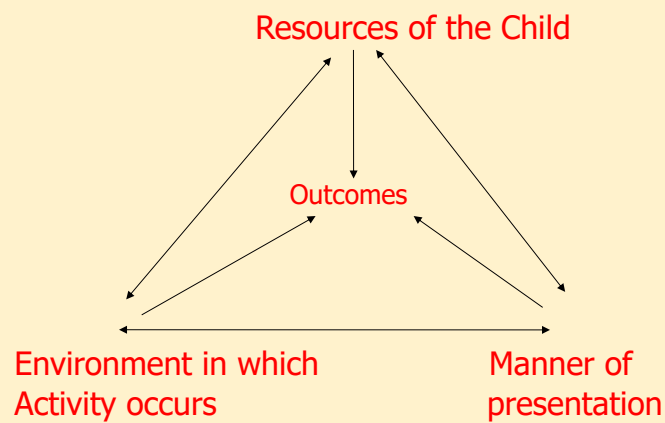
Cairney et al. 2013
Mancini et al, 2016



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Motor Development and Learning



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Presentation in early years with DCD



Later walker/some didn't crawl



Slower learning to ride a bike/scooter



Difficulties dressing/feeding compared to others of a similar age



Avoid climbing/exploring playground equipment



Less social interaction

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Presentation in primary school with DCD

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Handwriting



Team games- ball skills



Dressing, changing, feeding (use of cutlery)- messy eater



Fine motor tasks-using pencils, scissors, rulers



Emotional – self esteem and confidence



Social- harder to make and maintain friends



Poor organisation of work- lose clothes

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Secondary school child with DCD

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Handwriting at speed and clarity, spacing

Poor organisation of self and work, spatial awareness of others

Slouching in class

Team games- ball skills- and avoidance approaches

Weight gain

Dressing- shoe laces,slow to change for PE

Fine motor tasks-using scissors,rulers, compasses

Emotional – self esteem and confidence

Social- More isolated

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Presentation in adults with DCD



Handwriting



Learning to drive



Learning new motor
skills



Avoidance of sports

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Non Motor

- **Executive function difficulties** (although an area of strength for some) – managing money, planning ahead, organising & finding things (Kirby et al, 2008; 2011; Rosenblum, 2013; Tal Saban et al, 2012; 2014; Purcell et al, 2015)
- **Hot EF-** Emotional responses to motor problems leading to higher anxiety (Rahimi-Golkhandan et al, 2016)
- **Loss of attention** (Kirby et al, 2011; Tal Saban et al, 2014)
- **State and trait anxiety** (Hill & Brown, 2013; Kirby et al, 2013)
- **Symptoms of depression** (Hill & Brown, 2013; Kirby et al, 2013), higher rates of clinical depression (Hill & Brown, 2013)
- **Spending leisure time alone** (Kirby et al, 2011)
- **Global self-esteem** (Eggleston et al, 2012; Tal-Saban et al, 2012)

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Impact related to poor motor functioning

Reduced levels of physical activity (Hill & Brown, 2013)

Higher BMI, higher rates of obesity (esp. in females) (Cantell et al, 2008)

Lower endurance, flexibility, strength (Cantell et al, 2008)

Poorer metabolic indices (e.g. cholesterol measures) (Cantell et al, 2008)

Poorer general health (mental & physical) (Kirby et al, 2013)

Fatigue (Thomas, Kirby, 2015)

Sleep problems (Law & Barnett, 2016)

Close Relationships

Gaining employment

Leaving home

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Diagnosing DCD



Listen to parental concerns



Listen out for red flags that suggest delay or disorder



Use screening tools and activities









Watch out for signs and symptoms characteristic of DCD

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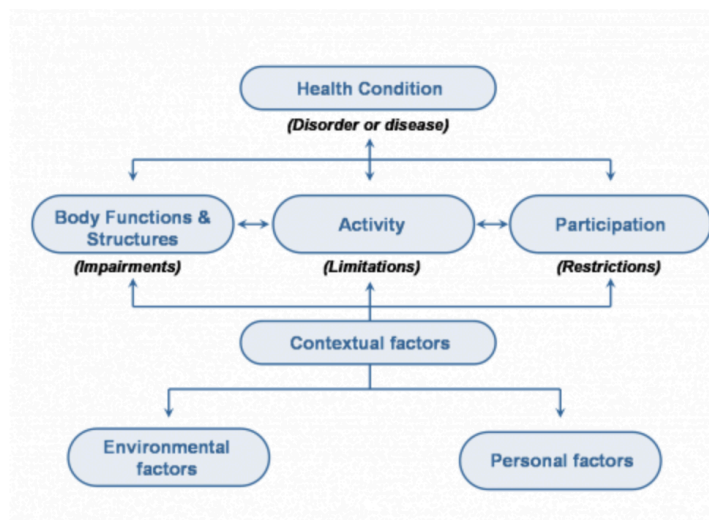
Ref:
<https://primarycare.ementalhealth.ca/index.php?m=fpArticle&ID=26926>

Age of child, yr	Paper and pencil	Standing	Throwing and catching a tennis ball
4	<ul style="list-style-type: none"> Draw:  Draw a person with at least 3 body parts 	Stand on one foot for 3 seconds	Throw with direction to a person 5 feet (1.5 m) away
5	<ul style="list-style-type: none"> Draw:  Print first name (letter reversals may be present) 	Hop 5 times	Catch tennis ball with 2 hands from 5 feet (1.5 m) away (can use body to trap the ball)
6	<ul style="list-style-type: none"> Draw:  Print first and last names correctly 	Stand on one foot for 10 seconds	Catch tennis ball with 2 hands from 5 feet (1.5 m) away (hands only, not body)
7	<ul style="list-style-type: none"> Draw:  Draw a person with at least 8 body parts 	Skip forward for 20 feet (6 m)	Bounce and catch tennis ball – 2-handed catch
8	<ul style="list-style-type: none"> Draw:  Copy the sentence "The quick brown fox jumps over the lazy dog" in 1 minute 	Stand on one foot for 20 seconds	Bounce and catch tennis ball – 1-handed catch
9	<ul style="list-style-type: none"> Draw:  Copy the sentence "The quick brown fox jumps over the lazy dog" in 30 seconds 	Hop forward 5 times, stop and balance on one foot for 5 seconds	Throw tennis ball at wall from 5 feet (1.5 m) away and catch with 2 hands before it bounces
Diagnostic cues			
Drawing and printing Watch for <ul style="list-style-type: none"> <input type="checkbox"/> Head too close to paper <input type="checkbox"/> Awkward or tense pencil grasp <input type="checkbox"/> Failure to use nondominant hand to stabilize the paper <input type="checkbox"/> Uses excessive force <input type="checkbox"/> Rotates paper or body 		Hopping/standing on one foot Watch for <ul style="list-style-type: none"> <input type="checkbox"/> Looks at feet <input type="checkbox"/> Exaggerated arm movements <input type="checkbox"/> Lack of rhythm in hops <input type="checkbox"/> Heavy, flat-footed or stiff-legged landings <input type="checkbox"/> Holds body rigidly 	Throwing/bouncing tennis ball Watch for <ul style="list-style-type: none"> <input type="checkbox"/> Lack of adjustment of body position <input type="checkbox"/> Inaccurate aim <input type="checkbox"/> Poor judgment of force needed <input type="checkbox"/> Changes hands between trials <input type="checkbox"/> Does not look at target
			Catching tennis ball Watch for <ul style="list-style-type: none"> <input type="checkbox"/> Turns away/closes eyes/flinches <input type="checkbox"/> Arms and hands do not "give" with contact from ball <input type="checkbox"/> Does not adjust/correct if unsuccessful <input type="checkbox"/> Positions self incorrectly (e.g., arms too far apart)

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ICF(WHO)
 Approach
 taken



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Screening tools

- Early years movement checklist
- Movement ABC checklist
- DCD-Q
- Adult DCD screening tools

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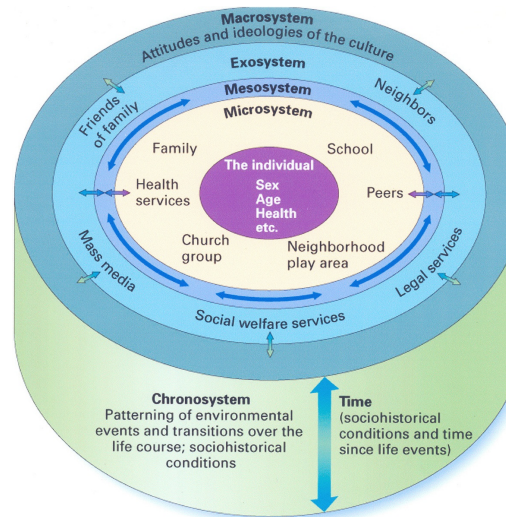
Assessment

- Needs to a neurological examination
- Rule out other conditions e.g. Cerebral Palsy
- Consider other co-occurring conditions and assess for these too.
More than one diagnosis can be given.

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The need to consider the ecology



https://en.wikipedia.org/wiki/Ecological_systems_theory

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United Kingdom Version of the DCD Module

Developmental Coordination Disorder

Description Goals Audience Development Team Credits

Learn to recognize the core features of DCD, evidence-based approaches to management, and how to communicate with parents and connect them with resources.

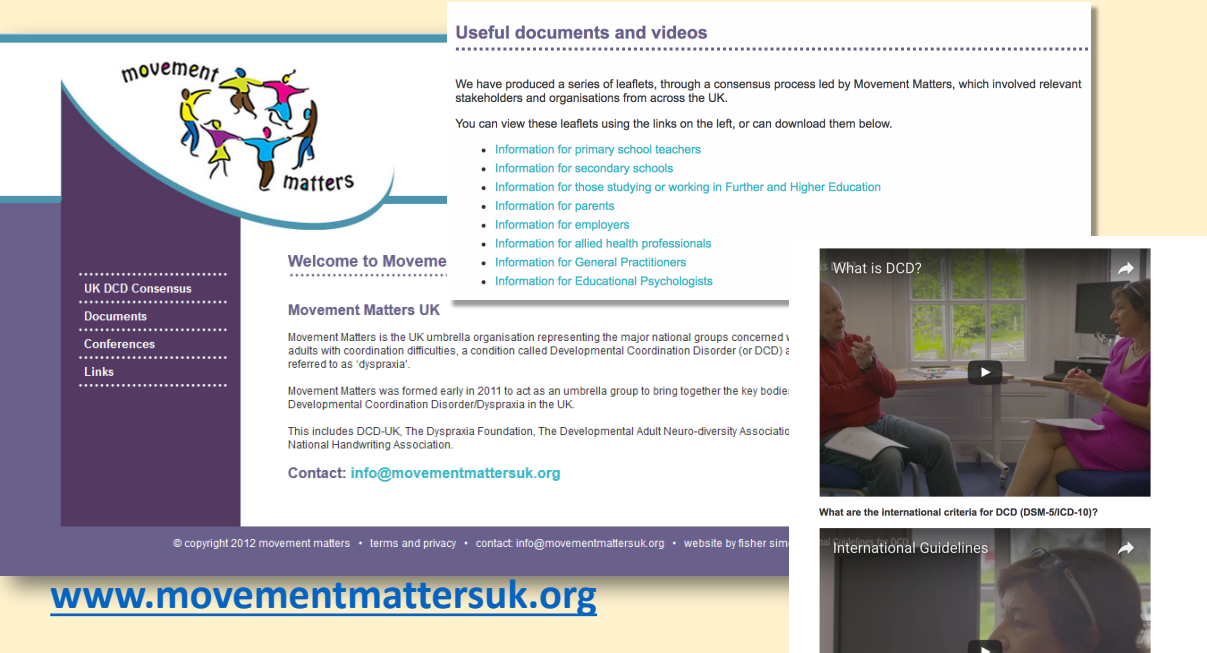
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https://machealth.ca/programs/developmental_coordination_disorder/

<https://primarycare.ementalhealth.ca/index.php?m=fpArticle&ID=26926>

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movement matters

UK DCD Consensus
Documents
Conferences
Links

Welcome to Movement Matters UK

Movement Matters is the UK umbrella organisation representing the major national groups concerned with adults with coordination difficulties, a condition called Developmental Coordination Disorder (or DCD) referred to as 'dyspraxia'.

Movement Matters was formed early in 2011 to act as an umbrella group to bring together the key bodies Developmental Coordination Disorder/Dyspraxia in the UK.

This includes DCD-UK, The Dyspraxia Foundation, The Developmental Adult Neuro-diversity Association, National Handwriting Association.

Contact: info@movementmattersuk.org

Useful documents and videos

We have produced a series of leaflets, through a consensus process led by Movement Matters, which involved relevant stakeholders and organisations from across the UK.

You can view these leaflets using the links on the left, or can download them below.

- Information for primary school teachers
- Information for secondary schools
- Information for those studying or working in Further and Higher Education
- Information for parents
- Information for employers
- Information for allied health professionals
- Information for General Practitioners
- Information for Educational Psychologists

What is DCD?

What are the international criteria for DCD (DSM-5/ICD-10)?


International Guidelines

www.movementmattersuk.org

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Creating the right milieu

1. Look for skills
2. Consider the context - family
3. Understand motivation
4. Avoid or adapt
5. Social and physical fitness
6. Increase confidence and decrease shame
7. Provide opportunity, appropriate and sufficient practice
8. Build organisational and planning skills

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- **Consider working on skills that have transferability and long term impact**

- Executive functioning
- Social skills
- Wellbeing – managing anxiety
- Working on being fit

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Review

- DCD is a motor disorder... no history of motor... it is not motor
- Consider motor and non motor elements and impact and co-occurs- whole person in the context of life
- Discuss priorities
- Encourage sufficient practice to gain skills
- Take a long term view of wellbeing ... fitness, sleep, mood etc
- Aid goal setting

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Screening for DCD

- In children- DCDQ and Little DCD-Q and M-ABC2 checklist
- Adults –Adult DCD checklist

Other scales and questionnaires also exist; but these 'unspecific' instruments do not verify the diagnosis of DCD. However, the information gathered may be useful. Some examples are:

- Early years motor skills checklist⁸³
- Children Activity Scales for Parents and Children Activity Scales for Teachers⁸⁴
- The Handwriting Proficiency Screening Questionnaire (HPSQ)⁸⁵ for teachers/parents report and the Handwriting Proficiency Screening Questionnaire-Children (HPSQ-C)⁸⁶ for the child's self report about handwriting difficulties.
- My Child's Play (MCP), a parent questionnaire designed to detect the play characteristics of young children aged 3-6 suspected for DCD^{87, 88}.

Furthermore, there are self-reports for children, most of these measure aspects of self-efficacy for movement and self-esteem:

- The All about Me Scale^{89, 90}
- The Perceived Efficacy and Goal Setting System^{89, 91}
- The Childrens Self-Perceptions of Adequacy in and Predilection for Physical Activity (CSAPPA)^{69, 71}. The CSAPPA has been examined mainly by one research group. A number of terms in this scale are specific to North America (e.g., the different settings for participation).

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Useful references

- www.movementmattersuk.org
- www.canchild.ca
- https://machealth.ca/programs/developmental_coordination_disorder/

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