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
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**

- 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
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 affecting movement e.g. cerebral palsy, muscular dystrophy, degenerative disorder).

DCD descriptor

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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

- 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.
• 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.

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.
Basis of the guidelines for clinical practice

• European/International DCD Guidelines (2016;2019)

• UK Guidelines (2017)

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


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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.
Co-occurrence patterns: DCD+

- Reading/Dyslexia (Cheng, Chen, Tsai, Chen, & Cherng, 2009; Fletcher-Finn, 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

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.
<table>
<thead>
<tr>
<th>Conditions</th>
<th>Other commonly co-occurring condition(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Psychological</strong></td>
<td><strong>Physical</strong></td>
</tr>
<tr>
<td>ASD</td>
<td>Anxiety disorders, eating disorders, gender dysphoria, mood disorders, OCD, personality disorders, schizophrenia, substance use disorders, Tourette's syndrome, tic disorders.¹</td>
</tr>
<tr>
<td>ADHD</td>
<td>Anxiety disorders, gender dysphoria, mood disorders, OCD, personality disorders, schizophrenia, substance use disorders, Tourette's syndrome, tic disorders.³</td>
</tr>
<tr>
<td>DCD</td>
<td>Anxiety disorders, mood disorders, personality disorders, substance use disorders, tic disorders.⁴</td>
</tr>
<tr>
<td>DLD</td>
<td>Anxiety disorders, mood disorders, OCD, personality disorders, schizophrenia.⁷</td>
</tr>
<tr>
<td>Dyscalculia</td>
<td>Mood disorders, schizophrenia.⁹</td>
</tr>
<tr>
<td>Dyslexia</td>
<td>Anxiety disorders, mood disorders, schizophrenia.¹¹</td>
</tr>
</tbody>
</table>

**Dimensional and not categorical**

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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 Parkinson’s, Huntingdon’s 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
- 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)
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

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.
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

Early identification issues

Some children may be ‘late bloomers’

Standardised tests in under 5s are unreliable- need more than one measure
What sort of challenges do children, young people and adults have with DCD?

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MOTOR

- Posture
- Planning
- Fine motor
- Gross motor

Fine motor
Gross motor
Balance

Organisation
Social interaction

Bullying
Anxiety
Depression
Weight gain
Self esteem

Motor
Non Motor
Impact

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“A negative involvement cycle”

(Keogh, Griffin, & Spector, 1981)

Environmental Stress Hypothesis

Cairney et al. 2013
Mancini et al, 2016
Motor Development and Learning

Resources of the Child

Outcomes

Environment in which Activity occurs

Manner of presentation

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
Presentation in primary school with DCD

- 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

Secondary school child with DCD

- 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
Presentation in adults with DCD

Handwriting

Learning to drive

Learning new motor skills

Avoidance of sports

- 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)

Non Motor

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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

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
### ICF (WHO) Approach taken

#### Diagnostic cues
- 
  - Drawing:
    - Name too close to paper
    - Awkward or tense pencil grasp
    - Failure to use non-dominant hand to hold the paper
    - Uses excessive force
    - Rotates paper or body

- Hopping/standing on one foot:
  - Watch for:
    - Feet looks at feet
    - Exaggerated arm movements
    - Lack of rhythm in hops
    - Heavy, flat-footed or stiff-legged landing
    - Holds body rigidly

- Throwing/bouncing tennis ball:
  - Watch for:
    - Lack of adjustment of body position
    - Inaccurate aim
    - Poor judgment of force needed
    - Changes hands between toss
    - Does not look at target

- Catching tennis ball:
  - Watch for:
    - Toss away/side
    - Eyes fixed
    - Arms and hands do not come “in line” with contact from ball
    - Does not adjust/incorrect if unsuccessful
    - Positions will incorrectly (e.g., arms too far apart)

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**Ref:**
https://primarycare.ementalhealth.ca/index.php?m=fpArticle&ID=26926
Screening tools

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

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.
The need to consider the ecology


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United Kingdom Version of the DCD Module

Developmental Coordination Disorder

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

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

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

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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
• Consider working on skills that have transferability and long term impact
  • Executive functioning
  • Social skills
  • Wellbeing – managing anxiety
  • Working on being fit

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
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 checklist
  - Children Activity Scales for Parents and Children Activity Scales for Teachers
  - The Handwriting Proficiency Screening Questionnaire (HPSQ) for teachers/parents report and the Handwriting Proficiency Screening Questionnaire-Children (HPSQ-C) 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.

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
  - The Perceived Efficacy and Goal Setting System
  - The Children’s Self-Perceptions of Adequacy in and Prediction for Physical Activity (CISAPPA) The CISAPPA 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).

Useful references

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