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DEVELOPMENTAL CO-ORDINATION DISORDER
LEARNING OUTCOMES

➢ WHAT IS DCD?
➢ IMPAIRMENTS & IMPLICATIONS
➢ CAUSES & PATHOGENESIS
➢ CO-MORBID CONDITIONS
➢ RISK FACTORS
➢ DIAGNOSTIC CRITERIA
➢ RELEVANT ASSESSMENTS
➢ O.T INTERVENTION APPROACHES
WHAT IS DCD

- Neuro-Motor Disorder
- Prevalence of DCD among children is 5-10%
- Impairs motor coordination
- Impacts functional areas
- Not attributable to any known medical/neurological condition

Labels-

**Earlier Named**
- Clumsy child syndrome
- Developmental dyspraxia
- Gross/ fine motor challenges
- Sensory based motor disorder
- Motor coordination difficulties

**Current Term**
- Developmental Coordination Disorder
  - International Consensus (1994)
  - EACD Guidelines (2012)
IMPAIRMENTS

➢ WEAKNESS & POOR COORDINATION
➢ LOW MUSCLE TONE & JOINT LAXITY
➢ MUSCLE CO-CONTRACTION & JOINT STABILIZATION
➢ ABNORMAL POSTURE & GAIT, SPATIAL ORGANIZATION
➢ ↓ MULTI-SEQUENCE TASKS
➢ MAX USE OF VISION TO GUIDE MOTOR ACTIONS
➢ DECREASED REACTION TIME
➢ VARIABILITY IN MOVEMENT QUALITY

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PRIMARY CLINICAL FEATURES

• POOR SENSORY PROCESSING ABILITY
• POOR PERCEPTUAL MOTOR INTEGRATION
• POOR PRAXIS
• IMMATURE BODY SCHEME & AWARENESS
• POOR SPATIAL SKILLS
• AVERAGE INTELLECTUAL CAPACITY
• POOR NEUROMOTOR FUNCTIONS
• POOR FUNDAMENTAL MOTOR SKILLS
IMPLICATIONS

Participation Restrictions:

- Fitness & ADL
- Play & Academic functioning
- Avoids participation & unmotivated
- Social relationships
- Psychological issues - depression and anxiety
- Low self-esteem & Decreased QOL
CAUSES

ETIOLOGY : LARGELY UNKNOWN

OTHER POSSIBLE CAUSES

- *Sensory processing dysfunction* (planning, organizing & timing of motor responses)
- *Perceptual-motor dysfunction* (Failure to anticipate sensory input cues or use perceptual information for movement)
- *Environmental* (social /physical environmental interaction impacts ability to acquire skills)
PATHOGENESIS

• UNKNOWN

• Some theoretical models... disruption in the neurological pathways of motor development (Nelson SL, Jaskiewicz JL. 2014)

• The motor cortex, vestibular system, and cerebellum integrate neural pathways for movement or sequence of movements

• Inadequate functioning of these neurological systems slow, unsteady, or clumsy movement
CO-MORBID CONDITIONS

- Anxiety: 16.7%–33.8%
- Depression: 9.1%–11.8%
- ADHD: 50%
- ASD: 4.1%–8.2%
- Specific Learning Disability: 17.8%–27.5%
- Specific Language Impairment: 70%

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RISK FACTORS

➢ VERY PRETERM BIRTH (< 32 WK)
➢ LOW BIRTH WEIGHT (< 1500 G)
➢ MALE: FEMALE RATIO VARY 2:1 TO 7:1
➢ STEROIDS & LEAD
➢ ALCOHOL & DRUGS IN UTERO
SCREENING & DIAGNOSIS

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SCREENING & HISTORY

➢ SCREENING

❑ DCDQ (B.N. Wilson 2007): 15-item questionnaire; 5–15 years olds; assesses: Control during movement, Fine motor/Handwriting & General coordination

❑ MOQ-T (Schoemaker et al., 2006): 18-item questionnaire; 5–11 years olds; gross & fine motor functioning
HISTORY

• FAMILY HISTORY: Neurologic disorders
  Mental health concerns
  Family’s social situation

• CHILD’S HISTORY: Pregnancy
  Birth
  Age of attainment of motor milestones
  School performance
  any previous or current disorders
  Neurologic or sensory concerns
  Current gross motor and fine motor difficulties
  performance in activities of daily living
  sleep disturbances(parasomnia)
  Obesity
MULTI-DISCIPLINARY TEAM

**PHYSICIAN**  (Child psychiatrist, develop pediatrician)

**CHILD NEUROLOGIST**  (rules out coexisting /other neuro motor conditions )

**OCCUPATIONAL THERAPIST**
(Standardized motor tools, sensory integration)

**PHYSICAL THERAPIST**
(Standardized motor tools, gait training)

**SCHOOL PSYCHOLOGIST (STD IQ TEST**  (Intelligence)

**SPEECH & LANGUAGE THERAPIST**  (Oral praxis)

**OPHTHALMOLOGIST**  (Visual acuity impairments)
A. **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.

B. The motor skill deficit in Criterion A significantly and persistently interferes with **activities of daily living** appropriate for 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 condition affecting movement (e.g. cerebral palsy, muscular dystrophy, degenerative disorders).

-APA (2013)
<table>
<thead>
<tr>
<th>Diagnostic Criteria</th>
<th>Assessment Domain</th>
<th>Recommended Measures</th>
<th>Key Information</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>Motor functioning</td>
<td>Movement Assessment Battery for Children, 2nd ed. (MABC-2)⁹</td>
<td><strong>Age range:</strong> 3 years to 16 years 11 months</td>
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<tr>
<td></td>
<td></td>
<td><strong>Subsections:</strong> Manual dexterity, ball skills, and balance (static &amp; dynamic)</td>
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<td>Bruininks-Oseretsky Test of Motor Proficiency, 2nd ed. (BOT-2)¹⁰</td>
<td><strong>Age range:</strong> 4 to 21 years</td>
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<tr>
<td></td>
<td></td>
<td><strong>Subsections:</strong> Running ability, agility, balance, bilateral co-ordination, upper limb speed, and dexterity, and visual motor control</td>
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<tr>
<td>B</td>
<td>Activities of daily living</td>
<td>Developmental Coordinating Disorder Questionnaire (DCDQ'07)¹¹</td>
<td><strong>Age range:</strong> 5 to 15 years</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Subsections:</strong> Control during movement, fine motor skills &amp; handwriting, general coordination</td>
<td>Free download available at <a href="http://www.dcdq.ca">www.dcdq.ca</a></td>
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<tr>
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<td></td>
<td>Movement Assessment Battery for Children Checklist, 2nd ed. (MABC-2 Checklist)¹⁰</td>
<td><strong>Age range:</strong> 5 to 12 years</td>
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<tr>
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<td><strong>Subsections:</strong> Movement in a static environment, movement in a dynamic environment, non-motor factors</td>
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<td></td>
<td>Early onset</td>
<td>Parent interview and/or tools such as the Listening for DCD Checklist$^{12}$ or clinical interview guidelines$^{13}$ may be used</td>
<td>Developmental history as part of OT and/or physician assessment; a history of motor learning challenges should be evident from early in life</td>
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<td>Medical examination</td>
<td>Neurological exam and other tests, as required</td>
<td>Refer to physician to rule out other possible medical or neurological explanations for motor difficulties$^{14}$</td>
</tr>
<tr>
<td>D</td>
<td>Cognitive functioning</td>
<td>IQ testing</td>
<td>Not required if no history of challenges with school functioning/academic achievement$^{1}$</td>
</tr>
</tbody>
</table>
OCCUPATIONAL THERAPY ASSESSMENTS

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MOTOR BEHAVIOUR ASSESSMENTS

TASK-ORIENTED STANDARDIZED TEST *(Top down)*

➢ EXAMINES TASKS THAT CONSTITUTE MOTOR BEHAVIOUR

   Eg. Bruininks-oseretsky test of motor proficiency *(Bruininks, 1978)*

   Movement assessment battery for children *(Henderson, 1992)*

PROCESS-ORIENTED STANDARDIZED TEST *(Bottom up)*

➢ EXAMINES UNDERLYING MOTOR BEHAVIOR PROCESS

   E.g. Sensory Integration & Praxis Test *(Ayres, 1989)*
SIPT

BATTERY OF 17 SUBTESTS
AGE: 4 - 8 YRS 11 MONTHS
1. Praxis on verbal command
2. Design copying
3. Constructional praxis
4. Postural praxis
5. Oral praxis
6. Sequencing praxis

Examines: imitation of Body Gestures, facial gestures, plan & sequence unfamiliar movements, construct with blocks, execute unfamiliar single/multiple-step verbal instructions and ability to try new activities without excessive prompting, demonstration, guidance or rewards.
PRAXIS & FUNCTION

Basic neuromotor function
- Muscle tone
- Reflex integration
- Body symmetry
- Postural-motor control
- Bilateral integration
- Cerebral integrity

Fundamental motor skills
- Physical fitness
- Gross motor skills
- Fine motor skills
- Ocular-motor skills
- Sport skills
- Graphomotor skills

Praxis functions
- Ideation
- Motor planning
- Execution

Body scheme

Perceptual functions
- Tactile-kinaesthetic perception
- Visual perception
- Auditory perception
- Body awareness

Functional motor skills
- Rhythm and temporal awareness
- Spatial orientation and relationships
- Development of laterality
- Sequencing
- Visual-motor Integration
- Auditory-motor integration

Adaptive behaviours
- Purposeful activities
- Interaction with environment
- Intellectual, social and emotional development
- Independence in daily activities
OCCUPATIONAL THERAPY INTERVENTION

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TREATMENT APPROACHES

REMEDIAL APPROACH
➢ SENSORY INTEGRATION
➢ NEURO-DEVELOPMENTAL
➢ PERCEPTUAL MOTOR TRAINING

FUNCTIONAL APPROACH
➢ FUNCTIONAL HANDWRITING SKILLS TRAINING
➢ SELF-CARE SKILLS TRAINING

COMPENSATORY APPROACH
➢ SET APPROPRIATE LEVEL OF EXPECTATION
➢ ALLOW MORE TIME TO COMPLETE A TASK
TREATMENT APPROACHES

**ADAPTIVE APPROACH**
- MODIFICATION OF NATIONAL CURRICULUM
- ADAPTIVE DEVICES / TOOLS

**MANAGEMENT APPROACH**
- PROMOTE UNDERSTANDING OF CHILD’S PROBLEMS
- REINFORCEMENT PROGRAMME (TOKEN ECONOMY, STAR CHART)

**MAINTENANCE APPROACH**
- EMPHASIZE STRENGTHS & INTERESTS
- PARTICIPATION - COMMUNITY-BASED RECREATIONAL, FITNESS
INTERVENTIONS SHOULD:
• CONTAIN ACTIVITIES THAT ARE FUNCTIONAL & RELEVANT TO DAILY LIVING
• MEANINGFUL TO THE CHILD, PARENTS, TEACHERS

SHOULD CONSIDER:
• WISHES OF THE CHILD, THE SIGNIFICANT PERSONS IN THE CHILD’S LIFE
• CHILD’S CONTEXTUAL LIFE AND FAMILY CIRCUMSTANCES
• THEORY- AND EVIDENCE-BASED

• Eg:

• COGNITIVE ORIENTATION TO DAILY OCCUPATIONAL PERFORMANCE (CO-OP)
  .. “a client-centred, performance based, problem solving approach that enables skill acquisition through a process of strategy use and guided discovery” (Polatajko & Mandich, 2004, p. 2)
KEY POINTS

• Despite a range of labels and names used over the years, DCD is now established as the diagnostic term of choice.

Etiology of DCD is largely unknown.

• There are a number of coexisting conditions and associated difficulties.

• Risk of long term negative consequences.
KEY BENEFITS

• Occupational therapists play a key role in diagnosis of DCD as part of multidisciplinary pathway (Missiuna et al 2008).

• Occupational therapy intervention enables children with DCD overcome the difficulties in their ADL (Dunford 2011).


4. Harris SR, Mickelson EC, Zwicker JG, Diagnosis and management of developmental coordination disorder CMAJ. 2015 Jun 16; 187(9): 659–665


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PASUMALAI, MADURAI-4

‘Thank you’