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Developmental Coordination Disorder Defined: Understanding the Clumsy Child

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Objectives

- Independently distinguish diagnostic criteria and general characteristics of an individual with DCD
- Accurately recognize the possible co-existing conditions of DCD
- Identify appropriate test and measures and assessments to assist in obtaining a DCD diagnosis
- Independently distinguish between activity-oriented and body function- oriented interventions used with children with DCD
- Recognize resources to provide to caregivers and practitioners to assist in promoting optimal outcomes for individuals with DCD

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Why are we talking about DCD?

- Under-diagnosed disorder
  - 5-6% of the population
- Historically ambiguous terminology
  - Apraxia/dyspraxia vs. DCD
- Coordination difficulties impact more than gross motor skills
- Global health and disease prevention

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DSM-5 criteria for diagnosis

A diagnosis of DCD is made by a physician when the following 4 criteria are observed:

1. Learning and execution of coordinated motor skills is below age level given the child's opportunity for skill learning
2. Motor difficulties significantly interfere with ADL's, academic productivity, prevocational and vocational activities, leisure and play
3. Onset is in the early developmental period
4. Motor coordination difficulties are <u>not</u> better explained by intellectual delay, visual impairment, or other neurological conditions that affect movement

DSM 5th edition, 2013

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Co-occurring conditions

- ADHD (approximately 50% co-occurrence)
- Specific learning disabilities (esp. reading and writing)
- Speech and language disorder
- Autism Spectrum Disorder
- Conduct disorder
- Joint hypermobility

R. Blank et al. 2018

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Risk factors

- Gender
- Prematurity
  - Very preterm (<32 weeks)
  - Very low birth weights (<1500g)
  - Greater post-natal steroid exposure
- Independent walking >15 months
- Difficulties in attention, social communication, non-word repetition, spelling, reading

J Edwards et al. 2011, J Zwicker et al. 2013; L Faebo et al. 2013

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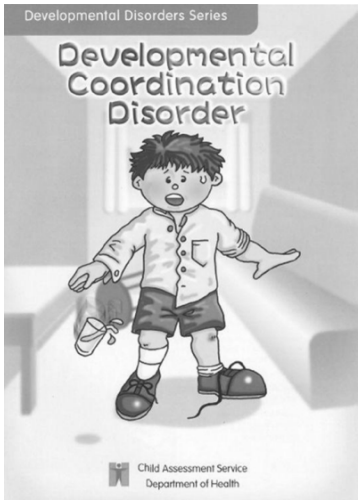
Characteristics of DCD

- Motor skill delay
- ADL limitations
- School challenges
- Social implications
- Communication issues
- Poor fitness/obesity



http://www.dhcas.gov.hk/english/health_pro/develop_dis_dcd.html

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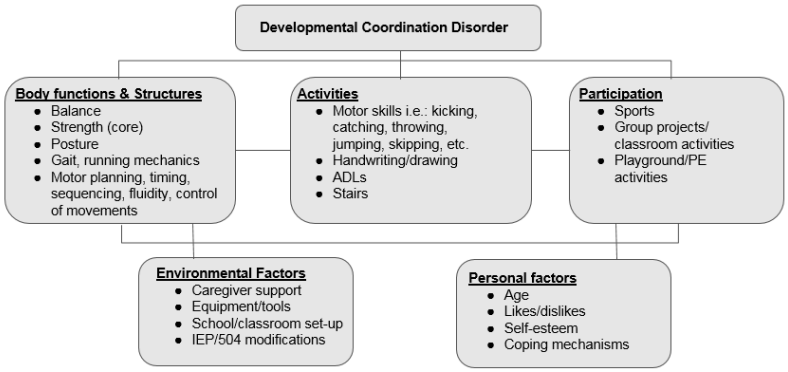
Motor characteristics of DCD



Magalhaes et al. 2011

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ADL limitations

- Difficult sequencing and completing tasks
- Inability to fasten buttons, zippers, or tie shoes
- Require assistance with cleaning up/getting ready
- Meal time difficulties:
  - Coordinating use of utensils
  - Frequent spills
  - Positioning self at table
  - Carrying at tray

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Magalhaes et al. 2011

School challenges

- Fine motor:
  - Issues with handwriting and keyboarding
  - Using scissors, folding paper, completing artwork
  - Opening locker or combination lock
  - Opening lunch items
- Gross motor:
  - Problems keeping up with peers at recess or in gym class
  - Donning/doffing coat and shoes, gym clothes
  - Getting off/on the bus
  - Achieving functional posture for circle time, class seating

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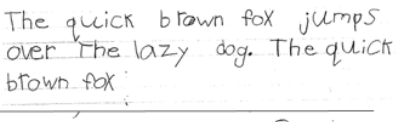
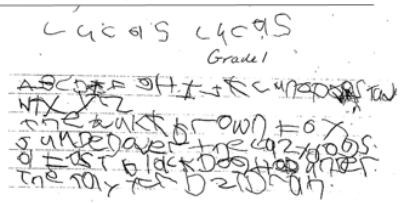
School challenges cont.

- Sample of a typical 1st grader



- Sample of a 1st grader with DCD



www.canchild.ca

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School challenges cont.

- Executive functioning:
  - Organizing and finishing work on time
  - Sequencing tasks
  - Efficiently opening locker
  - Retrieving and opening lunch items
  - Attending and behaving in class
  - Completing homework (individually or with caregiver)

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Social implications

- Social implications:
  - Lower self-esteem
  - Behavioral issues
  - Anxiety and depression
  - Higher levels of frustration
- Communication issues:
  - Can be verbal or written
  - Receptive and expressive

C. Missiuna et al. 2014, Poulsen et al. 2008, Crane et al. 2017, Lingam et al. 2010

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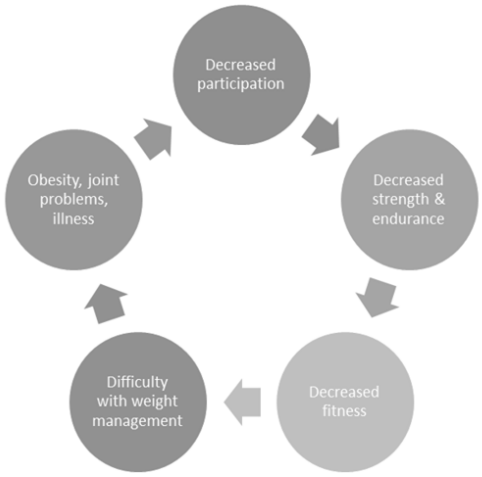
Long-term health implications



Cairney et al. 2007

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Case example

- ***Jonathan video
  - 8 year old boy
  - Referred for “evaluation and treatment of gross motor skills, skipping, coordination, and balance” with diagnoses of gross motor delay, coordination problems, and balance problems.
  - Co-existing conditions: OCD, intermittent explosive disorder, other speech disturbances, sensory disturbance
  - Subjective: Mom reports clumsiness and issues with PE activities such as balance, running, and skipping. He is becoming more aware of activities that are difficult which contributes to his aggressive and disruptive behavior.

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So how do we recognize these patients on our caseload?

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Screening tools

DSM Criteria:
1) Impaired planning, learning, and execution of motor skills
2) Impacts various areas of the child's life
3) Onset in the early developmental period
4) Not explained by intellectual disability, visual disturbance, or other neurological diagnosis

- Used to determine the overall impact of coordination difficulties on the child's life
- Cannot be used alone to diagnose DCD
- Developmental Coordination Disorder Questionnaire (DCDQ)

R. Blank et al. 2018

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DCDQ/Little DCDQ

- DCDQ
  - 15 question parent questionnaire (Likert scale)
  - 5-15 years of age
  - Time: 10 minutes
  - Free and can be found online: http://dcdq.ca/
  - Sensitivity = 85%
  - Overall specificity = 71%
- Little DCDQ: ages 3-4 ($50 fee)

B. Wilson et al. 2000, B. Wilson et al. 2009

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Standardized testing

DSM Criteria:

1) Impaired planning, learning, and execution of motor skills
2) Impacts various areas of the child's life
3) Onset in the early developmental period
4) Not explained by intellectual disability, visual disturbance, or other neurological diagnosis

- Standardized tests:
  - Identifies motor delays, does not diagnose DCD specifically
  - As always, interpret with caution
  - Movement Assessment Battery for Children – version 2 (MABC-2)
  - Bruininks-Oseretsky Test of Motor Proficiency, Second Edition (BOT-2)

R. Blank et al. 2018

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MABC-2

- Movement Assessment Battery for Children-version 2 (MABC-2)
- Age range: 3:0-16:11 years
- Time: 20-40 minutes
- Content:
  - 8 tasks cover the following 3 areas:
    - Manual Dexterity
    - Ball Skills
    - Static and Dynamic Balance

- A score below 16th percentile, indicates motor impairment
  - <5th percentile: indicates children with DCD
  - 5-15th percentile: children at risk for DCD
- MABC-2 Checklist for teachers/families

S. Henderson et al. 2007; S. Chow et al. 2003

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BOT-2

- Bruininks-Oseretsky Test of Motor Performance - second edition
- Age Range: 4:0-21:11
- Multiple options
  - Short Form:15-20 minutes
  - Complete Form: 45-60 minutes
  - Fine Motor only: 25-30 minutes
  - Gross Motor only: 25-30 minutes
- Content:
  - 8 sections
    - Fine Motor Precision, Fine Motor Integration, Manual Dexterity, Bilateral Coordination, Balance, Running Speed and Agility, Upper-Limb Coordination, Strength
- No specific cut-offs for DCD designation at this time though recommending 1 SD below normal

R. Bruininks, B Bruininks 2005

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Other testing/referrals

- Goal setting
  - Canadian Occupational Performance Measure (COPM)
  - Goal Attainment Scaling (GAS)
- Other evaluations/referrals:
  - Behavioral and cognitive evaluation
    - Attentional disorders, learning disorders, and autism spectrum disorder common
  - Cognitive function (IQ testing)
    - Does not need to be completed if a normal history of school/academic achievement
  - Fine motor testing (Occupational Therapy)
    - Handwriting tests
    - Disability inventories

R. Blank et al. 2018

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So how do we fix it?

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Interventions

- Body function oriented interventions
  - Addresses the body functions required to perform an activity
  - Balance, strength, sensory integration, proprioception, etc.
  - Bottom up approach
  - Formally called “process oriented”
- Activity-oriented interventions
  - Addresses the motor task itself
  - Can be whole or part training
  - Top down approach
  - Formally called “task-oriented”

B. Smits-Engelsman et al. 2018

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Body function oriented

- The hypothesis is that the improvement of body functions such as sensory integration, kinesthesia, muscle strength, core stability, visual–motor perception, and so on leads to better skill performance.
- Example: riding a bike
  - Work on leg strength, balance, overall endurance, coordination with the intention that this will translate into bike riding

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Activity-oriented

- Working on the desired task, whether in whole or part, to improve the overall task performance
- Example: riding a bike
  - Attempt to ride & determine the breakdown in performance
  - Coach the child through making a goal and plan, then gaining awareness into what went wrong and discovering new solutions.
  - Work on bike riding the entire time in some capacity.

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It is recommended for children with Developmental Coordination Disorder, that activity-oriented interventions be employed to improve motor skills.

Note: Body function-oriented interventions can be employed though may be less beneficial than task-based interventions.

Key: Make sure it is GOAL DRIVEN

B. Smits-Engelsman et al. 2018

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Activity-oriented interventions

- Neuromotor Task Training
  - Analyzing and modifying the interaction between the child, task, and environment
- Cognitive Orientation to daily Occupational Performance (CO-OP)
  - Use of cognitive strategies to problem-solve and attain the skill
  - Goal, Plan, Do, Check
- Motor Imagery
  - Mental rehearsal of a skill without the motor component

B. Smits-Engelsman et al. 2018

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Neuromotor Task Training

- Process
  - Step 1: Observation and problem identification
  - Step 2: Selection of tasks
  - Step 3: Identification of task constraints
    1) Task analysis (general)
    2) Task Performance Analysis (specific to child)
  - Step 4: Intervention
    - Adapt the task/environment to see what is truly limiting the success
    - Train to overcome the barriers while progressively increasing the demands to promote learning
    - Consider feedback –timing and type
  - Step 5: Evaluation

M. Schoemaker et al.2005

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NTT case study

- Goal: to bounce and catch a tennis ball with one hand ***NTT video
- Task constraints:
  - Task analysis – pronation with one-handed ball release, proper force and trajectory for ball to hit floor in front of body and return back up to hip height to allow for supination & fingers flexing around ball all while following with eyes and maintaining stable stance
  - Task performance analysis- inconsistent one- or two-handed release, either downwards or upwards, trunk flexion over ball, various locations of floor contact and force, inconsistently bringing two hands together to trap ball against body

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NTT case study cont.

- Intervention
  - Decrease constraints of the task, environment, and/or child to make the task successful
  - Examples:
    - Using a larger ball
    - Sitting in a chair
    - Using a visual target on the floor
    - Allowing a two-handed catch for success
  - Gradually increase difficulty
    - Using a smaller ball
    - Transitioning back to one-handed catch
    - Performing in a busier setting
    - Walking and catching

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CO-OP

- CO-OP is an "active client-centered approach that engages the individual at the meta-cognitive level to solve performance problems"
- Essential elements:
  - collaborative goal setting
  - dynamic performance analysis
  - cognitive strategy use
  - guided discovery
  - enabling principles
- Goal, Plan, Do, Check

A. Thorton et al. 2016

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CONTINUED

CO-OP cont.

- Goals of CO-OP:
  - Skill acquisition
  - Strategy use
  - Generalization to other settings
  - Transfer to other tasks

  - KEY: The real goal of CO-OP is *proficient use of problem-solving, motor-planning strategies.*

A. Thorton et al. 2016

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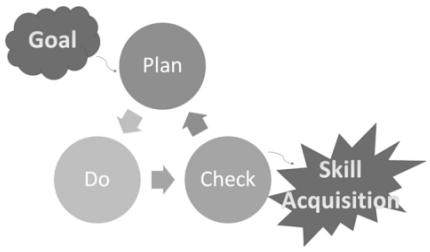
CO-OP cont.

- Patient requirements for success:
  - Ability to goal set
  - Sufficient language skills
  - Basic cognitive ability
  - Behavioral responsiveness
  - General awareness



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CO-OP: Guided Discovery

- A means of providing both instruction and feedback
- Encourages learner to problem solve independently
- Guided by knowledgeable instructor who provides coaching and hints

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CO-OP: Guided discovery

- One thing at a time
- Ask, don't tell
- Coach, don't adjust
- Make it obvious

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CO-OP case study

- Colby – 5 yr old, wants to play basketball
  - Pre-therapy video
- Goal: Dribble down the hallway without losing the ball
- Plan:
  1) Bounce ball on the side, not in front
  2) Don't slap the ball, push it
  3) Keep it by my "here" – pointing to hip
- Do:
  - Post-therapy video (2)
- Check:
  - Did we meet our goal?

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Motor Imagery

- Mental rehearsal of a skill without the motor component
- Can be used in a group setting
- Use of videos to assist with problem solving and preparation
- Cuing into how the activity feels

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Resources

- CanChild website: **https://canchild.ca/en/diagnoses/developmental-coordination-disorder**
  - Online workshops for families, therapists, and physicians
  - Fliers for teachers, PE teachers, coaches, therapists, doctors, & children
  - Handouts to assist with school accommodations, M.A.T.C.H strategies
  - Videos of intervention
- 2011 EACD guideline: new guidelines created – to be published 2018
  - https://www.eacd.org/publications.php
- APTA Clinical Practice Guideline – in process

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