


Developmental Coordination Disorder: Consultation, Assessment, and Treatment

Jill G. Zwicker PhD, OT(C)
 Assistant Professor, Department of Occupational Science & Occupational Therapy, University of British Columbia
 Associate Member, Department of Pediatrics (Division of Developmental Pediatrics), University of British Columbia
 Investigator, BC Children's Hospital Research Institute
 Clinician Scientist, Sunny Hill Health Centre for Children
 Associate Investigator, Kids Brain Health Network
 Research Associate, CanChild Centre for Childhood Disability Research


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Outline


- What is DCD?
- Why it is important to identify/diagnose DCD?
- How do you assess for DCD?
- What evidence-based treatments exist for DCD?
- If I cannot provide direct intervention, how else can I help children with DCD?
- Where can I learn more?



Meet Max



- Max is a bright 9-year-old boy who often looks disheveled – his shirt is untucked and his shoes untied. He struggles with ball games, has poor balance, and has not yet learned to ride his bicycle despite the fact that his parents have tried to teach him numerous times.
- Max has recently stopped playing soccer because the other kids made fun of his running and he felt embarrassed. Although Max does not necessarily enjoy skipping, he wants to learn to skip because there is an upcoming school-wide skipping fundraiser.



Meet Max



- His parents are concerned about the amount of time Max spends in sedentary activities, that he spends much of his time alone, and that he has few close friends. In school he struggles with written work and has started to be disruptive, assuming the role of 'class clown' to avoid participating.
- Max's mother says it is also a struggle to get dressed every morning, since Max can't do buttons or tie his shoes independently. Max's parents and teachers don't know what to do to help him. His parents have consulted different health care professionals, but he doesn't have a diagnosis.



What is DCD?

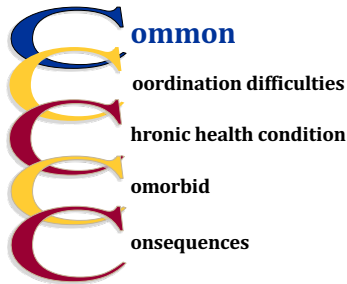


What is DCD?

- A developmental disorder present from birth but often is not recognized until the child reaches school age
(Cousins & Smyth, 2003)
- Motor disorder of unknown etiology that significantly interferes with a child's ability to perform and learn motor skills
- Affects 5-6% of school-age children
(APA, 2013)



The 5 C's of DCD



Adapted from:  CanChild
Centre for Research in Child Development

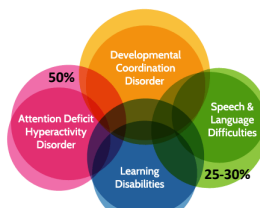
DSM-5 Criteria for DCD

- A. Motor skills are substantially below that expected given the individual's chronological age and opportunity for skill learning and use
- B. Motor skills deficit significantly and persistently interferes with ADL and impacts school productivity, prevocational/vocational activities, leisure, and/or play
- C. Onset of symptoms is in the early developmental period
- D. Motor skills deficits are not better explained by intellectual disability, visual impairment, or neurological condition affecting movement

APA, 2013

Co-occurring conditions associated with DCD

- Up to 50% of children with DCD may meet the diagnostic criteria for ADHD (Kadesjo & Gillberg, 1999; Watemberg et al., 2007)
- DCD frequently co-occurs with learning disabilities, particularly in reading (O'Hare & Kalid, 2002; Visser, 2003)
- Specific language impairment has also been associated with DCD (Archibald & Alloway, 2008; Hill, 2001)
- Since the DSM-5, children with ASD may have a co-occurring DCD diagnosis; co-occurrence is unknown but > 50% of children with ASD may have motor difficulties (Provost et al. 2007)



www.canchild.ca

DCD more common in preterm children

- Children born preterm (< 32 weeks gestational age) are 6-8x more likely to develop DCD compared to full-term peers (Edwards...Zwicker, 2011)
- Up to 50% of infants born preterm may meet the diagnostic criteria for DCD (Holsti et al., 2002; Edwards...Zwicker, 2011)
- Perinatal and neonatal predictors of DCD include:
 - Male sex
 - Low birth weight
 - Postnatal steroid exposure (Zwicker et al., 2013)

Why it is important to identify/diagnose DCD?



Impact of DCD

- The impact of motor difficulties tends to increase over time
- The majority of children with DCD do not outgrow their motor difficulties
- Secondary psychosocial concerns often develop
- Diagnosis will help to increase awareness of the disorder and assist with policy change
- Intervention is effective in helping children learn motor skills (but is currently not standard of care)

Age, yr	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14		
Motor	Delays in fine and gross motor skills; late riding tricycle; cannot catch or throw ball with accuracy; cannot ride bicycle; difficulty jumping or skipping; decreased fitness																
Self-care	Difficulty using utensils; needs help dressing and grooming; cannot tie shoes or do zippers and buttons; messy eater; cannot cut meat																
Academic	Awkward pencil grasp; difficulty completing written work; gap between verbal ability and performance on evaluations; frustration with writing and homework																
Social	Limited participation in sports and extracurricular activities; tends to watch instead of participating; victimization/bullying; social isolation																
Behavioural/emotional	<table border="0"> <tr> <td style="vertical-align: top;"> Behavioural <ul style="list-style-type: none"> Avoids active play and fine motor activities Dislikes sports and active recreation Is frustrated and avoids tasks </td> <td style="vertical-align: top; padding-left: 100px;"> Emotional <ul style="list-style-type: none"> Self-deprecating comments Decreased self-esteem Poor perceived competence Anxious, depressed, withdrawn </td> </tr> </table>															Behavioural <ul style="list-style-type: none"> Avoids active play and fine motor activities Dislikes sports and active recreation Is frustrated and avoids tasks 	Emotional <ul style="list-style-type: none"> Self-deprecating comments Decreased self-esteem Poor perceived competence Anxious, depressed, withdrawn
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Missiuna, C. et al. CMAJ 2006;175:471

CMAJ-JAMC


DCD: More than a motor impairment

Compared to typically-developing children, children with DCD:


- experience academic and behavioural difficulties
- report lower perceived competence in physical, cognitive, and social activities
- have higher levels of anxiety, depression, and loneliness
- experience greater social rejection, teasing, and bullying
- have lower self-esteem, quality of life, and life satisfaction

Zwicker et al., 2013; Zwicker et al., 2018

Sorry...I cannot circulate the results of this study as it is under consideration for publication....but I will share them with you verbally



How do you assess for DCD?



Diagnosis of DCD


- Despite its prevalence, DCD is under-recognized and under-diagnosed (Blank et al., 2012)
- As therapists, we have a key role in facilitating a diagnosis by providing information to physicians about diagnostic criteria A and B

DSM-5 diagnostic criteria revisited

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.

Typically assessed by OT or PT:

- MABC-2 cut off score at ≤ 16 %ile), except for children 3-5 years, where $\leq 5^{\text{th}}$ %ile is used
- If a child scores $\leq 5^{\text{th}}$ %ile in one domain (e.g., fine motor, balance) but scores $> 16^{\text{th}}$ %ile in other domains, a DCD diagnosis could be made if other diagnostic criteria are met



DSM-5 diagnostic criteria revisited

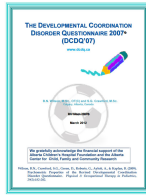
B. The motor skills deficit in Criterion A significantly and persistently interferes with activities of daily living appropriate to chronological age (e.g., self-care and self-maintenance) and impacts academic/school productivity, prevocational and vocational activities, leisure, and play.

- Developmental Coordination Disorder Questionnaire (DCDQ)/Little DCDQ (www.dcdq.ca)
- Clinical interview guidelines (Missiuna et al., Can J Occup Ther, 2008)
- Listening for DCD Checklist (www.canchild.ca)

DCDQ (ages 5-15 years)

• Parent questionnaire which explores the child’s ability to:

- Catch and throw a ball
- Hit an approaching ball/birdie
- Jump over obstacles
- Print (speed and legibility)
- Cut with scissors
- Ride a bike
- Learn new motor skills
- Dress, tie shoes, etc.
- Play individual versus team sports



• Scores indicate definite DCD, suspected DCD or probably not DCD

Little DCDQ (ages 3yr-4yr11mo)

• Parent questionnaire which explores the child’s ability to:

- Throw
- Catch
- Kick
- Run
- Drink from cup
- Use spoon or fork
- Use pencil or crayon
- Puzzles
- Use playground equipment, etc.

• Scores indicate “suspect DCD” or “probably not DCD”

Clinical Interview Guidelines

Guidelines give specific examples and probes to gather information to answer the following three questions:

1. What types of activities are difficult for your child (self-care, school, leisure)?
2. Are these difficulties that you have noticed for a while or has anything changed?
3. Has there been a time when you have tried to teach your child something and it has taken longer than you think it should?

Missiuna et al., 2008

Listening for DCD Checklist



Listening for DCD Interview Guide

Child's name: _____ Date: _____
 Caregiver name: _____ Relation to child: _____

Please use the following questions to guide your interview with the parent. Indicate (x) whether the parent has any concerns.

Question	Concern	Parent Comments
Do you have any concerns about your child's development, learning or behaviour? (Think about: difficulty learning new things, particularly motor-based tasks, increased effort, frustration)	<input type="checkbox"/> Low <input type="checkbox"/> Some <input type="checkbox"/> High	
What types of activities does your child enjoy? (Think about whether these are mostly nonphysical activities (e.g., computer, TV, video games))	<input type="checkbox"/> Low <input type="checkbox"/> Some <input type="checkbox"/> High	

http://canchild.ca/elearning/dcd_pt_workshop/assets/identification/listening-dcd-interview-guide.pdf

DSM-5 diagnostic criteria revisited

- C. Onset of symptoms is in the early developmental period
 Developmental history and developmental screening
- D. Motor skills deficits are not better explained by intellectual disability, visual impairment, or neurological condition affecting movement
 Cognitive function does not need to be evaluated by objective measures (e.g., IQ testing) if there is a normal history of school and academic achievements (Blank et al., 2012)

Resources to assist with diagnosis

- Harris, S. R., Mickelson, E. & Zwicker, J. G. (2015). Diagnosis and management of developmental coordination disorder. *Canadian Medical Association Journal*, 187, 659-65.
 - CanChild Handout for Physicians
https://canchild.ca/system/tenon/assets/attachments/000/000/608/original/RoleofPhysicianFlyer_08-05-2015.pdf
- include one or both of these with your assessment report 😊

Early Identification?

- While DCD is often not diagnosed before age 5 years, warning signs of risk of DCD are evident early in life, particularly in high risk populations (e.g., children born preterm) (Edwards et al., 2011)
- A retrospective study of preterm children diagnosed with DCD at 4.5 years found that these children scored more poorly on ALL early motor assessments, from as young as 4 months of age, compared to children who did not have motor problems (Isberg...Zwicker, in prep)
- MABC-2 at age 3 years has good sensitivity but also many false positives (Kwok...Zwicker, submitted)

Role of SLP in identifying DCD

- High co-occurrence of speech and/or language impairment and motor coordination difficulties
- Consider referral to OT or PT for assessment if you notice:
 - Clumsiness
 - Handwriting / printing / copying difficulties
 - Extra effort or attention when tasks have a motor component (or they avoid them)
 - Difficulty with dressing, feeding, grooming
 - Difficulty with sports and on the playground
 - Difficulty learning new motor skills
 - Difficulty with, or reduced interest in, physical activities


Missiuna & Gaines, 2007; Missiuna et al., 2002

What evidence-based treatments exist for DCD?




Goal Setting

- Children with DCD have body structure and function deficits but this is rarely the level of concern of children and families.
- Goals should focus on **increasing function, well-being, and participation.**
- Involve the family and child in goal-setting



Examples of Goal Setting Tools

- Canadian Occupational Performance Measure (COPM) (Law et al., 2014)
- Goal Attainment Scaling (GAS) (Turner-Stokes, 2009)
- Perceived Efficacy and Goal Setting (PEGS) (Missiuna et al., 2004)
- Pediatric Activity Card Sort (PACS) (Mandich et al., 2004)

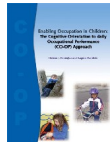


Intervention for DCD

- Several systematic reviews have reported that **sensory integration** and kinesthetic training are **not effective** for children with DCD (Pless & Carlsson, 2000; Polatajko & Cantin, 2006; Smits-Engelsman et al., 2013)
- Current evidence **overwhelmingly supports task-specific interventions** as the most effective for children with DCD (Pless & Carlsson, 2000; Polatajko & Cantin, 2006; Hillier, 2007; Smits-Engelsman et al., 2013; Preston et al., 2017; Smits-Engelsman et al., 2018)
 - includes motor learning and cognitive strategies
 - e.g., Cognitive Orientation to Occupational Performance (CO-OP)

CO-OP

- Involves **7** key features which are incorporated into the definition of CO-OP:
- A **client-centred, performance-based, problem-solving, approach** that uses **strategies**, identified through a process of **guided discovery** to enable **skill acquisition**



Polatajko et al., Phys Occup Ther Pediatr, 2001

Theoretical Foundations of CO-OP

- Theories of learning and problem-solving
- Motor learning and motor control
- Client-centred practice
- Teaching and use of strategies

Missiuna et al., Phys Occup Ther Pediatr, 2001

CO-OP Protocol

- Typically 10 sessions of 1 hour
- Address 3 child-chosen functional motor goals in each session
- After setting goals, perform a *dynamic performance analysis* to determine where the “break down” is in performing the tasks
- Help the child to discover strategies for supporting their motor performance using global problem solving strategies and trialing domain-specific strategies
- Evaluate change in performance and change in child/family performance and satisfaction ratings

Dynamic Performance Analysis of Max



Global Problem Solving Strategy

“Goal, Plan, Do, Check”

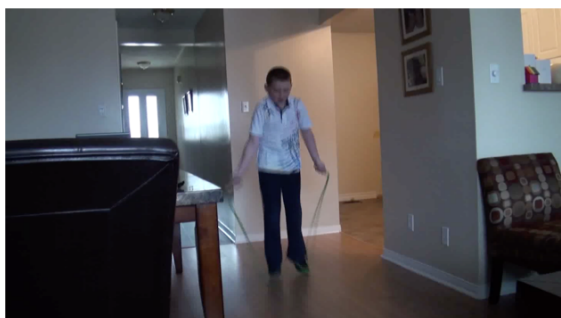
- Goal** - What do I want to do?
- Plan** - How am I going to do it?
- Do** - Carry out the plan.
- Check** - How well did my plan work?



Domain Specific Strategies (BATS For 2V's)

- Body position - e.g., where are your feet?
- Attention to doing - e.g., where are you looking when you throw the ball
- Task specification/modification - e.g., try a pencil grip
- Supplementing task knowledge - e.g., start writing from the left margin
- Feeling the movement - e.g., feel the position of your fingers in the scissors
- Verbal motor mnemonic - e.g., where's my helper hand?
- Verbal rote script - e.g., "stroke, stroke, breathe"

Max Post-Intervention



Modified CO-OP also effective

Physical & Occupational Therapy in Pediatrics, Early Online:1-15, 2014
 © 2014 by Informa Healthcare USA, Inc.
 Available online at <http://informahealthcare.com/ptop>
 DOI: 10.3109/01942628.2014.957431

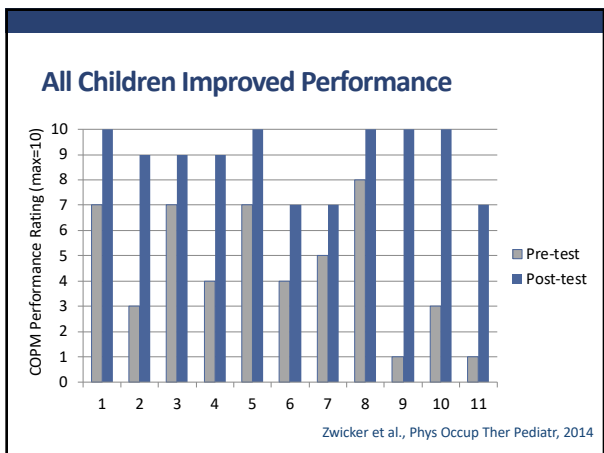
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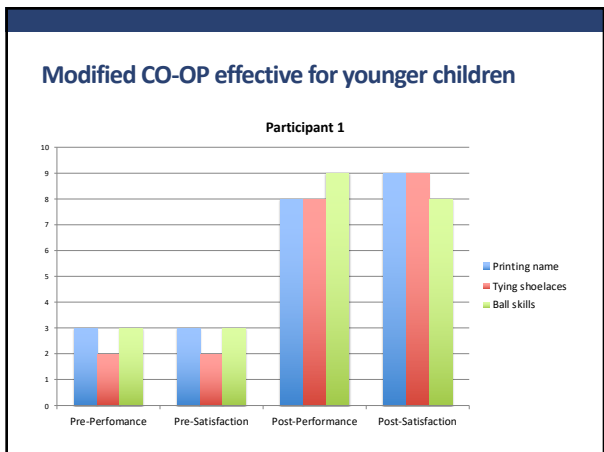
Effectiveness of a Summer Camp Intervention for Children with Developmental Coordination Disorder

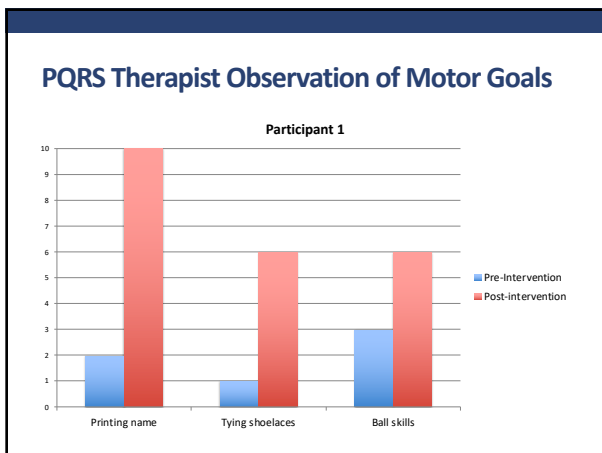
Jill G. Zwicker^{1,2,3,4,5}, Harpreet Rehal¹, Sharan Sodhi¹, Morgan Karkling¹, Alissa Paul¹, Mike Hilliard⁶, & Tal Jarus¹

¹Department of Occupational Science and Occupational Therapy, University of British Columbia, Vancouver, BC, Canada, ²Department of Pediatrics, University of British Columbia, Vancouver, BC, Canada, ³Child & Family Research Institute, Vancouver, BC, Canada, ⁴Sunny Hill Health Centre for Children, Vancouver, BC, Canada, ⁵CanChild Centre for Childhood Disability Research, Hamilton, Ontario, Canada, ⁶Vancouver Regional Pediatric Team, Vancouver, BC, Canada













If I cannot provide direct intervention, how else can I help children with DCD?



Consultation for DCD

- A wealth of information for parents, educators, medical professionals, and coaches is available on the CanChild website: <https://canchild.ca/en/resources/123-children-with-motor-difficulties-for-educators>
- M.A.T.C.H. the activity to the child
 - Modify the task
 - Alter your expectations
 - Teach strategies
 - Change the Environment
 - Help by understanding


Physical Activities

Children with DCD typically do better with non-competitive and individual sports, such as:

- martial arts
- swimming
- gymnastics



Where can I learn more?



Resources

- Upcoming webinars for DCD Advocacy Toolkit (same content in each webinar)
 - CAOT-BC April 5, 2018 12:00-1:00pm gboniface@caot.ca
 - BCACDI May 15, 2018 12:00-1:00pm jason@bcacdi.org
 - CAOT-BC June 6, 2018 3:00-4:00pm gboniface@caot.ca
 - Webinar will be archived and available for viewing after these dates
- DCD Evidence for Practice (e4p) Synthesis
 - <http://www.childdevelopment.ca/E4PGroup/E4P.aspx>
- DCD Workshop for Physical Therapists
 - http://elearning.canchild.ca/dcd_pt_workshop/index.html

Resources

- CanChild Website educational resources and handouts
<https://canchild.ca/en/diagnoses/developmental-coordination-disorder/dcd-educational-materials-for-home-school-physicians-and-other-health-professionals>
- Blank, R., et al. (2012). European Academy for Childhood Disability (EACD): Recommendations on the definition, diagnosis, and intervention of developmental coordination disorder (long version). *Developmental Medicine and Child Neurology*, 54, 54-93.
- Harris, Mickelson, & Zwicker (2015). Diagnosis and management of developmental coordination disorder. *CMAJ*, 187, 659-65.

DCD Research Database

Participate in Research
 Creating profile of children with Developmental Coordination Disorder (DCD) in British Columbia

Principal Investigator:
 Jill G. Zwicker, PhD, OT (C)
Assistant Professor, Department of Occupational Science and Occupational Therapy, University of British Columbia, Vancouver, BC, Canada

Are you a child/youth with DCD or do you have a child with DCD?
 Consider participating in the DCD Clinic Research Database

What is this study about?
 The purpose of the database is to create a profile of children with DCD in BC and to invite families in the database to participate in other studies.

RESEARCH AREA:
 Developmental Coordination Disorder (DCD)

Who can participate?
 Participants in the research:
 • have a diagnosis of DCD
 • are between 4 and 18 years old
 • speak English

What's involved?
 By providing us access to medical and rehabilitation information related to children's developmental history and DCD diagnosis.
 By completing questionnaires (parents).


QUESTIONS? PLEASE CONTACT
 Jane Shen
 604-875-2000 ext 6535
jshen@cw.bc.ca

What are the benefits of participating?
 Participation in the database will help us to learn more about children with DCD. Families may be invited to participate in other research and intervention studies.



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Acknowledgements

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- my **research team**: Janet Rigney, Gisela Gosse, Sara Leckie, Jane Shen, and many clinicians
- my **trainees**: Meisan Brown-Lum, Sara Izadi-Najafabadi, Kamaldeep Gill, Shie Rinat, and many MOT students
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