

# Bridging Cultures: Adapting the Developmental Coordination Disorder Questionnaire (DCDQ'07) for Singaporean Children

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# Background of Study

# About Developmental Coordination Disorder (DCD)

**Neurodevelopmental condition** characterised by significant impairments in **motor coordination skills** (American Psychiatric Association, 2013)

Estimated prevalence of **5-6% worldwide** (American Psychiatric Association, 2013)

**Limited data** on DCD prevalence in Singapore

- Wright and Surgden (1996): DCD occurs in 4 out of 100 children (4%) in Singapore
- Toh (2016): High risk of DCD amongst 7 to 8 year old children (61.5% of the participants scoring substantially below what is expected of their age)





## Importance of Diagnosing DCD

As DCD can **co-occur with other childhood disorders** such as Autism Spectrum Disorders, Attention Deficit Hyperactivity Disorder, and Learning Disorders, it can be **challenging to screen and diagnose** (Caçola, 2016; Lino & Chieffo, 2022)

Lifelong effects on **physical** (Cairney et al., 2010; Rivillis et al., 2011), **psychosocial health** (Caçola, 2016) and **motor skills** (Missiuna et al., 2008) have been linked to DCD

Important for healthcare professionals, educators, and parents to possess the knowledge and tools to assess the signs of DCD and facilitate early intervention

# Developmental Coordination Disorder Questionnaire 2007 (DCDQ'07)

**Canadian-English screening parent-reported tool** to screen for DCD in children from 5-15 years old on a **15-items, 5-point Likert scale** (Wilson et al., 2009)

Provides information on how the **child's motor function affects his/ her daily activities** (Wilson et al., 2009)

Conducted as a **preliminary screener** before more standardised tests are used to confirm the child's diagnosis (Nowak, 2016)

Its **simplicity** facilitates its use by a layperson as Singapore moves towards integrating the **community** such as childcare centres, preschools and family service centres into the **national developmental surveillance and screening system** (3rd Enabling Masterplan Steering Committee, 2016; Ho, 2021)



## Cross-cultural adaptation of DCDQ'07

**Well-validated tool, but, cannot be generalised to all populations** (Asunta et al., 2019)  
as items may fail to sufficiently encompass local customs, cultural understanding,  
languages or expressions (United Nations Children's Fund, 2013)

Need for cultural adaptation even if original language of DCDQ'07 coincides with the  
one of the official languages in Singapore due to **differences in culture** (Beaton et al.,  
2000; Lim et al., 2015; Uy et al., 2020)

There is a need to **CULTURALLY ADAPT** the DCDQ'07 to  
screen DCD in children in Singapore



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## Research Aims



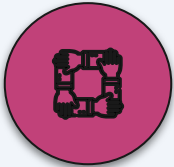
# Research Aims



To evaluate the clarity of the DCDQ'07 questionnaire items from the perspective of professionals and parents of children aged 5-15 years old in Singapore



To identify any cultural or linguistic nuances that affect the understanding and interpretation of the DCDQ'07 items by parents and professionals in Singapore



To revise DCDQ'07 based on what has been identified in the interviews and feedback given from the parents and professionals to achieve cultural equivalence



# 03

## Methodology

**3.1 Recruitment**

**3.2 Data Collection**

**3.3 Data Analysis**



# 3.1 Recruitment

A total of **29 participants** were recruited

## 11 Professionals

**Purposive sampling** - to sample professionals of varied:

- Settings (e.g. acute, community, educational institutes)
- Disciplines (e.g. occupational therapist, paediatrician, teachers)

**Snowball sampling** - subsequently used to expand the sample size

## 18 Parents

**Purposive and snowball sampling** - to sample parents with children

**Maximum variation sampling** - to ensure a diverse representation of parents (i.e age, race & socioeconomic status [SES])

**Quota sampling** - subsequently used to recruit underrepresented parent profiles

# 3.1 Recruitment

## Inclusion criteria

### Professionals

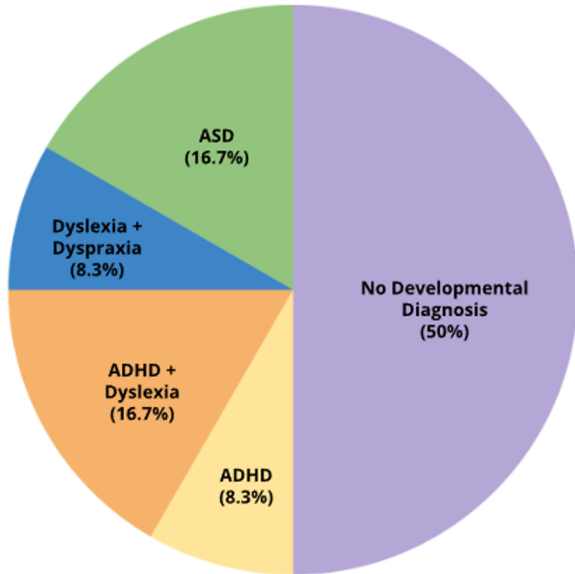
- (1) Have clinical or working experience in the last 5 years, with experience administering caregiver-related questionnaires in paediatric settings

### Parents

- (1) Identified as a parent or legal guardian of a child
- (2) Able to read and understand English
- (3) Child is between 5 to 15 years old at the time of the study.
- (4) Have not done DCDQ before

## 3.1 Recruitment: Parents

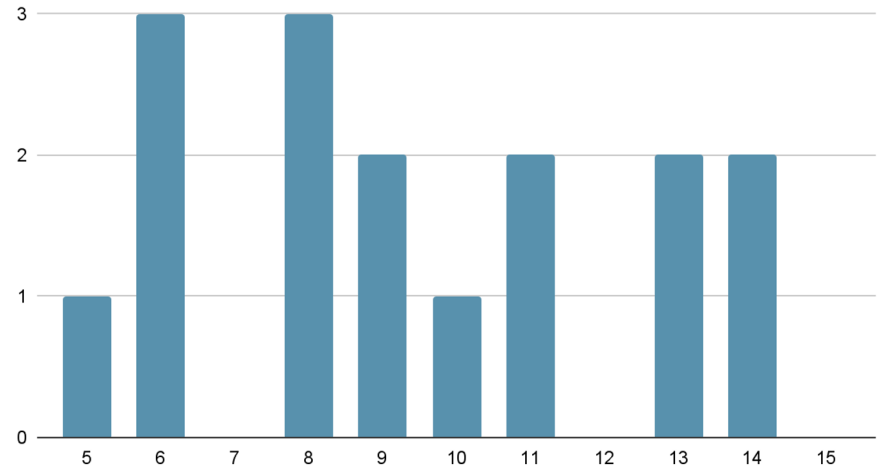
### Diagnosis



Varied developmental diagnosis

### Children's Age

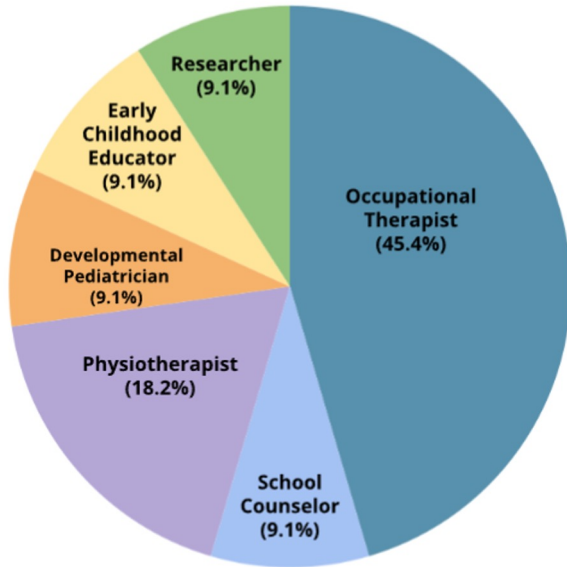
Child's Age



Widely distributed across targeted age range

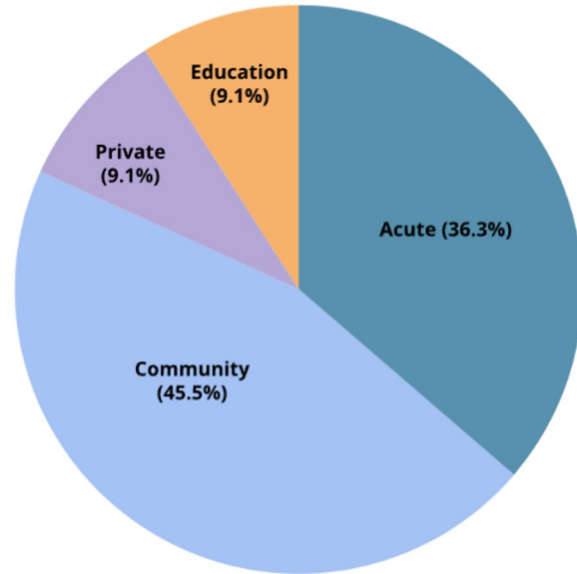
## 3.1 Recruitment: Professionals

### Types of Profession



Diverse professional backgrounds

### Types of Settings



Broad representation of service contexts

## 3.2 Data Collection

**Qualitative** design utilised  
Meetings were carried out using **Zoom**

### Professionals

**Semi-structured interview** method:

- How they think parents would comprehend the items specifically in DCDQ'07
- Potential doubts or queries that might surface when doing the DCDQ'07
- General feedback

### Parents

**Cognitive interviewing**, using **Three-Step Test-Interview (TSTI)** method:

- To assess their interaction with the questionnaire and find out their experience and opinion of it (Hak et al., 2008)

## 3.3 Data Analysis

**Data management, analysis & interpretation** were guided by strategies proposed by Knafl et al. (2007)

### Item-by-item review

- Based on **(1) understandability, (2) relevance and (3) other suggestions** gathered from each participant group
- Summarised data based on:
  - (1) **both** participant groups had **no concerns**
  - (2) **either** participant groups had **concerns**
  - (3) **both** participant groups had **concerns**

### Decision making process

- Cultural equivalence was determined using the **Applied Cultural Equivalence Framework** (Stevelink & Brackel, 2013).
- Terms/activities that **did not achieve** cultural equivalence were **either modified or removed** based on participants' suggestions



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## Results & Discussion





## Results – Item Equivalence

Equivalence Type	Definition	Results	Modifications similar to other countries
Item	Refers to when items estimate the same parameters on the latent trait being measured and when they are equally relevant and acceptable in both cultures	7 out of 15 items modified	Items with uncommon sports/activities in local contexts (e.g. building a house or a structure with blocks) were changed to more popular local activities (e.g. Lego™)



## Results – Semantic Equivalence

Equivalence Type	Definition	Results	Modifications similar to other countries
Semantic	The transfer of meaning across languages, achieving a similar effect on respondents who speak different languages	8 out of 15 items modified	Unfamiliarity of: <ul style="list-style-type: none"><li>• "bull in a China shop"</li></ul> Changed to: <ul style="list-style-type: none"><li>• "does not bump into things, gets bruises easily or trips and falls very often"</li></ul>



# Results – Operational Equivalence

Equivalence Type	Definition	Results	Modifications similar to other countries
Operational	The possibility of using a similar questionnaire format, instructions, mode of administration and measurement methods	Modified instructions, response options and format of questionnaire	Changing response options: <ul style="list-style-type: none"> <li>• “your child” to “my child”</li> <li>• “extremely like my child” to “exactly like my child”</li> </ul>

Not at all like your child 1	A bit like your child 2	Moderately like your child 3	Quite a bit like your child 4	Extremely like your child 5
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1	2	3	4	5
<b>Not at all like my child</b> = 10% of the time or less	<b>A bit like my child</b> = 25% of the time	<b>Moderately like my child</b> = 50% of the time	<b>Quite a bit like my child</b> = 75% of the time	<b>Exactly like my child</b> = 90% of the time or more



## Results – Conceptual Equivalence

Equivalence Type	Definition	Results	Modifications similar to other countries
Conceptual	Achieved when the questionnaire has the same relationship to the underlying concept in both cultures, primarily in terms of domains included and the emphasis placed on different domains (Lim et. al, 2015)	Participants found DCDQ'07 useful for assessment of the child's motor performances in daily activities	-



## Discussion

**Important to cross-culturally adapt a tool** even without the need for translation

- Both professionals and parents shared similar perspectives on conceptual, item, and operational equivalence
- Views diverged on semantic equivalence where parents understood terms that professionals thought they might struggle with



Value of **gathering insights** from **both professionals and parents**



## 5.2 Clinical Implications

Incorporate into the National Child Health Surveillance Programme as a **quick screening tool** to detect DCD amongst children in Singapore

Promote awareness of the condition amongst community providers to **facilitate early detection of DCD**

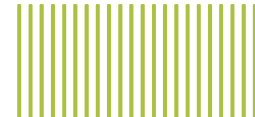
For use by **various professionals**  
(therapists, early childhood educators, paediatricians etc.)

**Next step: Psychometric evaluation of the DCD-Q Singapore version**



# Thank you for listening

Thank you to all of our research participants who have taken part in our study



# References

## References for Background of Study:

- American Psychiatric Association. (2013). Neurodevelopmental disorders. In Diagnostic and Statistical Manual of Mental Disorders (5th ed.). <https://doi.org/10.1176/appi.books.9780890425596>
- Asunta, P., Viholainen, H., Ahonen, T., & Rintala, P. (2019). Psychometric properties of observational tools for identifying motor difficulties – A systematic review. *BMC Pediatrics*, 19(1). <https://doi.org/10.1186/s12887-019-1657-6>
- Beaton, D. E., Bombardier, C., Guillemin, F., & Ferraz, M. B. (2000). Guidelines for the process of cross-cultural adaptation of self-report measures. *Spine*, 25, 3186–3191 .doi:10.1097/00007632-200012150-00014
- Caçola, P. (2016). Physical and mental health of children with developmental coordination disorder. *Frontiers in Public Health*, 4, Article 224. <https://doi.org/10.3389/FPUBH.2016.00224>
- Cairney, J., Veldhuizen, S., & Szatmari, P. (2010). Motor coordination and emotional-behavioural problems in children. *Current Opinion in Psychiatry*, 23(4), 324–329. <https://doi.org/10.1097/YCO.0b013e32833aa0aa>
- EMP2030 Steering Committee (2023). Enabling Masterplan 2030. [https://www.msf.gov.sg/docs/default-source/enabling-masterplan/emp2030-report-\(final2\).pdf](https://www.msf.gov.sg/docs/default-source/enabling-masterplan/emp2030-report-(final2).pdf)
- Ho, L. Y. (2021). Current status of the early childhood developmental intervention ecosystem in Singapore. *Singapore Medical Journal*, 62(1 Suppl), S43–S52. <https://doi.org/10.11622/smedj.2021076>

# References

## References for Background of Study:

- Lino, F., & Chieffo, D. P. R. (2022). Developmental Coordination disorder and most prevalent comorbidities: A narrative review. *Children (Basel)*, 9(7), 1095. <https://doi.org/10.3390/children9071095>
- Missiuna, C., Moll, S., King, G., Stewart, D., & Macdonald, K. (2008). Life experiences of young adults who have coordination difficulties. *Canadian Journal of Occupational Therapy*, 75(3), 157–166. doi:10.1177/000841740807500307
- Lim, C. Y., Law, M., Khetani, M., Pollock, N., & Rosenbaum, P. (2015). Establishing the cultural equivalence of the Young Children's Participation and Environment Measure (YC-PEM) for use in Singapore. *Physical & Occupational Therapy in Pediatrics*, 36(4), 422–439. <https://doi.org/10.3109/01942638.2015.1101044>
- Nowak, A. (2016). Cross-cultural adaptation of the Developmental Coordination Disorder Questionnaire (DCDQ'07) for the population of Polish children. *Biomedical Human Kinetics*, 8(1), 17–23. <https://doi.org/10.1515/bhk-2016-0003>
- Rivilis, I., Hay, J., Cairney, J., Klentrou, P., Liu, J., & Faught, B. E. (2011). Physical activity and fitness in children with developmental coordination disorder: A systematic review. *Research in Developmental Disabilities*, 32(3), 894–910. <https://doi.org/10.1016/j.ridd.2011.01.017>

# References

## References for Background of Study:

- 2nd Enabling MasterPlan Committee. (2011). *Enabling Masterplan 2012-2016*. [https://www.ncss.gov.sg/docs/default-source/ncss-documents-and-forms/enabling-masterplan-2012-2016-report-\(8-mar\)-\(em2\).pdf](https://www.ncss.gov.sg/docs/default-source/ncss-documents-and-forms/enabling-masterplan-2012-2016-report-(8-mar)-(em2).pdf)
- 3rd Enabling MasterPlan Committee. (2016). *3rd Enabling MasterPlan 2017-2021*. [https://sustainabledevelopment.un.org/content/documents/1533Enabling\\_Masterplan\\_2017\\_2021.pdf](https://sustainabledevelopment.un.org/content/documents/1533Enabling_Masterplan_2017_2021.pdf)
- Toh, J. H. (2016). Identification of movement coordination deficiencies in Singapore primary school children. *Sport Science and Management Nanyang Technological University*. <http://hdl.handle.net/10356/66598>
- United Nations Children's Fund. (2013). *The State of the World's Children 2013: Children with Disabilities*. <https://www.unicef.org/media/84886/file/SOWC-2013.pdf>
- Uy, E. J. B., Xiao, L. Y. S., Xin, X., Yeo, J. P. T., Pua, Y., Lee, G. L., Kwan, Y. H., Teo, E. P. S., Vaingankar, J. A., Subramaniam, M., Chan, M. F., Kumar, N., Ang, A. L. C., Bautista, D., Cheung, Y. B., & Thumboo, J. (2020). Developing item banks to measure three important domains of health-related quality of life (HRQOL) in Singapore. *Health and Quality of Life Outcomes*, *18*(1), 2. <https://doi.org/10.1186/s12955-019-1255-1>
- Wilson, B., Crawford, S., Green, D., Roberts, G., Aylott, A., & Kaplan, B. (2009). Psychometric properties of the revised Developmental Coordination Disorder Questionnaire. *Physical & Occupational Therapy in Pediatrics*, *29*(2), 182–202. <https://doi.org/10.1080/01942630902784761>
- Wright, H. C., & Sugden, D. A. (1996). A two-step procedure for the identification of children with developmental coordination disorder in Singapore. *Developmental Medicine & Child Neurology*, *38*(12), 1099–1105. <https://doi.org/10.1111/j.1469-8749.1996.tb15073.x>

# References

## References for Methods:

- Hak, T., Van der Veer, K., & Jansen, H. (2008). The Three-Step Test-Interview (TSTI): An observation-based method for pretesting self-completion questionnaires. *Survey Research Methods*, 2(3), 143–150. <https://doi.org/10.18148/srm/2008.v2i3.1669>
- Knafl, K., Deatrick, J., Gallo, A., Holcombe, G., Bakitas, M., Dixon, J., & Grey, M. (2007). The analysis and interpretation of cognitive interviews for instrument development. *Research in Nursing & Health*, 30(2), 224–234. <https://doi.org/10.1002/nur.20195>
- Palinkas, L. A., Horwitz, S. M., Green, C. A., Wisdom, J. P., Duan, N., & Hoagwood, K. (2015). Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. *Administration and Policy in Mental Health and Mental Health Services Research*, 42(5), 533–544. <https://doi.org/10.1007/s10488-013-0528-y>
- Stevelinck, S., & Van Brakel, W. H. (2013). The cross-cultural equivalence of participation instruments: a systematic review. *Disability and Rehabilitation*, 35(15), 1256–1268. <https://doi.org/10.3109/09638288.2012.731132>

# References

## References for Results and Conclusion:

- Caravale, B., Baldi, S., Gasparini, C., Wilson, B. N. (2013). Cross-cultural adaptation, reliability and predictive validity of the Italian version of Developmental Coordination Disorder Questionnaire (DCDQ). *European Journal of Paediatric Neurology*, 18(3), 267-272. <https://doi.org/10.1016/j.ejpn.2013.11.009>
- Lim, C. Y., Law, M., Khetani, M., Pollock, N., & Rosenbaum, P. (2015). Establishing the cultural equivalence of the Young Children's Participation and Environment Measure (YC-PEM) for use in Singapore. *Physical & Occupational Therapy in Pediatrics*, 36(4), 422-439. <https://doi.org/10.3109/01942638.2015.1101044>
- Montes-Montes, R., Delgado-Lobete, L., Pereira, J., & Pousada, T. (2020). Cross-Cultural adaptation and preliminary validation of the European Spanish version of the Developmental Coordination Disorder Questionnaire (DCDQ-ES). *American Journal of Occupational Therapy*, 74(4), 7404205060p1-7404205060p10. <https://doi.org/10.5014/ajot.2020.038315>
- Patel, P., & Gabbard, C. (2016). Adaptation and preliminary testing of the Developmental Coordination Disorder Questionnaire (DCDQ) for children in India. *Physical & Occupational Therapy in Pediatrics*, 37(2), 170-182. <https://doi.org/10.3109/01942638.2016.1150383>
- Prado, M. S. S., Magalhães, L. C., & Wilson, B. N. (2009). Cross-cultural adaptation of the Developmental Coordination Disorder Questionnaire for Brazilian children. *Brazilian Journal of Physical Therapy*, 13(3), 236-243. <https://doi.org/10.1590/s1413-35552009005000024>
- Ray-Kaesler, S., Satink, T., Andresen, M., Martini, R., Thommen, E., & Bertrand, A. M. (2015). European-French cross-cultural adaptation of the Developmental Coordination Disorder Questionnaire and pretest in French-speaking Switzerland. *Physical & Occupational Therapy in Pediatrics*, 35(2), 132-146. <https://doi.org/10.3109/01942638.2015.1009229>

# References

## References for Results and Conclusion:

- Tseng, M. H., Fu, C. P., Wilson, B. N., Hu, F. C. (2009). Psychometric properties of a Chinese version of the Developmental Coordination Disorder Questionnaire in community-based children. *Research in Developmental Disabilities, 31*(1), 33-45. <https://doi.org/10.1016/j.ridd.2009.07.018>
- Vlasakova, N., Musalek, M., Cepicka, L. (2023). Factor validity and generic reliability of the Developmental Coordination Disorder questionnaire in the Czech population. *Children, 10*(6), 990. <https://doi.org/10.3390/children10060990>
- Wilson, B., Rodger, S., Mickan, S., Kennedy-Behr, A. (2013). Cross-cultural adaptation of the Developmental Coordination Disorder Questionnaire 2007 for German-speaking countries: DCDQ-G. *Neuropediatrics, 44*(5), 245-251. <https://doi.org/10.1055/s-0033-1347936>
- Yildirim, C. K., Altunalan, T., Acar, G., Elbasan, B., Gucuyener, K. (2018). Cross-Cultural adaptation of the Developmental Coordination Disorder questionnaire in Turkish children. *Perceptual and Motor Skills, 126*(1), 40-49. <https://doi.org/10.1177/0031512518809161>