Malta Journal of Health Sciences
https://doi.org/10.14614/DEVCOORDDIS/6/20
DOI: 10.14614/DEVCOORDDIS/6/20

Research Paper

Validating the Developmental Coordination Disorder Questionnaire for use with children aged between five and fifteen in the Maltese context

Lara Maria Camilleri[1] (laramcam19@gmail.com), Nathalie Buhagiar[1], Charmaine Mifsud[1], Marjorie Bonello

[1] Department of Occupational Therapy, Faculty of Health Sciences, University of Malta.

Abstract. The Developmental Coordination Disorder Questionnaire (DCDQ), developed by Wilson (2007), is a subjective parent/guardian screening tool which is used by Maltese paediatric Occupational Therapists. It is available solely in the English language and so within the local context poses several challenges for respondents who are not well versed in this language. This paper reports on a study which was carried out to address the gap in the current situation by translating and validating the original English DCDQ'07. This process involved a forward and backward translation of the DCDQ followed by its administration using a quantitative cross-sectional survey methodology. The translation team involved four translators who worked independently of each other and a moderator who facilitated the whole process. When the final Maltese version was completed, the bilingual test-retest technique using the split-half method was used to determine the validity and reliability of the final Maltese questionnaire. This involved data collected from 44 bilingual parents whose children were receiving Occupational Therapy at a local paediatric centre and completed both the Maltese and English versions at a seven-day interval. Data analysis of the findings compared the final scores achieved from the Maltese translation with those obtained from the original English questionnaire. Statistical tests yielded p values of 0.000 which indicated satisfactory intra-rater reliability implying that the translated Maltese questionnaire can be used with confidence. This would add to the available resources that assist Occupational Therapists in evaluating motor coordination difficulties in children.

Keywords: Coordination Disorder, Paediatric, Questionnaire, Multilingualism, Translation and Occupational Therapy

Received: 30.03.2020; Revised: 22.05.2020;
Accepted: 28.05.2020;
Published: 30.06.2020

1. Introduction

Coordination is a result of adequate equilibrium, postural tone and appropriate muscle tension when producing the required movement (as the individual interacts with the environment) (Pedretti, 2013). It is essential during the developmental process since it is a pre-requisite skill for the performance of functional tasks. Coordination difficulties may be the result of neurological impairment or difficulties with sensory processing abilities and may be manifested as difficulties in ideation, motor planning and execution (Ayres, 2005). Coordination difficulties in children, largely but not exclusively, fall under the DSM V diagnosis of DCD.

DCD is a disorder that affects motor skills. Children with such disorders experience difficulties with functional performance and quality of movement (Ayres, 1989). In everyday life, these difficulties, amongst others, are experienced as clumsiness in performing daily activities, lack of organisation, difficulties with short term memory, illegible handwriting, restlessness, untidiness and lack of personal hygiene. There are also

feelings of self-consciousness, shame and humiliation when these children realise that they cannot keep up with their peers. However, in spite of these limitations, these children generally show a high degree of creativity and perseverance and, if their needs are met, may perform remarkably well (Zwicker *et al*., 2012).

The Developmental Coordination Disorder Questionnaire (DCDQ) is a standardised tool used by Occupational Therapists worldwide as part of the evaluation of children for DCD who exhibit symptoms related to dysfunction in motor coordination. The original questionnaire was developed in English and is based on the caregivers' perspective on the behaviours demonstrated by the child during everyday tasks and activities. Its reliability and hence validity can be doubted when it needs to be translated *ad hoc* in countries where English is not the primary language. In such cases, the parents are given two options. They are either aided by the therapist or by another family member. If family members are involved, the responses achieved may not reflect the child's true behaviour as the parent might feel judged for choosing certain responses. Thereby the answers obtained may jeopardise the DCDQ final score and this would undermine its purpose (Demetriou *et al*., 2015). On the other hand, the therapist may have to translate the questionnaire orally on the spot. This is likely to affect the inter-rater reliability and thus accuracy of results. In view of this, the main aim of this research study was to translate and validate the DCDQ for use with Maltese speaking families.

2. Methodology – The Translation Process

Following ethical approval from both Faculty and University research committees (under reference number 059/2017), this study involved two stages:

Stage 1: Forward-Backward Translation Process – this method was used to ensure content validity and semantic equivalence of the two versions

Stage 2: Quantitative Cross-Sectional Survey Using the Bilingual Test-Retest Technique – to compare the data collected from the English questionnaire to that of the Maltese version.

2.1. Sample

This research study was based on a convenience sample of 44 bilingual parents (approached through the intermediary) whose children were aged between 5 and 15 years. The children were receiving weekly Occupational Therapy for any disorder relating to motor coordination at a local paediatric service. Parents who did not have knowledge of both languages and those whose children did not receive regular Occupational Therapy treatment were excluded from participating in this study.

2.2. Procedure

Stage 1: Forward-Backward Translation Process

The forward-backward translation process of the DCDQ'07 involved 4 translators and a moderator. These were all familiar with the English and Maltese languages and worked independently of each other.

The process started with two of the translators - T1 and T2 - doing the initial forward translation from English into Maltese independently of each other. T1 has a background in Occupational Therapy and was chosen to ensure that the translation reflected Occupational Therapy language in Maltese. T2, was a certified proof reader and was chosen to ensure that the translation reflected the true English meaning.

These two Maltese versions were then compared and compiled into one document by the moderator M1, a University of Malta ex-lecturer who was proficient in both the Maltese and English languages. This version was then given to the third and fourth translators, T3 and T4 both having a background in education, to carry out the back translation, i.e. to convert the Maltese questionnaire into the English language. T3 and T4 worked independently of each other and were not familiar with the DCDQ'07 before conducting the back translation. At this point, the two backward translations were compared once again by M1, who formulated a single document to reflect their work. Finally, the original English questionnaire was compared for equivalency of meaning to the Maltese version to ensure that the meaning of the Maltese questionnaire was the same as the original one. When a question from the two versions failed to have the same level of functional meaning, the back-translation process was repeated iteratively until equivalence between the two versions was achieved. Feedback from parents was taken by the intermediary throughout this process.

Stage 2: Survey Using Bilingual Test-Retest Technique

The next step involved testing of the two questionnaires using the bilingual test-retest technique. In this case the split-half method was employed during which half of the parents completed the English version followed by the Maltese version. The other remaining half completed the Maltese version followed by the English version. This stage was carried out to ensure that both questionnaires imparted the same meaning, thereby ensuring the validity and reliability of the Maltese translation. To reduce recall bias, the two questionnaires were administered within a seven-day interval.

3. The Translation Process Using the Forward- Backward Method

During the translation process, there were specific instances where the translators found it difficult to translate an English word to the corresponding Maltese word. This was largely due to the Maltese language having verbs which are specific to a gender pronoun; addressing both genders in each question would make the questionnaire very lengthy, and difficult to understand.

In view of this, the researcher formulated a male and a female version of the Maltese questionnaire which made the questionnaire easier to understand by parents. Additionally, some English words which have become an accepted part of the Maltese spoken language were left in the Maltese translation.

Table 1 – Results for the Kendall Tau Test

	Value	Standard Error	Approximate T	P-value
Question 1	0.797	0.053	13.233	0.000
Question 2	0.816	0.051	14.123	0.000
Question 3	0.679	0.087	7.231	0.000
Question 4	0.653	0.094	5.279	0.000
Question 5	0.734	0.078	6.919	0.000
Question 6	0.551	0.122	4.453	0.000
Question 7	0.761	0.067	10.908	0.000
Question 8	0.744	0.075	10.908	0.000
Question 9	0.457	0.131	3.536	0.000
Question 10	0.677	0.104	6.237	0.000
Question 11	0.780	0.097	7.502	0.000
Question 12	0.661	0.108	6.044	0.000
Question 13	0.662	0.081	7.677	0.000
Question 14	0.541	0.114	4.667	0.000
Question 15	0.483	0.121	4.015	0.000

4. Results

Kappa, Kendall Tau and Intraclass Correlation Tests

The questionnaires which were scored according to the established protocol in the DCDQ'07 (Wilson, 2007) were then analysed and compared statistically using Kendall's Tau Intraclass Correlation and Kappa tests via SPSS statistics programme (PASW Statistics Version 24.0, 2016). These tests were based on a 95% confidence interval.

4.1. Kendall Tau Test

This test was used to validate the translation of the questionnaire by evaluating the Maltese and English responses of the same parent. This test was deemed to be appropriate because the items (Q) have an ordinal scale. The alternative hypothesis specifies that the participants provided a consistent response when answering the Maltese and English questionnaires separately and is accepted if the p value is less than the 0.05 criterion.

Table 1 displays the computed p value of ($p<0.05$) for questions 1 to 15, indicating that there is a statistically significant inter-rater reliability between the responses of the two questionnaires.

4.2. Intraclass Correlation

The final score of the DCDQ consisted of three sub scores, namely control during movement, fine motor skills and general coordination. A comparison of the three sub-scores and the total score of both questionnaires was computed. The p values ($p = 0.000$) obtained for all the different subcategories, as illustrated in tables 2-5 were less than the 0.05 criterion, implying satisfactory significant intra-rater reliability between the two questionnaires.

4.3. Control During Movement

Table 2: Intraclass Correlation for Questions relating to Control During Movement

	Intraclass Correlation	95% Conf. Int.		F Test with True Value 0			
		Lower Bound	Upper Bound	Value	df1	df2	P-value
Single Measures	0.883	0.786	0.936	17.471	43	43	0.000
Average Measures	0.938	0.880	0.967	17.471	43	43	0.000

4.4. Fine Motor/ Handwriting

Table 3: Intraclass Correlation for Questions relating to Fine Motor/ Handwriting

	Intraclass Correlation	95% Conf. Int.		F Test with True Value 0			
		Lower Bound	Upper Bound	Value	df1	df2	P-value
Single Measures	0.866	0.769	0.925	13.799	43	43	0.000
Average Measures	0.928	0.869	0.961	13.799	43	43	0.000

4.5. General Coordination

Table 4: Intraclass Correlation for Questions relating to General Coordination

	Intraclass Correlation	95% Conf. Int.		F Test with True Value 0			
		Lower Bound	Upper Bound	Value	df1	df2	P-value
Single Measures	0.857	0.753	0.919	12.939	43	43	0.000
Average Measures	0.923	0.859	0.958	12.939	43	43	0.000

4.6. Total Score

Table 5: Intraclass Correlation for Questions relating to the Final Score

	Intraclass Correlation	95% Conf. Int.		F Test with True Value 0			
		Lower Bound	Upper Bound	Value	df1	df2	P-value
Single Measures	0.901	0.827	0.945	19.501	43	43	0.000
Average Measures	0.948	0.905	0.972	19.501	43	43	0.000

4.7. Kappa Test

The Kappa test was calculated for the final score of the DCDQ, i.e. the score which in practice is used to give a definite answer if a child is likely to have DCD or not. The scores achieved in both questionnaires were categorised according to whether these indicate that the child has problems with co-ordination. These scores are illustrated in Table 6.

Table 6: Kappa Test

		DCD English		Total
		Yes	No	
DCD Maltese	Yes	15	4	19
	No	1	24	25
Total		**16**	**28**	**44**

The kappa test yielded a p value of 0.000 which is significantly less than the 0.05 criterion, implying satisfactorily intra-rater reliability between the original English questionnaire and the Maltese version. The results achieved for the Kappa Test are illustrated in Table 7.

Table 7: P value for Kappa Test

	Value	Standard Error	Approx. T	P-value
Measure of Agreement Kappa	0.764	0.098	5.119	0.000
N of Valid Cases	44			

In summary, all tests carried out - namely the Kappa, Kendall Tau and Intraclass Correlation - yielded p values of 0.000. This is significantly less than the 0.05 value, thereby indicating satisfactory intra-rater reliability. These results imply that the Maltese questionnaire can be used with confidence in situations where parents or guardians prefer to answer the questionnaire in Maltese.

5. Discussion

The DCDQ is an established and well recognised standardised tool that captures the parents' perception of their child's overall behaviour in different contexts. The research project aimed to produce a Maltese version, by undergoing a translation and validation process. These processes along with the subsequent results obtained from standardised tests, have proved the translation to be a reliable version that can be used in local clinics.

5.1. The Significance of a Maltese Tool in the Clinical Setting

Parents' observations are vital to the Occupational Therapy assessment process as it is unlikely that every aspect of the child's behaviour is elicited in a clinical setting. The unfamiliar environment, time factor as well as the child's compliance play a major role in this regard (Green and Wilson, 2008). Hence it is vital for parents to be able to fully comprehend the language, especially in a tool like the DCDQ that is primarily a caregiver questionnaire. The Occupational Therapist will then have a better understanding of the child as the information required is easily available and understood by all parties (Schoemaker *et al*., 2006).

To date, there are no assessment tools in Maltese. Therefore, the Maltese questionnaire available through this study would open new possibilities for Occupational Therapists and parents. This possibility to use a research tool available in Maltese will also increase the repertoire of available standardised tools in the local clinics.

Despite that the scores on the Likert scale were not totally identical, comparison of the English and Maltese responses of the same parent through the Kappa Test resulted in the same final score. This implies that the Maltese version is a true representation of its English counterpart.

5.2. Cultural Appropriation

The information collected is considered to be valid if it is linguistically and culturally appropriate to the population that it is used with (Kuliś *et al*., 2011). This is mainly achieved through *foreignisation* or *familiarisation*. The latter occurs when the translation is adapted to include examples that are more familiar to the Maltese culture, while the former takes place when the translator gives an explanation of the unfamiliar example (Al-Hassan, 2013).

The balance between these methods determines the success of the translation (Al-Hassan, 2013), as a translation that contains too many foreign elements, would risk that it would not be fully understood by the Maltese population. The translation team determined which of the two methods to use. This was done to safeguard the social and cultural aspect as recommended by Wong and Poon (2010). Throughout the process of translation cultural appropriation was acknowledged; however, the researcher was unable to modify questions due to copyright regulation. Hence a foreignisation approach was taken for the negative questions at the end of the original questionnaire.

Following the participants' comments along with the researcher's observations, it can be concluded that the original version of the DCDQ has shown that it is not totally compatible with the Maltese culture. As anticipated, from previous cross-cultural adaptations, comprehension difficulties arose when items were not relevant to the local culture (Hilton & Skrutkowski, 2002). This was specifically noted in questions asking for rating of the child's performance of sports which are not practised in Malta. It would thus be ideal if these sports are changed to ones that are more relevant to the Maltese population and that involve the same motor planning and execution.

Thus, to ensure cultural and occupational relevance, revision of the current content in the Maltese DCDQ is of benefit to achieve the desired results with the target

population. For example, riding a bicycle would be a good substitute for "ice-skating" as this activity requires coordinated bilateral movement that is also needed when skating. Bowling would be a better substitute for "golfing" as this also requires control over force and directionality when aiming at a target (Zwicker *et al*., 2012).

Another point to note is that, similar to the situation with the Israeli DCDQ, it was necessary to search for an explanation of the phrases which do not have a direct Maltese translation (Traub et al., 2005). Idioms are difficult to translate, and risk being misunderstood in other languages. Maltese parents found it challenging to understand them when filling in the English version. However, following familiarisation parents later stated that the Maltese interpretation made it easier for them to understand the concept behind the question.

Such instances justify the scores achieved through statistical tests; Maltese speaking parents find it easier and thus prefer to answer a questionnaire about their child's behaviour in Maltese. Hence the Maltese version may yield more accurate results for clinical purposes. This was further affirmed by parents who said it was easier to identify their child's performance on a Likert scale when presented with a Maltese version, as opposed to them having to over analyse their answer when presented with the English counterpart.

Similar to what occurred in the Portuguese cross-cultural adaptation of the DCDQ, parents found the last two questions difficult to answer in a Likert scale format despite understanding the wording used in the question. The process was also scrupulously conducted according to the guidelines that were established for cross cultural adaptation (Prado *et al*., 2009). It may be concluded that further work on the DCDQ locally is needed to make it culturally relevant.

6. Implications to Practice

The DCDQ primarily is one of the tools used to support the identification of motor coordination difficulties. It is an important tool that helps to give the therapist another perception other than the clinical observation. The perspective of the caregiver is an important stakeholder in the whole therapeutic process As outlined above the Maltese translation can be recognised as a valid tool in local practices, especially in the case of caregivers who find it difficult to understand English.

Within this research there were few instances where there was a discrepancy between the Maltese and English versions. The majority of which showed that the same child scored positive for DCD when the parent was presented with the Maltese version whilst scoring negative for DCD in the English version. Even though this discrepancy has been considered negligible statistically, these children could potentially have had coordination difficulties which were not identified with the English version.

Therefore, having a Maltese DCDQ available could possibly ensure that the scores achieved reflect the child's true performance and that the detection and targeting of problems would be more efficient. Additionally, further testing to determine the root of difficulties in coordination, and a treatment plan could have been subsequently set up earlier. The overall result of Occupational Therapy will decrease the risk of imbalances in emotional and physical health later in life of both the children and caregivers (Missiuna, 2011).

7. Strengths and Limitations

Since this was a small-scale undergraduate study, the researcher was unable to carry out a larger scale study to pilot the tool in the local context. Nonetheless, the translated version emanating from this study can be used as the basis for further research that needs to be carried out to finalise the Maltese version; the reason being that it still needs to be tested further to be accepted as valid for use.

The researcher was also unable to adapt certain questions so as to make them more culturally appropriate to the Maltese population: this would have breached copyright regulations. There was also the limitation in the sampling technique (convenience sample). Possibly a more diverse population sample could have been better suited to obtain more reliable results.

8. Conclusion

The main purpose of this study was, to translate and to validate the DCDQ to the native Maltese language to mitigate any language barriers when administered to Maltese speaking locals. Both the Maltese and original questionnaires provided similar results. Hence, no further modification to the Maltese version was required. All tests confirmed that the Maltese version is a reliable and valid tool that can be used with confidence for further studies. This was determined by the resulting p values which were lower than 0.05 criterion, implying that the aim of this research study has been achieved. Thus, it can be concluded that the Maltese version of the DCDQ'07 is a true translation of the original version.

This study also indicates that the forward backward translation using the bilingual test-retest technique was an adequate choice to achieve this aim. The translation and validation process ensured content validity and semantic equivalence of the two versions. Should further larger scale studies take place, the parents can have the option to choose between the two versions according to their preference in the local setting.

Since to date, there are no assessment tools in Maltese, an analogous questionnaire to the one available through this study would open new possibilities for Occupational Therapists to plan their intervention. Following the significant results achieved through statistical testing, it can be concluded that the Maltese DCDQ has proved to be a good basis for future studies.

Acknowledgements

Acknowledgements are due to all the participants in the study as well as translators and mentors, without whom this study would not have been possible.

Funding

This research has received no specific grant from any funding agency in the public, commercial or non-profit sectors.

Conflicts of Interest

The author reports no conflict of interest.

References

Al-Hassan, A. 2013, "The Importance of Culture in Translation: Should Culture be Translated?", *International journal of applied linguistics and English literature,* 2 (2), pp. 96-100.

Ayers, A.J. 1989, *Sensory Integration and praxis tests (SIPT),* Western Psychological Services.

Ayres, A.J. & Robbins, J. 2005, *Sensory integration and the child: Understanding hidden sensory challenges,* Western Psychological Services.

Demetriou, C., Ozer, B.U. & Essau, C.A. 2015, "Self-Report Questionnaires", *The Encyclopedia of Clinical*

Psychology, .

Green, D. & Wilson, B.N. 2008, "The importance of parent and child opinion in detecting change in movement capabilities", *Canadian journal of occupational therapy. Revue canadienne d'ergotherapie, 75* (4), pp. 208-219.

Hilton, A. & Skrutkowski, M. 2002, "Translating instruments into other languages: development and testing processes", *Cancer nursing,* vol. 25, no. 1, pp. 1-7.

Kuliś, D., Arnott, M., Greimel, E.R., Bottomley, A. & Koller, M. 2011, "Trends in translation requests and arising issues regarding cultural adaptation", *Expert review of pharmacoeconomics & outcomes research,* vol. 11, no. 3, pp. 307-314.

Missiuna, C., Rivard, L. & Pollock, N. 2011, "Children with Developmental Coordination Disorder: CanChild

Centre for Childhood Disability Research", *McMaster University,* .

Pedretti, L.W., Pendleton, H.M. & Schultz-Krohn, W. 2013, *Pedretti's occupational therapy: practice skills for physical dysfunction,* 7th ed.. edn, Elsevier.

Prado, M., Magalhães, L. & Wilson, B. 2009, "Cross-cultural adaptation of the Developmental Coordination Disorder Questionnaire for Brazilian children", *Brazilian Journal of Physical Therapy,* 13 (3), pp. 236-243.

Schoemaker, M.M., Flapper, B., Verheij, N.P., Wilson, B.N., Reinders-Messelink, H.A. & de Kloet, A. 2006,

"Evaluation of the Developmental Coordination Disorder Questionnaire as a screening instrument", *Developmental medicine and child neurology,* vol. 48, no. 8, pp. 668-673.

Traub, R. B., Levi, A., & Parush, S. (2005). Validity and reliability of the developmental coordination disorder questionnaire for school-aged children in Israel. *Israel Journal of Occupational Therapy*, 14(4), H175-91.

Wilson, B., Kaplan, B., Crawford, S. & Roberts, G. 2007, " The developmental coordination disorder questionnaire 2007©©(DCDQ'07)", *Administration and scoring for the DCDQ'07 with psychometric properties.*

Wong, J.P. & Poon, M.K. 2010, "Bringing translation out of the shadows: translation as an issue of methodological significance in cross-cultural qualitative research", *Journal of Transcultural Nursing,* vol. 21, no. 2, pp. 151-158.

Zwicker, J.G., Missiuna, C., Harris, S.R. & Boyd, L.A. 2012, "Developmental coordination disorder: a review and update", *European journal of paediatric neurology: EJPN: official journal of the European Paediatric*

Neurology Society, 16 (6), pp. 573-581.