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Adapting The Gross Motor Function Classification System Family Report (GMFCS-FR) Into Turkish, Determining Its Reliability, and Investigating the Consistency of Family and Physiotherapist in Determining Gross Motor Function Levels

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ABSTRACT

Purpose: The aim of this study is to adapt the Gross Motor Function Classification System Family Report (GMFCS-FR) to Turkish, to examine its reliability, and to determine the consistency between different raters.

Methods: The study was conducted with the participation of mothers, fathers, physiotherapists and individuals with good cognitive levels of 100 individuals diagnosed with CP between the ages of 2 and 18. GMFCS-FR was adapted to Turkish with the principles of cross-cultural validity. The reliability of the questionnaire was assessed with test-retest analysis of mothers, fathers and individuals with good cognitive levels; and the consistency between mothers, fathers, individuals with good cognitive levels and physiotherapists was assessed with the Kappa coefficient.

Results: In the test-retest analyses, the ICC values of the assessments of mothers and fathers were found to be between 0.961 and 1.000 in all age groups, indicating that the Turkish version of the GMFCS-FR is highly reliable. Similarly, the self-assessments of individuals with good cognitive levels in the 12–18 age group were also found to be reliable (ICC = 0.964, $p<0.001$). Interobserver consistency was particularly high in the 2–6 age group. Good agreement was also observed between young individuals and physiotherapists ($\kappa = 0.715$).

Discussion: The results show that the Turkish version of the GMFCS-FR is a reliable and consistent tool that supports a family-centered approach in the rehabilitation of individuals with CP. It is thought that it will be an important resource for the active participation of families in the rehabilitation process.

Key words: Cerebral palsy, family-centered approach, GMFCS-FR, reliability, consistency

INTRODUCTION

In recent years, the family-centered approach has gained importance with the inclusion of the family in the care and decision-making process in Cerebral Palsy (CP) rehabilitation, and the family-centered approach has been accepted as one of the best practices in the rehabilitation program of children with special needs (1, 2). Family-centered care is an approach to service delivery that meets the needs of both children and their families, emphasizing a partnership between parents and healthcare providers. This approach is grounded in the understanding that every family is unique, that the family serves as the enduring constant in the child's life, and that parents hold specialized insight into their child's abilities and needs (3). Family needs and priorities determine how and when services are provided. Incorporating a broad perspective on family needs provides flexibility in intervention targets and enables family priorities to be addressed (4).

The principles of the International Classification of Functioning, Disability, and Health (ICF) closely correspond with those of a family-centered approach (5). As outlined in the ICF, the family plays a pivotal role in rehabilitation, functioning as the common foundation for all components (6).

By addressing the needs of both children and their families, family-centered approaches facilitate comprehensive family participation in all aspects of service provision and strengthen partnerships between parents and health professionals. According to the principles of family-centered service, each family is distinct, and the achievement of optimal child functioning depends on the support provided by both family and community (1).

Although families are central to the process, with active participation in every phase of CP rehabilitation and its management, little is known about the goals that are important to parents and their children. Therefore, how parents perceive the goal-setting process with therapists becomes important. Because families are more likely than clinicians and researchers to witness their children's activities and social participation, family-assessed measures or family reports are valuable. Accordingly, assessing the validity, reliability, and stability of classification systems that are accessible for use by parents is of considerable importance (7, 8).

The Gross Motor Classification System (GMFCS), extensively used in both research and clinical settings for treatment planning, prognosis, and clinical decision-making, provides a standardized method for classifying gross motor function (9). It was adapted for use by parents by Morris et al. in 2004 and named the Gross Motor Classification System Family Report Questionnaire (GMFCS-FR) (10). When proven reliable, families can more conveniently and affordably determine their children's, and individuals within a specific age group can more easily and affordably determine their own impacts. These applications can be an efficient and cost-effective method for clinical and experimental research. They can also provide information about families' awareness of their children's disability (7).

Considering all these, the main objective of our study was to translate the GMFCS-FR into Turkish and ensure its reliability, which is thought to be important in disseminating family-centered approaches in our country and increasing the involvement of families in rehabilitation processes.

METHODS

Study Design

At the beginning of the study, the necessary approval for the master's thesis was obtained from the Hacettepe University Non-Interventional Clinical Research Ethics Committee, registration number GO 18/860.

Participants

The mothers, fathers, and physiotherapists of 100 individuals diagnosed with CP between the ages of 2 and 18, predicted by power analysis, and young individuals between the ages of 12 and 18 with a good cognitive level participated in the study. 100 mothers, 100 fathers, 34 physiotherapists and 20 young people between the ages of 12 and 18 with a good cognitive level participated. Informed consent form was obtained from all participants. The inclusion criteria for the study were: 1) consent to participate, 2) all participants' native language being Turkish, 3) all parents, physiotherapists, and young individuals aged 12-18 with a good cognitive level being literate.

The study began by creating age groups. Four different age groups were determined in accordance with the GMFCS-FR: the 2-4 age range as the first group, the 4-6 age range as the second group, the 6-12 age range as the third group, and the 12-18 age range as the fourth group. Each of the participants with CP in our study was placed in appropriate groups according to their age, and the examinations were conducted according to these groups. The GMFCS-FR has a separate group, designated GMFCS-SR (self-report), for youth aged 12-18 with good cognitive abilities. In our study, this group, for youth aged 12-18 with good cognitive abilities, was included as the fifth group.

All participants in the fifth group were young individuals with CFCS (Communication Function Classification System) level 1 or 2, attending a mainstream school, and meeting the inclusion criteria. The study was planned and conducted with 20 individuals with CP in each of five different groups.

Procedure

Initially, demographic information (age, height, weight, gender) and the socio-demographic characteristics (age, education level) of the individuals with CP were obtained and recorded. The individuals' GMFCS scores were obtained from their physiotherapists and recorded.

First of all, all mothers, fathers and physiotherapists participating in the study were asked to determine the motor skill level of individuals with CP according to the GMFCS-FR, while at the same time, young individuals aged 12-18 with a good cognitive level were asked to choose the most appropriate motor skill level for themselves according to the GMFCS-SR questionnaire. Thus, the first administration was completed. To determine the reliability of the GMFCS-FR, a second administration was conducted fifteen days after the first administration, in which the mothers and fathers of individuals with CP participating in the study were asked to determine the most appropriate motor skill level for their children, and young individuals aged 12-18 with good cognitive abilities were asked to re-determine the most appropriate motor skill level for themselves.

Cross-Cultural Adaptation Process

The study began by obtaining the necessary permissions and approvals from Christopher Morris and Peter Rosenbaum through the Can Child Group, the holder of the publishing rights to the original version, to adapt the GMFCS-FR questionnaire to Turkish.

Two professional academics, native Turkish speakers and fluent English speakers, who are familiar with the terminology of the GMFCS-FR questionnaire, carried out the Turkish translation. Thus, two draft translations, A1 and A2, were obtained. The translations were compiled, compared, and discussed, resulting in a consensus draft translation, which we call A12, with the translation that best represents each question. This questionnaire was then translated back into English by a fluent English-speaking translator. The resulting text was compared with the English version of the GMFCS-FR and then sent back to the researcher who owned the original questionnaire for approval. After obtaining approval from the owners of the original English questionnaire for the back translation, an expert team was formed to evaluate the suitability of the Turkish version of the questionnaire and create the final version of the translation. In this translation, forward and back translation methods were used to perform cross-cultural adaptation, based on the guide developed by Beaton et al. (11).

Assessments

The Gross Motor Function Classification System developed by Palisano et al. in 1997, was developed as a result of the need for a standard system to define and classify the severity of movement limitations among children with CP (12). In 2008, a new age range of 12-18 years was added to the GMFCS, thus expanding and revising it (13). The revised GMFCS E&R includes five levels and five age ranges: 2 years and under, 2-4 years, 4-6 years, 6-12 years, and 12-18 years (14). The GMFCS E&R has been translated into 25 languages to date. It was translated into Turkish by Kerem Günel et al. (7). This Turkish version was used in our study.

Gross Motor Function Classification System Family Report questionnaire, newly developed by Morris et al. in 2004, offers an option for parents to participate in classifying their children's motor abilities. The questionnaire includes four age ranges for children and adolescents: 2-4 years, 4-6 years, 6-12 years and 12-18 years. In addition, the questionnaire provides an opportunity for young individuals aged 12-18 with a good cognitive level to classify their own motor skills. This part of the questionnaire is the fifth group and is called the GMFCS-SR (self-report) within the GMFCS-FR. The questionnaire consists of five different levels to describe an individual's motor ability. Each level is further detailed with three different sub-definitions. While the best level in the GMFCS is Level I, the opposite is true in the GMFCS-FR, with the best level being Level V.

Statistical Analysis

The collected data were analyzed using the Statistical Package for Social Sciences (SPSS) for Windows 23.0 software. In our study, the reliability of the GMFCS-FR was determined by test-retest. The median time interval for test-retest reliability was two weeks, and the ratio of sample size to the number of items in each measure for test-retest reliability was between 1 and 4 (15).

The Intraclass Correlation Coefficient (ICC) was used for the reliability of the questionnaire. ICC values ranged from 0.00 to 1.00, with values above 0.80 considered excellent, values between 0.60 and 0.80 considered good, values between 0.40

and 0.60 considered moderate, and values below 0.40 considered poor.

Consistency between the family, the youth, and the physiotherapist was examined using the Kappa test. Accordingly, 0.000-0.200 was considered insignificant agreement, 0.201-0.400 was considered low agreement, 0.401-0.600 was considered moderate agreement, 0.601-0.800 was considered good agreement, and 0.801-1.000 was considered excellent agreement.

RESULTS

The mothers, fathers, and physiotherapists of 100 individuals with CP, aged between 2 and 18, and the cognitively sound youth themselves, aged between 12 and 18, participated in the study. Demographic information for the children is shown in Table 1, and demographic information for the mothers and fathers is shown in Table 2.

Table 1. Demographic information of children

	Group 1	Group 2	Group 3	Group 4	Group 5
Sex (G/B)	7/13	7/13	11/9	12/8	8/12
	X±SD	**X±SD**	**X±SD**	**X±SD**	**X±SD**
Age (year)	2.68 ± 0.85	4.72 ± 0.72	8.05 ± 0.73	13.10 ± 1.37	13.65 ± 1.73
Height (cm)	93.10 ± 10.67	103.55 ± 9.18	121.25 ± 10.59	142.60 ± 14.89	154.50 ± 12.27
Weight (kg)	12.53 ± 2.26	17.63 ± 5.12	24.40 ± 8.85	36.55 ± 11.81	46.80 ± 10.18

Group 1: 2 to 4 Years, Group 2: 4 to 6 Years, Group 3: 6 to 12 Years, Group 4: 12 to 18 Years, Group 5: 12 to 18 Years Young with Good Cognitive Levels, G: Girl, B:Boy, X: mean, SD: standard deviation, Cm: centimeters, Kg: kilograms

Table 2. Demographic information of mothers and fathers

	Mothers	Fathers
	X±SD	**X±SD**
Age (year)	37.50 ± 6.78	41.20 ± 7.76
Educational status	**(n)**	**(n)**
Primary school	8	5
Middle school	15	9
High school	32	29
Associate degree	3	3
Licence	35	40
Master	7	14
Total	100	100

X: mean, SD: standard deviation, n: sample

GMFCS-FR Test-Retest Reliability

For test-retest reliability, each of the mothers and fathers of 100 individuals with CP participating in the study were asked to complete the GMFCS-FR, and 12-18 cognitively sound youth were asked to complete the GMFCS-SR twice, 15 days apart. Analysis revealed similar ICC values across all groups, ranging from 0.98 to 0.99, demonstrating excellent reliability for the GMCFS-FR (Table 3).

Table 3. Test-retest reliability results

		ICC	95%CI	p
Mothers	**Group 1**	0.990	0.975-0.996	<0.001*
	Group 2	0.991	0.977-0.996	<0.001*
	Group 3	0.985	0.961-0.994	<0.001*
	Group 4	0.987	0.966-0.995	<0.001*
	Group 5	0.989	0.973-0.996	<0.001*
Fathers	**Group 1**	0.961	0.902-0.985	<0.001*
	Group 2	1.000	1.000-1.000	<0.001*
	Group 3	0.989	0.972-0.996	<0.001*
	Group 4	0.986	0.966.-0.995	<0.001*
	Group 5	1.000	1.000-1.000	<0.001*
Group 5		0.964	0.909-0.986	<0.001*

Group 1: 2 to 4 Years, Group 2: 4 to 6 Years, Group 3: 6 to 12 Years, Group 4: 12 to 18 Years, Group 5: 12 to 18 Years Young with Good Cognitive Levels, GMFCS-FR: Gross motor function classification system family report, GMFCS-SR: Gross motor function classification system self report, ICC: Intra-Class Correlation Coefficient, CI: Confidence Interval

Consistency Between GMFCS-FR Levels Determined by Mothers, Fathers, Youth, and Physiotherapists

Kappa values were calculated for the consistency between GMFCS-FR levels determined by each participant individually. When the values between the groups were examined, the agreement levels were moderate to excellent. The values for all groups are detailed in Table 4.

The agreement between different observers (mother, father, physiotherapist, and young individuals with good cognitive levels) of the GMFCS-FR was evaluated using the Kappa coefficient. The findings generally show moderate to good agreement, although they vary by age group. Interobserver

agreement was particularly high in the younger age groups (ages 2–6), while this agreement decreased with age.

Table 4. Inter-rater agreement (Kappa) between mothers, fathers, youth and physiotherapists

	Mothers-PT (κ)	Fathers-PT V	Group 5-PT (κ)
Group 1	0.738	0.741	-
Group 2	0.676	0.807	-
Group 3	0.806	0.936	-
Group 4	0.530	0.590	-
Group 5	0.718	0.502	0.715

Group 1: 2 to 4 Years, Group 2: 4 to 6 Years, Group 3: 6 to 12 Years, Group 4: 12 to 18 Years, Group 5: 12 to 18 Years Young with Good Cognitive Levels, PT: Physiotherapist, (κ): Kappa value

A good level of agreement was found between the mother and the physiotherapist in the 2–4 age group (κ = 0.738), a moderate-good level of agreement in the 4–6 age group (κ = 0.676), a good level of agreement again in the 6–12 age group (κ = 0.806), a moderate level of agreement in the 12–18 age group (κ = 0.530), and finally a good level of agreement between the physiotherapist and the mothers of young individuals aged 12–18 with a good cognitive level (κ = 0.718). When comparing fathers and physiotherapists, the correlation was good for ages 2–4 (κ = 0.741), good for ages 4–6 (κ = 0.807), excellent for ages 6–12 (κ = 0.936), and moderate for ages 12–18 (κ = 0.590). A moderate level of agreement (κ = 0.502) was found in the 12–18 age group with good cognitive levels. Furthermore, a good level of agreement (κ = 0.715) was found between the assessments of physiotherapists and those of young individuals aged 12–18 with good cognitive levels.

Relationship Between GMFCS-FR Levels and GMFCS Levels Determined by Physiotherapists

When the relationship between GMFCS-FR levels and GMFCS levels determined by participating physiotherapists was examined, a perfect negative correlation was found ($r=-0.981$, $p<0.001$).

DISCUSSION

This study evaluated the Turkish adaptation of the GMFCS-FR questionnaire and its test-retest reliability and inter-observer consistency in individuals diagnosed with CP between the ages of 2 and 18. The findings revealed that the Turkish version of the questionnaire is a highly reliable and consistent instrument.

Test-retest reliability was analyzed using self-assessments from mothers, fathers, and young individuals across different age groups. Intraclass correlation coefficient (ICC) values ranged from 0.96 to 1.00 across all groups, demonstrating high reliability across all groups. This suggests that the Turkish version of the GMFCS-FR can be used reliably by both family members and young individuals in repeated administrations. In statistical analyses, the lowest ICC value for data from mothers was 0.989, and the highest was 0.991. For fathers, the range was between 0.961 and 1.000, again demonstrating relatively high reliability. The results obtained for both mothers (ICC = 0.991) and fathers (ICC = 1.000), particularly in the 4-6 age group, support the questionnaire's consistent results even with short-term repetitions. The ICC value for the assessment, based on self-reports of young individuals aged 12-18 with adequate cognitive levels, was found to be 0.964. This result demonstrates that children's self-reports are also sufficiently reliable.

Morris et al., for a test-retest study, asked 79 families with children aged 6-12 to grow up at three-month intervals. Their analyses showed excellent retention of bursting levels. Thus, they reported that the GMFCS-FR can be used based on parent reports, is reliable across the entire range of impairments and disabilities and demonstrates a high level of test-retest performance (10, 16). In another study, special education teachers and caregivers assessed the gross motor skills of children aged 2 to 12 years using the Thai version of the GMFCS-FR twice, two weeks apart, and the results were found to be highly reliable (17). Our findings are consistent with the high reliability reported in previous studies using different versions of the GMFCS-FR.

The lack of a significant decrease in ICC values with increasing age is consistent with the finding by Palisano et al. that GMFCS levels are stable with age (12). This supports the suitability of the questionnaire for long-term follow-up in different age groups.

After the translation and adaptation process of adapted scales is completed in literature reviews, researchers are strongly recommended to ensure that the new version has the necessary measurement features for the intended use (18-20). The ICC values obtained in our study provide important data regarding the use of questionnaires in different cultures and show that the Turkish version of the GMFCS-FR is highly reliable in terms of both content and application.

These findings are largely consistent with previous studies. The high level of agreement obtained in the Morris et al. study demonstrated that family reports of the GMFCS are a reliable method for assessing gross motor function in children aged 6–12 years (10). Similarly, Mutlu et al. reported that GMFCS levels were classified quite consistently by parents and clinicians in their study (21).

Ramrit et al. (22) examined the agreement between caregivers and special education teachers in the Thai version of the GMFCS-FR and reported high agreement. Our study also found that the agreement between mothers and fathers and physiotherapists was similarly good in younger age groups. However, it has been observed that this concordance decreases with age, and differences between rater perspectives emerge. This is in line with the findings emphasized by Palisano et al. (12) that intermediate levels of the GMFCS may become more complex with age. It is also thought that the influence of environmental factors and social roles may increase with age, and parents may tend to evaluate their own children in more detail or optimistically, and this may create differences between evaluations made by professionals.

There are studies in the literature indicating that mothers and fathers' perceptions of their children's motor function, as well as their concerns and expectations about the future, may differ. Given the different roles mothers and fathers play in their children's lives, understanding the differences in expectations between mothers and fathers is of particular importance. Some previous studies have shown that mothers and fathers interact with their children in different ways (23-25). This may explain why the mothers who participated in our study had less consistency with physiotherapists than the fathers in the groups other than the 12-18 age group with good cognitive levels. We also believe that differences in parental assessments based on age and cognitive level may be related to changes in the child's developmental process, as well as to the parents' psychosocial status, caregiving burden, and experiences. Therefore, in family-centered evaluations of CP and similar neurodevelopmental conditions, it is important to evaluate mothers and fathers separately and to take both perspectives into account.

Another notable finding in our study was the good agreement between 12-18 years with good cognitive abilities and physiotherapists. In this context, it appears that individual self-assessment can also be considered in the GMFCS-FR classification. The literature emphasizes that personal goals established through self-reporting by young individuals increase performance and motivation, and it has been recommended that interventions be tailored to children's priorities and needs to increase motivation (26, 27).

In our study, a comparison of the classifications made by physiotherapists using the GMFCS and GMFCS-FR revealed a very strong and significant negative correlation between the two surveys. We believe the negative correlation coefficient is due to the reversed classification directions between these two measurements.

Limitations

The first limitation of our study was in the GMFCS-FR component, we considered only the behaviors of the child’s physical therapist, mother, and father. Future research could broaden this framework by including additional healthcare professionals, such as orthopedic specialists, pediatricians, and other caregivers, including older siblings, grandparents, or other primary caregivers. Secondly, the absence of an examination of clinical transducers and limb distributions in the children with cerebral palsy who participated in the research. This omission resulted from clinical constraints that led to unequal conditions among participants. Future studies may address this issue to enhance comparability and comprehensiveness.

CONCLUSION

The analyses we obtained as a result of the study show that the Turkish version of the GMFCS-FR is reliable for all age groups, valid, and consistent among mothers, fathers, and physiotherapists for all age groups.

Author Contributions:

EİO: Planning the study, recruiting cases, statistical analysis and writing the article. MKG: Planning and interpretation of the study

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