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THE TURKISH VERSION OF THE EATING AND DRINKING ABILITY CLASSIFICATION SYSTEM: INTRA- RATER RELIABILITY AND THE RELATIONSHIPS WITH THE OTHER FUNCTIONAL CLASSIFICATION SYSTEMS IN CHILDREN WITH CEREBRAL PALSY

ORIGINAL ARTICLE

ABSTRACT

Purpose: Oral motor problems, feeding and swallowing problems are one of the most common problems in children with cerebral palsy. The Eating and Drinking Ability Classification System (EDACS) is used to classify eating and drinking performance in children with cerebral palsy. The aims of this study were to translate the EDACS into the Turkish and to investigate its intra-rater reliability and the relationship with other functional classification systems.

Methods: The EDACS was translated from English into Turkish. The Turkish version of the EDACS was applied to 125 children with cerebral palsy. For intra-rater reliability, the Turkish EDACS was re-scored after two weeks. Gross Motor Function Classification System, Manual Ability Classification System, and Communication Function Classification System were also recorded to determine the functional status of children.

Results: Fifty-four females and 71 males with a mean age of 7.44±3.95 years were included. The intra-rater reliability of the Turkish EDACS was almost perfect (ICC=0.972, Confidence Interval=0.959-0.980, p<0.001). Significant correlations were found between the Turkish EDACS and Gross Motor Function Classification System, Manual Ability Classification System, and Communication Function Classification System (r=0.769, r=0.786, and r=0.824, respectively, p<0.001).

Conclusion: The Turkish EDACS was found as a highly reliable instrument. The level of functional eating and drinking abilities is related to motor functional levels and communication status of children with cerebral palsy.

Key Words: Cerebral Palsy; Drinking; Eating; Swallowing.

YEME VE İÇME BECERİLERİ SINIFLANDIRMA SİSTEMİNİN TÜRKÇE VERSİYONU: SEREBRAL PALSİLİ ÇOCUKLARDA DEĞERLENDİRİCİ-İÇİ GÜVENİRLİĞİ VE DİĞER FONKSİYONEL SINIFLANDIRMA SİSTEMLERİ İLE İLİŞKİSİ

ARAŞTIRMA MAKALESİ

ÖZ

Amaç: Oral motor problemler ile beslenme ve yutma problemleri serebral palsili çocuklarda en sık rastlanan problemlerden bir tanesidir. Yeme İçme Becerisi Sınıflandırma Sistemi (EDACS) serebral palsili çocuklarda yeme ve içme performansını sınıflandırmak için kullanılır. Bu çalışmanın amaçları, EDACS'ı Türkçeye çevirmek, değerlendirici-İçİ güvenirliliği ve diğer fonksiyonel sınıflandırma sistemleri ile ilişkisini araştırmaktır.

Yöntem: EDACS İngilizce'den Türkçeye çevrildi. EDACS'ın Türkçe versiyonu 125 serebral palsili çocuğa uygulandı. Değerlendirici-İçİ güvenirliliği için Türkçe EDACS iki hafta sonra tekrar puanlandı. Çocukların fonksiyonel durumlarını belirlemek için Kaba Motor Fonksiyon Sınıflandırma Sistemi, El Becerileri Sınıflandırma Sistemi ve İletişim Fonksiyonları Sınıflandırma Sistemi seviyeleri de kaydedildi.

Sonuçlar: Yaş ortalaması 7,44±3,95 yıl olan 54 kız ve 71 erkek çalışmaya katıldı. Türkçe EDACS'ın değerlendirici-İçİ güvenirliliği neredeyse mükemmeldi (ICC=0,972 ve Güven Aralığı=0,959-0,980, p<0,001). Türkçe EDACS ile Kaba Motor Fonksiyon Sınıflandırma Sistemi (r=0,769), El Becerileri Sınıflandırma Sistemi (r=0,786) ve İletişim Fonksiyonları Sınıflandırma Sistemi (r=0,824) arasında anlamlı pozitif korelasyon bulundu (p<0,001).

Tartışma: Türkçe EDACS son derece güvenilir bir araç olarak bulundu. Serebral palsili çocukların fonksiyonel yeme ve içme becerileri, motor fonksiyon seviyeleri ve iletişim durumları ile ilişkilidir.

Anahtar Kelimeler: Serebral Palsi; İçme; Yeme; Yutma.

INTRODUCTION

Cerebral palsy (CP) encompasses a heterogeneous group of disorders resulting from a non-progressive disruption or injury in fetal or infant brain. The CP is the most common neuromotor problem that causes physical disability in childhood (1). While the overall prevalence of CP was 2.11 per 1000 live births, the prevalence of CP was determined as 4.4 per 1000 live births in Turkey (2,3). The problems of sense, cognition, communication, speech, oral motor function, eating and drinking activities and nutrition may accompany motor disorders (4).

There is no adequate workable definition of oral motor disabilities, and measurement of prevalence rates varies enormously. However, Edvinsson and Lundqvist found that orofacial dysfunction occurred about 80% of the individuals and was present in all sub diagnoses in CP (5). Three out of four children with CP have oral motor disabilities that cause some difficulties with managing various food textures, choking on fluids and solids, slow eating, and handling utensils (6,7). Difficulties in the process of swallowing may cause dysphagia as disorders of eating and drinking activities. Two in three children with CP are estimated to have oropharyngeal dysphagia (8). Children who have dysphagia also encounter difficulties in participating in social life activities such as attending mealtimes with family and friends. It is reported that eating and drinking of adolescents with CP caused negative feelings including shame, frustration, fear of choking, concerns about future and distress (6). Children with CP are at risk for limited intake, malnutrition, aspiration, pneumonia, respiratory problems, and weak growth contribute significantly to increased morbidity and mortality (9,10). Therefore, evaluation and early management of eating and drinking difficulties become very important.

In the last two decades, researchers have developed simple multi-level classification systems to determine the activity level and functional capacity of children with CP. These classification systems are practical scales defining a common international language that provides ease of communication between various disciplines while characterizing comprehensive profiles of children with CP (11). Gross Motor Function Classification

System (GMFCS), Manual Ability Classification System (MACS), and Communication Function Classification System (CFCS) are the most well-known classification systems that have high validity and reliability and used in almost all CP-related research worldwide (12). Recently, the Eating and Drinking Ability Classification System (EDACS) has been developed for describing the oral functional capacity of children with CP aged three years and older (13). Once translated into Turkish, professionals in Turkey would be able to use EDACS to identify children with CP in studies of swallowing function, eating and drinking skills. We could not find another valid and reliable classification system related to eating and drinking function of children with CP in Turkish language. This study would be the first classification system translated into Turkish to define the function of eating and drinking in children with CP.

The aims of this current study were to translate the EDACS into the Turkish language and to investigate the intra-rater reliability of the Turkish version of the EDACS, and to determine its relationship with the other functional classification systems. We hypothesized that the Turkish EDACS has sufficient intra-rater reliability, and the EDACS is related to the other classification systems including the GMFCS, MACS, and CFCS.

METHODS

Study Design

We performed a prospective cross-sectional psychometric study. This study has three parts including translation of the EDACS into the Turkish, intra-rater reliability, concurrent validity, and the relationship with the other classification systems. The ethical approval of the study was obtained from the Non-Interventional Clinical Research Ethics Committee (Approval Date: 10.10.2017 and Approval Number: GO17/787-16).

Participants

One hundred and twenty-five children with a diagnosis of CP undergoing a rehabilitation program at the Hacettepe University Faculty of Physical Therapy and Rehabilitation were included in the study. The sample size was identified after

power analysis based on study of Tschirren et al (14). The number of participants to be included in the study with 80% power with alpha error margin 0.05 and beta 0.20 was determined as at least 100 children with CP. Inclusion criteria were: diagnosed as CP by a pediatric neurologist, and older than three years of age. Children who were under three years of age were excluded from the study. Children with CP and their parents were informed about the study and written informed consent was obtained from the parents. All participants were classified according to Turkish versions of classification systems, GMFCS and the CFCS. Additionally, children aged four years and above classified with MACS by experienced physiotherapists about the motor and swallowing problems (Table 1).

The GMFCS was used to assess the sitting position, walking, and use of mobility devices. GMFCS shows the general performance of the child at home, school, or in society. It classifies the movement ability of a child with CP into five different levels between level I and V. Level I indicates "Walks without limitations," level II "Walks with limitations," level III "Walks using a hand-held mobility device," level IV "Self-mobility with limitations, may use powered mobility," and level V "Transported in a manual wheelchair." The GMFCS is a valid and reliable system in children with CP (15).

The MACS, classify the use of hands in handling objects during daily living activities and the need for self-help or adaptation into five levels in children with CP aged 4-18 years. According to MACS levels, level I subjects handle objects easily and successfully, and level II handles most objects, but with reduced quality and/or speed of achievement. The level III handles most objects, but with reduced quality and/or speed of achievement, level IV handles a limited selection of easily managed objects in simple actions, and level V does not handle objects and has severely limited ability to perform even simple actions. The MACS is a valid and reliable classification system in children with CP (16).

The CFCS classify the everyday communication of an individual with CP into one of five levels according to the effectiveness of communication. It consists of five levels describing everyday communication

ability including level I a person who independently and effectively alternates between being a sender and receiver of information with most people in most environments. Level II subject is a person who independently alternates between being a sender and receiver with the most of the people in most environments, but the conversation may be slower. Level III is a person who usually communicates effectively with familiar communication partners, but not unfamiliar partners, in most environments. Level IV is the person who is not always consistent with communicating with familiar communication partners. Level V is a person who is seldom able to communicate effectively even with familiar people. The validity and reliability of the CFCS in children with CP have been shown (17).

The EDACS describes the functional eating and drinking abilities of children with CP aged three years and older by using five distinct levels. It refers to key features including "safety" (aspiration and choking) and "efficiency" (amount of food lost and time taken to eat). The EDACS also provides a three-level ordinal rating scale to describe the degree of required assistance (independent; requires assistance, and dependent). The five distinct levels of ability include information about biting, chewing, and swallowing ability, food, and fluid textures that are managed, and breath changes associated with eating and/or drinking, and risk due to aspiration or choking. Level V shows an inability to eat and drink. The EDACS is a similar and complementary to five-level classification system to previous classifications. According to the EDACS levels, subjects in level I eat and drink safely and efficiently. Level II subjects eat and drink safely but with some limitations for efficiency. Level III subjects eat and drink with some limitations to safety, and there may be limitations to efficiency. The subjects in level IV eat and drink with significant limitations for safety. Level V subjects are unable to eat or drink safely – tube feeding may be considered to provide nutrition (13,14).

All children were observed in clinical settings to classify according to their gross motor and manual activities, and communication levels. An experienced physiotherapist directly observed their eating and drinking abilities in the clinical setting during feeding.

Translation Process

We obtained authorization and permission for validation from the owner (Seller D) of the EDACS copyright. The translation process of the EDACS consisted of two parts and based on the World Health Organization's instructions. The EDACS was translated into Turkish language by two native Turkish physiotherapists whose expertise was in the field of swallowing disorders in children with CP. Then, both translated documents were combined as draft translation. The translated version was translated back into the English by a native English speaker professional translator and compared with the original original measurement to correct translation mistakes. A linguist supported in crucial areas. After the translation process was completed, the Turkish version of EDACS was sent to three clinical physiotherapists to check if it is understandable.

Intra-rater Reliability

The intra-rater reliability is the degree to which the result of a test is consistent over time (18). All children were observed in their usual mealtime seating for at least one meal. The textures of food and fluids during mealtimes were similar to those the participant received at home. Children who need feeding adaptation were also recorded. The level of the Turkish EDACS was noted. After two weeks, the levels of the Turkish EDACS were re-scored by the same physiotherapist for intra-rater reliability.

Relationship between Classification Systems

The GMFCS, MACS, and CFCS levels of all children were recorded to investigate the relationship between eating and drinking function, locomotion level, manual ability, and communication status.

Statistical Analysis

Statistical analysis was performed using IBM-SPSS for Windows version 20 (IBM Corp, New York, USA). Descriptive analyses were performed For intra-rater reliability, the Intra-class Correlation Coefficient (ICC) value was used. Values of 0.41 to 0.60 indicate moderate agreement, 0.61 to 0.80 substantial agreements, and 0.81 to 1.00 almost perfect agreement (19). The Spearman's Correlation Coefficient was used to assess the correlation between the Turkish EDACS level and relationship with the other functional classification systems (GMFCS, MACS, and CFCS) (20).

RESULTS

A total of 125 children with CP, of which 56.80% (n=71) were males and 43.20% (n=54) were females included in the study between January 2018 and May 2018. The mean age of the children with CP was 7.44 ± 3.95 years. Table 1 presents the frequencies of children with CP according to functional classification systems (GMFCS, MACS, and CFCS). Table 2 shows the descriptive characteristics of the children. According to the EDACS, there were 44 (35.2%) children in level I, 34 (27.2%) children in level II, 16 (12.8%) children in level III, 22 (17.6%) children in level IV, and nine (7.2%) children classified at the level V.

Agreement among therapists was almost perfect for the EDACS level within 95% Confidence Interval (ICC=0.972 Confidence Interval=0.959-0.980, $p < 0.001$).

There were significant correlations between the EDACS, and GMFCS, MACS, and CFCS ($r=0.769$, $r=0.786$, and $r=0.824$, respectively, $p < 0.001$) (Table 3).

Table 1: Distribution of Children According to Functional Classification Systems.

Levels	GMFCS		MACS		CFCS	
	n	%	n	%	n	%
I	22	17.60	33	26.40	35	28
II	26	20.80	28	22.40	24	19.2
III	22	17.60	22	17.60	22	17.6
IV	25	20	14	11.20	22	17.6
V	30	24	28	22.40	22	17.6

GMFCS: Gross Motor Function Classification System, MACS: Manual Ability Classification System, CFCS: Communication Function Classification System.

Table 2: Descriptive Characteristics of Children with Cerebral Palsy (n=125).

Parameter	Mean±SD	Min-Max
Age (years)	7.44±3.95	4-18
Gender	n	%
Female	54	43.2
Male	71	56.8
CP Types	n	%
Spastic	95	76
Dyskinetic	19	15.2
Ataxic	9	7.2
Hypotonic	2	1.6

CP: Cerebral Palsy.

Table 3: Relationship between Turkish Version of Eating and Drinking Ability Classification System and Gross Motor Function Classification System, Manual Ability Classification System, and Communication Function Classification System.

Parameters	GMFCS		MACS		CFCS	
	r	p	r	p	r	p
EDACS	0.769	<0.001*	0.786	<0.001*	0.824	<0.001*

*p<0.05 EDACS: Eating and Drinking Ability Classification System, GMFCS: Gross Motor Function Classification System, MACS: Manual Ability Classification System, CFCS: Communication Function Classification System.

DISCUSSION

In this study, we found that the Turkish EDACS had high intra-rater reliability and high correlations with the other functional classification systems as we hypothesized. The Turkish version of a new measurement for classifying eating and drinking abilities of children with CP with acceptable psychometric properties is vital to be used in clinical settings or research studies.

Eating and drinking difficulties in children with CP have been shown as a common problem by different studies (6,21). However, in their systematic review, Sellers et al. (13) identified the lack of a reliable ordinal scale to classify the eating and drinking abilities of children with CP in both clinical and research context. Therefore, the EDACS may play a crucial role to classify eating and drinking abilities in individuals with CP, and it is essential to show its reliability in different languages (22). The EDACS identifies the critical features including safety (choking and aspiration risk) and efficiency (mealtime and food loss from the mouth) linked with limitations to oral skills required for biting, chewing, and swallowing (13).

After the World Health Organization has declared

the International Classification of Functioning, Disability, and Health, activity and participation become a crucial issue for rehabilitation (23). Although there are several assessment methods related to oral motor problems, which mostly focus on body functions and structures, the Turkish EDACS is one of the systems that directly focus on feeding problems of children with CP, which is the activity part of the International Classification of Functioning, Disability and Health. Since it allows using a common language between professionals and parents, it could also help to focus on family-centered rehabilitation (24).

Sellers et al. noted that the level of intra-rater agreement was 78% during the development phase of the EDACS (13). Benfer et al. found that intra-rater reproducibility of the EDACS was strong and suggested that there was little variability between repeated evaluations by the same rater. It has an 88.3% intra-rater agreement, and ICC was 0.95 (8). We found that the Turkish EDACS had a high intra-rater agreement, and ICC value was 0.97, which is quite similar to the previous findings.

Correlations of the Turkish EDACS with other functional classification systems were found

moderate to high in previous studies (8,13,25). Tschirren et al. stressed that the EDACS correlated moderately to highly with GMFCS ($r=0.52$), MACS ($r=0.69$), and CFCS ($r=0.64$) (14). Benfer et al. found that the EDACS classification is strongly related to the GMFCS in children with CP (10). Monbaliu et al. stated that the EDACS was significantly related to GMFCS ($r=0.78$) and MACS ($r=0.77$) but moderately related with CFCS ($r=0.49$) in children with dyskinetic CP (25). Goh et al. compared the classification systems for oropharyngeal dysfunction in children with CP, and they used the EDACS, CFCS, GMFCS, and MACS for the classification (26). While the EDACS level presented strong relationship CFCS ($r=0.74$) and MACS ($r=0.69$), there was a weak relationship with GMFCS ($r=0.51$) (26). As a complementary result, we also found a high correlation between the Turkish EDACS and GMFCS, MACS, and CFCS. Therefore, all studies mentioned emphasized that the level of functional eating and drinking abilities is related to motor functional levels and communication status of children with CP.

The main limitations of the study were the lack of inter-rater reliability of the Turkish EDACS and concurrent validity of the Turkish version. It is recommended to be determined in future studies.

In conclusion, the study showed that the Turkish EDACS is a reliable instrument to describe the functional eating and drinking abilities of children with CP. The functional eating and drinking abilities of children with CP is also related to motor functional levels and communication status, which are measured by frequently used functional classification systems including GMFCS, MACS, and CFCS. We recommend that therapists and researchers could use the EDACS in their clinical and research practice in children with CP with eating and drinking difficulty as well as to describe their abilities of children with CP using the other classification systems. Further study is need to determine interrater reliability and concurrent validity of Turkish EDACS.

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Conflict of Interest: There is no conflict of interest.

Ethical Approval: The ethical approval of the study was obtained from Non-Interventional Clinical Research Ethics Committee of Hacettepe University (Approval date: 10.10.2017 and Approval Number: GO17/787/16).

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