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Selen SEREL-ARSLAN, PT, PhD<sup>1</sup>  
Numan DEMİR, PT, PhD<sup>1</sup>  
Aynur Ayşe KARADUMAN, PT, PhD<sup>2</sup>

- 1 Hacettepe University, Faculty of Physical Therapy and Rehabilitation, Ankara, Turkey
- 2 Lokman Hekim University, Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, Ankara, Turkey

### Correspondence (İletişim):

Selen SEREL-ARSLAN, PT, PhD  
Address: Hacettepe University, Faculty of Physical  
Therapy and Rehabilitation, Altındağ, 06100,  
Ankara, Turkey  
Tel: +903123052525  
Email: selen.serel@hacettepe.edu.tr  
ORCID number: 0000-0002-2463-7503

Numan DEMİR  
E-mail: numan@hacettepe.edu.tr  
ORCID: 0000-0001-6308-0237

Aynur Ayşe KARADUMAN  
E-mail: ayse.karaduman@lokmanhekim.edu.tr  
ORCID: 0000-0001-6252-1934

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# AGREEMENT BETWEEN PARENTS AND CLINICIANS FOR CHEWING PERFORMANCE LEVEL OF CHILDREN WITH CEREBRAL PALSY

## ORIGINAL ARTICLE

### ABSTRACT

**Purpose:** The study was aimed to examine the agreement between parents and clinicians for determining chewing performance level in children with cerebral palsy (CP).

**Methods:** This cross sectional study included 50 children with CP and their mothers. The Karaduman Chewing Performance Scale (KCPS) was used to determine chewing performance level in children. Mothers of children with CP scored the level that best describes their child's chewing performance level twice with one-week interval. An experienced physical therapist in terms of chewing and swallowing disorders was also scored chewing performance level by using the KCPS.

**Results:** The physical therapist and mothers agreed on exactly the same KCPS level in 41 of 50 children (82%). There was an excellent positive correlation between the KCPS scores of the physical therapist and the mothers ( $r=0.959$ ,  $p<0.001$ ). There was also a substantial agreement in the KCPS scoring between physical therapist and mothers ( $p<0.001$ ,  $k:0.769$ ). There was an excellent positive correlation between two examinations of mothers ( $r=0.991$ ,  $p<0.001$ ). Perfect agreement in the KCPS scoring was detected between two examinations of mothers ( $p<0.001$ ,  $k:0.846$ ).

**Conclusion:** The agreement between therapists and parents suggests that parents could determine chewing performance level in children with CP. This may provide an efficient and less costly method to perform observational or community screening studies to define children's chewing performance, especially when evaluation of a clinician is not feasible.

**Key words:** Cerebral palsy, Chewing, Parents, Agreement

## SEREBRAL PALSİLİ ÇOCUKLARIN ÇIĞNEME PERFORMANS SEVİYESİ İÇİN EBEVEYNLER VE KLİNİSYENLER ARASINDAKİ UYUM

### ARAŞTIRMA MAKALESİ

#### ÖZ

**Amaç:** Bu çalışmada serebral palsili (SP) çocuklarda çiğneme performans seviyesinin belirlenmesinde ebeveynler ve klinisyenler arasındaki uyumun incelenmesi amaçlandı.

**Yöntem:** Bu kesitsel çalışmaya SP'li 50 çocuk ve anneleri dahil edildi. Çocuklarda çiğneme performans seviyesini belirlemek için Karaduman Çiğneme Performans Skalası (KÇPS) kullanıldı. SP'li çocukların anneleri, çocuklarının çiğneme performans seviyesini en iyi tanımlayan düzeyi birer hafta arayla iki kez puanladı. Çiğneme ve yutma bozuklukları konusunda deneyimli bir fizyoterapist de KÇPS'yi kullanarak çiğneme performans seviyesini puanlandı.

**Sonuçlar:** Fizyoterapist ve anneler, 50 çocuğun 41'inde (%82) tamamen aynı KÇPS seviyesi üzerinde anlaştılar. Fizyoterapist ve annelerin KÇPS puanları arasında mükemmel, pozitif yönde korelasyon vardı ( $r=0,959$ ,  $p<0,001$ ). Fizyoterapist ve anneler arasında KÇPS puanlamasında da önemli bir uyum vardı ( $p<0,001$ ,  $k:0,769$ ). Annelerin iki değerlendirmesi arasında mükemmel, pozitif yönde korelasyon vardı ( $r=0,991$ ,  $p<0,001$ ). Annelerin iki değerlendirmesi arasında KÇPS skorlamasında mükemmel uyum saptandı ( $p<0,001$ ,  $k:0,846$ ).

**Tartışma:** Terapistler ve ebeveynler arasındaki uyum, ebeveynlerin SP'li çocuklarda çiğneme performans seviyesini belirleyebileceğini düşündürmektedir. Bu, özellikle bir klinisyenin değerlendirilmesi mümkün olmadığı durumlarda, çocukların çiğneme performansını tanımlamak için gözlemsel veya topluluk tarama çalışmaları yapmak için verimli ve daha az maliyetli bir yöntem sağlayabilir.

**Anahtar kelimeler:** Serebral palsy, Çiğneme, Ebeveynler, Uyum

## INTRODUCTION

Chewing function necessitates holding and biting the food, transferring it to the molar area and breaking down the food between premolar teeth into small pieces (1,2). The reported methods in the literature to evaluate chewing function in the pediatric population are scarce and usually based on observational analysis and clinical judgments (3-5). The Karaduman Chewing Performance Scale (KCPS) is one of the most practical tool with five levels, which is developed for classifying chewing performance level of children based on the sequence of functional movements during chewing (6-8). Children at level 0 have normal chewing function whereas children at level IV can not bite and chew. It was developed by physical therapists that specialized in swallowing disorders, and other health professionals could also use the scale. Our clinical experiences suggest that it would also be appropriate to use as a parent or caregiver report in chewing assessment.

Parental assessment for chewing performance of children could be useful and helpful due to different perspectives. The first possible reason is that chewing training should be family centered to be successful (9). The repeated positive and successful experiences are the key for learning how to chew, therefore family participation to chewing training is essential (10). The rehabilitation process starts with the appropriate evaluation sessions; thereby it may be useful to include families to the evaluation process as well as rehabilitation process. The second reason is that it may provide a bridge between clinical and natural environment of children because clinicians evaluate children in a clinical environment, and parental feedback depends on natural environment. Another possible reason is that it may provide information about the awareness of families on their children's chewing performance level. And also, if the parent report chewing performance level will be reliable, it could be used in research studies or community screening as an efficient and less costly method to profile children's chewing performance. Therefore, the present study was aimed to assess the agreement between parents and clinicians for determining chewing performance level in children with cerebral palsy (CP).

## METHODS

### Participants

This study was a prospective cross-sectional study. It was performed between 1 March 2019 to 30 December 2019 at Hacettepe University Faculty of Physical Therapy and Rehabilitation. The Non-interventional Clinical Researches Ethics Board of Hacettepe University was approved the study protocol (Approval date= 11.04.2017, Approval number = GO17/351). All children and their families provided written informed consent form to participate the study.

Children with CP aged between 2 to 11 years who admitted due to complaints about chewing disorders and inability to intake solid food, and their parents were included in the study. The exclusion criteria were (i) being under the age of 2 years, (ii) using any medicine and/or oral appliances that may affect chewing performance, (iii) received any chewing training.

### Study design

Two physical therapists blinded to each other collected data in this prospective cross-sectional study. One physical therapist who had an 11 years of experience in chewing and swallowing disorders was informed each parent about study purpose and design, and gave the standardized form describing the KCPS levels with a checklist of key components of each level (Table 1). They were asked to read the statements and select the level that best represents their child's chewing performance. Parents were allowed to use adequate time to decide which level describes their child's chewing performance level. A control appointment was scheduled a week later for parents to rescore their child's chewing performance. Another physical therapist who had a 20 years of experience in chewing and swallowing disorders scored each child's chewing performance by using KCPS. The correlation between the KCPS scores of the physical therapist and the parents, and the correlation between two scorings of parents were used for reliability.

### Assessments

The descriptive characteristics including diagnosis, age (years), height (cm) and weight (kg) of the children were recorded. The gross motor functional

level was determined by the Gross Motor Function Classification System (GMFCS) (11). The GMFCS has five levels including Level I to V. The scale ranges from the most independent functional motor level (level I) to the most dependent level (level V). Descriptive characteristics about feeding including transition time to additional and solid food, meal time, number of meals, initial teething time, and number of teeth were also noted. An observational oral motor assessment was performed. The presence of open mouth, open bite, tongue thrust and high palate were scored as absent or present (12). The spontaneous opening of the lips at rest is the open mouth posture. Open bite indicates that the upper and lower incisors are not aligned and do not meet when the jaw is closed. Tongue thrust is the forceful protrusion of the tongue. High palate is the unusually high and narrow palate.

The KCPS was used to determine the chewing performance level of the children (6). Children were positioned to a sitting position on a chair with the head upright and midline position while the arms and legs supported, and asked to bite and chew a

standardized biscuit. The KCPS has five different levels between level 0 to IV. The level 0 indicates 'Normal chewing function', level I indicates 'The child chews, but there are some difficulties in transition food to bolus', level II indicates 'The child starts to chew, but he/she cannot hold the food in the molar area', level III indicates 'The child bites but cannot chew', and level IV indicates 'The child cannot bite and chew' (6).

### Statistical analysis

The G\*Power program was used to perform statistical power analysis. Fifty children with two observers have 0.5 effect size, 5% type I error margin, and 82% statistical power conditions to assess the agreement between parents and clinicians for determining chewing performance level in children with CP as statistically significant.

Data were analyzed with IBM-SPSS for Windows version 20 (IBM Corp., Armonk, NY, USA). Descriptive statistics were calculated as number/percent for qualitative data and mean±standard deviation for quantitative data. The non-parametric Spear-

**Table 1.** The Description of the Karaduman Chewing Performance Scale for Parents

Levels	Description
Level 0	<p>My child ...</p> <ul style="list-style-type: none"> <li><b>has efficient chewing function.</b> is able to keep and bite the chewable food in his/her mouth, move it with his/her <b>tongue movements</b> to the molar area, <b>break down the food between molar teeth into small pieces successfully.</b> He/she is able to turn the food into a cohesive bolus formation, and swallow the bolus successfully.</li> </ul>
Level 1	<p>My child ...</p> <ul style="list-style-type: none"> <li><b>chews but there are some difficulties in transition food into bolus.</b> is able to keep and bite the chewable food in his/her mouth, move it with his/her tongue movements to the molar area, <b>has an inefficient in breaking down the food between molar teeth into small pieces.</b> For instance.; prolonged chewing time and/or food/saliva loss and/or insufficient masticatory force. He/she is able to turn the food into a cohesive bolus formation, and swallow the bolus successfully.</li> </ul>
Level 2	<p>My child ...</p> <ul style="list-style-type: none"> <li><b>starts to chew but he/she can not hold the food in the molar area.</b> is able to keep and bite the chewable food in his/her mouth, transfer it with his/her tongue movements to the molar area, <b>can not be kept the food</b> in the molar area due to the problems in movements of the tongue. Thus, there are problems <b>in breaking down the food into small pieces efficiently and turning the food into cohesive bolus formation. The food is either transferred to swallow or thrown out of the mouth.</b></li> </ul>
Level 3	<p>My child ...</p> <ul style="list-style-type: none"> <li><b>bites but is not able to chew.</b> is able to hold and bite the chewable food. is not able to manage the other necessary steps to finish the chewing process.</li> </ul>
Level 4	<p>My child ...</p> <ul style="list-style-type: none"> <li><b>is not able to bite and chew.</b> There are problems in all steps of chewing function.</li> </ul>

**Table 2.** Descriptive Characteristics of the Children

	<b>Mean (SD)</b>	<b>Min - Max</b>
Age (year)	4.34 (2.45)	2-11
Height (cm)	95.16 (19.18)	67-140
Weight (kg)	14.02 (5.91)	7-34
Transition time to additional food (month)	7.64 (5.45)	3-36
Transition time to solid food (month)	12.17 (6.76)	6-36
Meal time (min)	23.19 (11.05)	5-60
Number of meals	4.18 (1.34)	2-8
Initial teething time (month)	9.80 (4.47)	4-30
Number of teeth	13.56 (5.64)	4-20
Oral motor evaluation parameters	<b>Number</b>	<b>%</b>
Open mouth	18	36
Open bite	13	26
Tongue thrust	16	32
High palate	16	32

man correlation coefficient was used to determine the reliability of the KCPS parent report. A Spearman correlation coefficient less than 0.30 indicates weak, between 0.30 and 0.70 indicates moderate, and greater than 0.70 indicates strong correlation (13). The Kappa coefficient was also used for the agreement of the chewing performance level scoring between physical therapist and parents, and also between two scorings of parents. The values between 0-0.2 indicate no agreement, 0.21-0.40 fair, 0.41-0.60 moderate, 0.61-0.80 substantial, 0.81-1.0 perfect agreement (14). The level of significance was set at  $p = 0.05$ .

**RESULTS**

Fifty children with a clinical diagnosis of spastic CP and a mean age of  $4.34 \pm 2.45$  years (22 girls, 28 boys), and their mothers were included. According to the GMFCS, there were 10 (20%) children in level I, 10 (20%) children in level II, 9 (18%) children in level III, 7 (14.0%) children in level IV, and 14 (28%) children in level V. The descriptive characteristics

of the children are shown in Table 2.

The KCPS scorings of the physical therapist and the mothers are presented in Table 3. The physical therapist and mothers agreed on exactly the same KCPS level in 41 of 50 children (82%). Mothers usually chose better levels (6 out of 9 disagreements) in chewing performance of children.

An excellent positive correlation was found between the KCPS scores of the physical therapist and the mothers ( $r=0.959$ ,  $p<0.001$ ). Substantial agreement in the KCPS scoring between physical therapist and mothers was also found ( $p<0.001$ ,  $k:0.769$ ). The number of children in each KCPS level as rated by the physical therapist and mothers are presented in Table 3.

An excellent positive correlation was found between two examinations of mothers ( $r=0.991$ ,  $p<0.001$ ). Perfect agreement in the KCPS scoring between two examinations of mothers was also found ( $p<0.001$ ,  $k:0.846$ ).

**Table 3.** Number of Children in Each KCPS Level as Rated by the Physical Therapist and Mothers

<b>Mothers</b>	<b>Physical therapist</b>					<b>Total</b>
	<b>Level 0</b>	<b>Level 1</b>	<b>Level 2</b>	<b>Level 3</b>	<b>Level 4</b>	
Level 0	9	1	0	0	0	10
Level 1	0	3	1	0	0	4
Level 2	0	1	6	3	0	10
Level 3	0	0	2	9	1	12
Level 4	0	0	0	0	14	14
Total	9	5	9	12	15	50

## DISCUSSION

Chewing evaluation is important to ensure appropriate nutritional intake and positive feeding behaviours in children (15). The methods used to evaluate chewing function in the pediatric population are usually based on clinical judgments of clinicians (3-5). Parental participation to decision-making process is supported in children's healthcare (16). Therefore, parental report measurements have become more popular and important in clinical settings (17). The current study shows that parent-rated chewing performance level had substantial agreement with expert rating when determining chewing performance level of children with CP.

Clinician rated functional classification systems including GMFCS, the Manual Ability Classification System (MACS), the Communication Function Classification System (CFCS) were developed according to the need of standardised systems for classifying the motor functional level of children with CP (11,18,19). Activity and participation level of children with CP have begun to be more important in the rehabilitation process with the development of the International Classification of Functioning Disability, and Health perspective. Therefore, these clinician rated functional classification systems become more popular and frequently used in both clinical and research settings. In literature, the GMFCS, MACS and CFCS were found to be suitable for parental rating (20-24). These studies all concluded that parents and clinicians could use the same language while classifying functional abilities of their children, and the methods are suitable for research and clinical practice. This is the first study to mention about parent report chewing performance level of children with CP. Children with chewing disorders are not able to manage solid food intake, experience food refusal and throwing food out of the mouth which result in longer meal times and increased numbers of meals, try to swallow without chewing and choke during swallowing which may cause danger in swallowing, and also have more problematic feeding behaviors (6,25). Parents have an important role in the management of chewing disorders (10). Considering the management process of chewing disorders, parental participation is crucial in recognizing the problem and consulting a specialist, performing home based chewing training

to ensure repeated positive and successful experiences (9,10). Therefore, increasing parental participation in the process will increase the success of the chewing management. The current study shows that parental report of chewing performance level had substantial agreement with clinician rating of chewing performance level in children with CP. In addition, repeated KCPS scoring of mothers was also found to be excellent, which shows that the parent report of KCPS is consistent for determining the severity of chewing problems.

In parental rating of chewing performance level, mothers were more successful in scoring level 0 and level 4. Level 1 is the level which mothers were least successful. This is reasonable because the most prominent levels of KCPS are level 0 and level 4. Level 0 indicates 'Normal chewing function', and level 4 means 'No biting and chewing'. Therefore, these levels are the most easily and clearly scored chewing performance levels. In addition, mothers usually chose better levels (6 out of 9 disagreements) in chewing performance of children. The tendency for rating better chewing performance level by mothers compared to ratings by physical therapist is also important for different ways. In a negative perspective, these mothers (i) may not be aware of the exact chewing performance of their children and/or (ii) may not be realistic and/or (iii) may be depressed by expressing them as low levels of chewing function. On the other hand, these mothers may be more optimistic and have fewer complaints compared to exact situation.

This is the first study to investigate the agreement between parents and clinicians for chewing performance level of children with CP. The strengths of the methodology of the current study are the inclusion of parents whose children have not received any treatment or rehabilitation related to chewing disorders before, the inclusion of two physical therapists blinded to each other for informing the parents and scoring the chewing performance level, and providing standardization by using the checklist. The current study also has some limitations. The study focuses on the reliability of parental report of chewing performance level in children CP; therefore contributing factors including socio-demographic characteristics of parents were not investigated. Another limitation is that only moth-

er responses were collected because they brought their children to our clinic. Therefore, we could not represent the results of both parents.

In conclusion, agreement between therapists and mothers suggests that parents could determine chewing performance level in children with CP. It may provide a common language for families and professionals. In future studies, the ratings of chewing performance level by parents could be used for observational or community screening studies as an efficient and less costly method to define children's chewing performance.

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## REFERENCES

1. Le Révérend BJ, Edelson LR, Loret C. Anatomical, functional, physiological and behavioural aspects of the development of mastication in early childhood. *Br J Nutr.* 2014; 111: 403-14.
2. Linas N, Peyron MA, Eschevins C, Hennequin M, Nicolas E, Collado V. Natural food mastication capability in preschool children according to their oral condition: A preliminary study. *J Texture Stud.* 2020;51(5):755-65.
3. Tarkowska A, Katzer L, Ahlers MO. Assessment of masticatory performance by means of a color-changeable chewing gum. *J Prosthodont Res.* 2017;61(1):9-19.
4. van der Bilt A. Assessment of mastication with implications for oral rehabilitation: a review. *J Oral Rehabil.* 2011;38(10):754-80.
5. Cichero JAY. Evaluating chewing function: Expanding the dysphagia field using food oral processing and the IDDSI framework. *J Texture Stud.* 2020;51(1):56-66.
6. Serel Arslan S, Demir N, Barak Dolgun A, Karaduman AA. Development of a new instrument for determining the level of chewing function in children. *J Oral Rehabil.* 2016; 43: 488-95.
7. Serel Arslan S, Aydın G, Alemdaroglu I, Yilmaz Ö, Karaduman AA. Reliability and validity of the Karaduman Chewing Performance Scale in paediatric neuromuscular diseases: A system for classification of chewing disorders. *J Oral Rehabil.* 2018; 45: 526-31.
8. Serel Arslan S, Demir N, Karaduman AA, Tanyel FC, Soyer T. Chewing function in children with repaired esophageal atresia-tracheoesophageal fistula. *Eur J Pediatr Surg.* 2018; 28: 534-8.
9. Bahr D, Johanson N. A family-centered approach to feeding disorders in children (Birth to 5-Years). *Perspect Swallow Disord (dysphagia).* 2013;22:161-71.
10. Serel Arslan S, Demir N, Karaduman AA. Effect of a new treatment protocol called Functional Chewing Training on chewing function in children with cerebral palsy: a double-blind randomised controlled trial. *J Oral Rehabil.* 2017; 44: 43-50.
11. Palisano R, Rosenbaum P, Walter S, Russel D, Wood E, Galuppi B. Development and reliability of a system to classify gross motor function in children with cerebral palsy. *Dev Med Child Neurol.* 1997; 39: 214-23.
12. Şahan AK, Sevim M, Serel Arslan S. Pediatrik popülasyonda beslenme ve yutma bozukluklarında klinik değerlendirme basamakları. *Türkiye Klinikleri J Health Sci.* 2020;5(1):157-65.
13. Mukaka MM. Statistics corner: a guide to appropriate use of correlation coefficient in medical research. *Malawi Med J.* 2012; 24: 69-71.
14. Viera AJ, Garrett JM. Understanding interobserver agreement: the kappa statistic. *Fam Med.* 2005; 37: 360-3.
15. Serel Arslan S, Ilgaz F, Demir N, Karaduman AA. The effect of the inability to intake chewable food texture on growth, dietary intake and feeding behaviors of children with cerebral palsy. *J Dev Phys Disabil.* 2018; 30: 205-14.
16. Aarthun A, Øymar KA, Akerjordet K. Parental involvement in decision-making about their child's health care at the hospital. *Nurs Open.* 2018;6(1):50-8.
17. Barton C, Bickell M, Fucile S. Pediatric oral motor feeding assessments: A systematic review. *Phys Occup Ther Pediatr.* 2018; 38:190-209.
18. Eliasson AC, Krumlinde-Sundholm L, Rösblad B, Beckung E, Arner M, Ohrvall AM, Rosenbaum P. The Manual Ability Classification System (MACS) for children with cerebral palsy: scale development and evidence of validity and reliability. *Dev Med Child Neurol.* 2006;48(7):549-54.
19. Hidecker MJ, Paneth N, Rosenbaum PL, Kent RD, Lillie J, Eulenberg JB, Chester K Jr, Johnson B, Michalsen L, Evatt M, Taylor K. Developing and validating the Communication Function Classification System for individuals with cerebral palsy. *Dev Med Child Neurol.* 2011;53(8):704-10.
20. Morris C, Galuppi BE, Rosenbaum PL. Reliability of family report for the Gross Motor Function Classification System. *Dev Med Child Neurol.* 2004; 46:455-60.
21. Rackauskaite G, Thorsen P, Uldall PV, Ostergaard JR. Reliability of GMFCS family report questionnaire. *Disabil Rehabil.* 2012; 34: 721-4.
22. Mutlu A, Kara OK, Gunel MK, Karahan S, Livanelioğlu A. Agreement between parents and clinicians for the motor functional classification systems of children with cerebral palsy. *Disabil Rehabil.* 2011; 33: 927-32.
23. Mutlu A, Kara ÖK, Livanelioğlu A, Karahan S, Alkan H, Yardımcı BN, et al. Agreement between parents and clinicians on the communication function levels and relationship of classification systems of children with cerebral palsy. *Disabil Health J.* 2018; 11: 281-6.
24. Morris C, Kurinczuk JJ, Fitzpatrick R, Rosenbaum PL. Who best to make the assessment? Professionals' and families' classifications of gross motor function in cerebral palsy are highly consistent. *Arch Dis Child.* 2006;91: 675-679.
25. Serel Arslan S, Ilgaz F, Demir N, Karaduman AA. Yutma bozukluğu olan serebral palsili çocuklarda büyüme yetersizliği ve beslenme şeklinin ebeveynlerin kaygı durumu üzerindeki etkisi. *Bes Diy Der.* 2018;45(1):28-34.