Reliability and validity of the Korean version of the Eating and Drinking Ability Classification System in children with cerebral palsy

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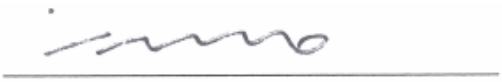

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ABSTRACT

Reliability and Validity of the Korean Version of the Eating and Drinking Ability Classification System in Children with Cerebral Palsy

AIM The objective of this study is to assess the reliability and validity of the Korean version of Eating and Drinking Ability Classification System (EDACS) for pediatric cerebral palsy (CP).

METHOD The reliability of the Korean-translated version of EDACS was examined using weighted kappa (κ) among a cohort of 40 children with CP. This evaluation involved a physician in pediatric rehabilitation, a speech therapist, and the caregiver of the subjects. The correlation of EDACS was assessed by comparing it with other functional classification systems, such as Functional Oral Intake System (FOIS), Gross Motor Function Classification System (GMFCS), Manual Ability Classification System (MACS), and Communication Function Classification System (CFCS), through Kendall's tau-b (Kτ).

RESULTS In the evaluation of each level and level of assistance in EDACS, there was almost perfect agreement between a physician and a speech-language therapist (κ = 0.940, 0.919). Substantial agreement was observed between the physician and the caregiver (κ = 0.618, 0.592), and a moderate agreement between the speech therapist and the caregiver (κ = 0.557, 0.556). Intra-rater reliability was consistently at an almost perfect across all comparisons. Additionally, moderate or high correlation with level of EDACS was found in FOIS (Kτ = -0.863), GMFCS (Kτ = 0.656), MACS (Kτ = 0.720), and CFCS (Kτ = 0.616).

CONCLUSION In the context of pediatric patients with CP, the Korean version of EDACS shows significant consistency among professionals, including a physician and a speech therapist, as well as their caregivers who contributed to the evaluation. EDACS shows strong support for effectively communicating dietary levels in children with CP, thereby enhancing its clinical utility. Furthermore, it demonstrates notable correlation when compared to other functional classification systems for CP.

Key words : cerebral palsy, pediatrics, eating behavior, drinking behavior, safety, efficiency, reproducibility of results

I. INTRODUCTION

Cerebral palsy (CP) is the most common developmental disorder in childhood, defined as a group of disorders characterized by motor dysfunction due to non-progressive lesions in the brain occurring before birth or during infancy.[1] In addition to motor impairments resulting from brain injury, CP can be accompanied by various other disabilities such as intellectual impairment, feeding difficulties, swallowing dysfunction, visual impairment, and auditory impairment. Among these, swallowing difficulties and oromotor dysfunction are clinically the most readily observable symptoms compared to abnormalities in other developmental stages, with reported prevalence rates of feeding difficulties at 54% and swallowing difficulties at around 50% in children with CP.[2] If feeding and swallowing problems in children with CP are left untreated, they may lead to nutritional deficiencies, failure to thrive, and respiratory problems such as recurrent aspiration pneumonia, which are closely associated with mortality rates.[3, 4]

The Eating and Drinking Ability Classification System (EDACS) is developed to assess and classify feeding-related functions in CP patients, aged 3 and above, into five levels based on how they eat and drink.[5] This classification, derived from the International Classification of Functioning, Disability and Health (ICF) concepts, evaluates and categorizes feeding function in children with CP at the level of activity and participation, facilitating exchange of information among healthcare professionals about children's function, and allowing for efficient classification of feeding function. EDACS categorizes feeding function into five levels based on safety and efficiency, with higher levels indicating increased feeding difficulty.[6] Additionally, based on the level of assistance required, it further classifies children into three levels: independent, assistance required, and totally dependent.

EDACS is designed to evaluate the process from oral activity through the pharynx to the esophagus, considering the texture and types of food ingested, and can provide information on the degree of assistance required. This enables physicians to predict the safety of eating, set restrictions on types of food that children with CP can consume, and plan treatment strategies such as oral rehabilitation therapy or additional videofluoroscopic swallowing studies. While EDACS results are meaningful for predicting aspiration risk, particularly for children classified in levels I and II, there may be omissions, necessitating confirmation through video fluoroscopic swallowing study and consideration of other feeding assessment tools.[7] The Functional Oral Intake Scale (FOIS), developed to measure oral intake in stroke patients, has shown high reliability for pediatric swallowing disorders and has been used to measure the effectiveness of therapeutic interventions for pediatric swallowing function. [8, 9]

Previous studies have demonstrated high reliability of the original EDACS and its translations into German, Dutch, and Chinese. [5, 6, 10, 11] The Korean version of EDACS showed high reliability between a speech and language therapist (SaLT) and caregivers of adult CP patients.[12] However, research on the reliability and validity of the Korean version of the EDACS in pediatric populations has not yet been conducted. Moreover, concerns arise regarding the agreement between non-expert caregivers and experts in determining the levels, and whether evaluations conducted by healthcare professionals responsible for diagnosing and planning treatment for children with CP are consistent with EDACS assessments.

Therefore, this study aims to assess the inter-rater and intra-rater reliability of the Korean version of EDACS among a physician, a SaLT, and caregivers, and to evaluate its validity

compared to FOIS, as well as correlation with other functional classification systems for children with CP such as Gross Motor Function Classification System (GMFCS), Manual Ability Classification System (MACS), and Commuication Function Classification System (CFCS).

II. METHODS

2.1. PARTICIPANTS

This study was a prospective cross-sectional study conducted as a psychometric study. Children with CP aged 3 years and older but under 18 years were included subjects who visited the Department of Rehabilitation Medicine at Eulji Medical Center in Daejeon from October 2022 to August 2023. Children whose eating habits and postures had changed due to surgery within the past 3 months were excluded. The study proceeded only with cases where both the patient and caregiver, capable of communicating in Korean, provided consent. In this study involving children with CP, with a sample size of 36 patients evaluated by three observers, a power of 90% (β=0.1) was achieved to detect a kappa value of 0.8 or higher over the null hypothesis of a moderate kappa value of 0.5, using a significance level of 0.05. To account for a dropout rate of 15%, resulting in a final analysis of 36 subjects, we aimed to recruit 42 participants. Consent was obtained through face-to-face explanations by the research personnel, and the same consent form was provided to both the subjects and their caregivers. This study was approved by the Institutional review board of Eulji Medical Center. It was supported by the Eulji University in 2022.

2.2. PROCEDURES

For patients who consented to participate in the study, incentive materials describing the evaluation methods and assessment tools of the study were provided to the caregivers. Basic information such as diagnosis, subclassification of CP, presence of comorbidities, and frequency of seizures were collected, and if available, diagnoses were reviewed by reconfirming with brain magnetic resonance imaging. Meanwhile, the SaLT had more than 5 years of experience treating children with CP and basically knew about EDACS evaluation. Before recruiting subjects, the physician had a lecture on EDACS to SaLT for 20 minutes, and then went through a process of discussing swallowing evaluation results through examples. Following consent acquisition, caregivers were provided with the Korean version of EDACS. They were given more than a week to read and fully understand the handout. They were then allowed to discuss any questions and receive clarification from the first author, who is a physician of pediatric rehabilitation medicine, regarding the use of EDACS to classify their children's eating and drinking abilities. The physician evaluated GMFCS and MACS through direct face-to-face assessments, while a SaLT evaluated CFCS through brief interviews of subjects lasting no more than 5 minutes. Evaluation using the Korean version of EDACS was conducted through observational assessment using recorded videos and additional information by caregivers. Two video recordings, spaced from one to two weeks apart, were conducted by caregivers. The child's meal preparation status and utensils used for eating were recorded, followed by capturing the child's meal process within 10 minutes and annotation of oral status after meals. [13, 14] Total mealtime, coughing due to aspiration, and excessive drooling information were also submitted in writing. At the time of video recording, caregivers were instructed to conduct the EDACS evaluation independently, without supervision from a physician or a SaLT. Evaluations by a physician and a SaLT for EDACS were conducted separately based on the submitted videos, with the physician additionally evaluating FOIS. The same procedure was performed again on videos that were re-taken at intervals. The physician and

the SaLT each evaluated all 40 patients, and each patient's caregiver evaluated only their own child. The physician was an experienced professional with over 5 years in the field of pediatric rehabilitation using these tests on a regular basis with their patients. All raters were blinded to the other's assessment to control for bias. Korean version of EDACS was used as the official Korean version, translated by Kim et al., and downloaded from www.edacs.org.

2.3. STATISTICS

Basic information was analyzed using technical statistical analysis methods. Inter-rater reliability among examiners was assessed by comparing results between caregivers and a SaLT, caregivers and a physician, and a SaLT and a physician. Intra-rater reliability was assessed by comparing results from the same examiner on two occasions. Weighted kappa (κ) was used to evaluate the reliability of EDACS values among the three examiners and intra-rater reliability. Kendall's tau-b (Kτ) was used to assess the relationship of EDACS against the FOIS, GMFCS, MACS, and CFCS.

According to Landis and Koch (1977), weighted kappa values between 0.401 and 0.600 indicate moderate agreement, values between 0.601 and 0.800 indicate substantial agreement, and values between 0.801 and 1.000 indicate almost perfect agreement. [15] Munro's classification was used to interpret Kendall's tau-b (Kτ) values, where correlation coefficients below 0.25 indicate little correlation, values between 0.26 and 0.49 indicate low correlation, values between 0.50 and 0.69 indicate moderate correlation, values between 0.70 and 0.89 indicate high correlation, and values between 0.89 and 1.00 indicate very high correlation. [6]

All p-values below 0.05 were considered statistically significant, and data analysis was performed using the statistical software SPSS version 27.0 (IBM, Armonk, NY, USA).

III. RESULTS

3.1. PARTICIPANTS CHARACTERISTICS

Out of a total of 42 children, 2 withdrew their consent, resulting in 40 children being included in the analysis. Table 1 displays the demographic data of the study participants. The mean age of the participants was 8.4 years (standard deviation of 4 years and 0 months), ranging from 3 years and 0 months to 17 years and 2 months. Among them, 22 children (55%) were identified as having a history of preterm birth. Fifteen children (37.5%) were unable to walk independently with a GMFCS level of IV or higher, while 21 children (52.5%) required assistance using both hands with a MACS level of III or higher. All participants were capable of oral feeding, with one child receiving both gastric tube and oral feeding simultaneously, and none of the children had undergone tracheostomy. None of the participants were tube-dependent, with all having a FOIS score of IV or higher, indicating oral feeding capability. Additionally, spastic CP was the most common subtype, observed in 30 children (75.0%).

Table 1 Demographic characteristics

Characteristics	
Age at assessment (yr), mean (range)	8.4 (3-17)
Gestational age (wk), mean (range)	32.5 (21-40)
Sex, n (%)	
Male	21 (52.5)
Female	19 (47.5)
Tone abnormality	
Spastic	30 (75.0)
Dyskinetic	2 (5.0)
Ataxic	3 (7.5)
Mixed	2 (5.0)
Non-classifiable	3 (7.5)
Motor distribution, n (%)	
Unilateral	6 (12.0)
Bilateral	44 (88.0)
GMFCS, n (%)	
I	12 (30.0)
II	9 (22.5)
III	4 (10.0)
IV	10 (25.0)

V	5 (12.5)
MACS, n (%)	
I	11 (27.5)
II	8 (20.0)
III	12 (30.0)
IV	4 (10.0)
V	5 (12.5)
CFCS, n (%)	
I	13 (32.5)
II	4 (10.0)
III	3 (7.5)
IV	2 (5.0)
V	18 (45.0)

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

3.2. INTERRATER RELIABLITY

3.2.1. ASSESSMENT OF EDACS - LEVEL

The reliability between a physician and a SaLT was found to be almost perfect. ($\kappa = 0.940$, 95%CI 0.874-1.006; $p<0.001$ for the first assessment, $\kappa = 0.919$, 95%CI 0.844-0.993; $p<0.001$ for the second assessment) Based on the first assessment, absolute agreement was seen 37 cases (92.5%). There were discrepancies in the assigned levels between a physician and a SaLT for only 3 out of all participants. One patient was evaluated as level II by the physician and level I by the SaLT. Another patient was evaluated as level IV by the physician and level III by the SaLT. A third patient was evaluated as level II by the physician and level III by the SaLT. The reliability between a SaLT and caregivers was moderate. ($\kappa = 0.557$, 95%CI 0.374-0.740; $p<0.001$ for the first assessment, $\kappa = 0.556$, 95%CI 0.379-0.733, $p<0.001$ for the second assessment) In the first assessment, absolute agreement was seen 24 cases (60.0%). 16 participants were evaluated differently, while in the second assessment, this number increased to 17 participants. The reliability between a physician and caregivers was moderate to substantial. ($\kappa = 0.618$, 95%CI 0.450-0.785; $p<0.001$ for the first assessment, $\kappa = 0.592$, 95%CI 0.431-0.753; $p<0.001$ for the second assessments) Respectively, 15 and 17 participants being evaluated differently. In the first assessment, absolute agreement was seen 26 cases (65.0%).

Among the cases where all evaluators did not fully agree in the first assessment, 16 participants were identified. Among these, discrepancies of only one level were observed in 9 participants, accounting for 56.3% of the cases of disagreement. Furthermore, in 10 cases (62.5%), caregiver evaluations were lower than those of both a physician and a SaLT. Complete agreement among a physician, a SaLT, and caregivers was observed in 24 participants, accounting for 60% of all participants. (Table 2)

Table 1 Agreement on EDACS level between physician, speech-language therapist, and caregivers

			Physician*			
SaLT*	I	II	III	IV	V	Total
I	22	1	0	0	0	23
II	0	3	0	0	0	3
III	0	1	5	1	0	7
IV	0	0	0	7	0	7
V	0	0	0	0	0	0
Total	22	5	5	8	0	40
			SaLT†			
Caregiver†	I	II	III	IV	V	Total
I	15	0	1	0	0	16
II	3	2	1	0	0	6
III	5	0	4	3	0	12
IV	0	1	1	3	0	5
V	0	0	0	1	0	1
Total	23	3	7	7	0	40
			Caregiver‡			
Physician‡	I	II	III	IV	V	Total
I	15	3	4	0	0	22
II	1	2	1	1	0	5
III	0	1	4	0	0	5
IV	0	0	3	4	1	8
V	0	0	0	0	0	0
Total	16	6	12	5	1	40

* $\kappa = 0.940$, 95%CI 0.874-1.006; $p<0.001$. † $\kappa = 0.557$, 95%CI 0.374-0.740; $p<0.001$. ‡ $\kappa = 0.618$, 95%CI 0.450-0.785; $p<0.001$.
EDACS : Eating and Drinking Ability Classification System. SaLT : Speech and language therapist.

3.2.2. ASSESSMENT OF EDACS – LEVEL OF ASSISTANCE

The reliability between a physician and a SaLT regarding the level of assistance needed was almost perfect for the first ($\kappa = 0.887$, 95%CI 0.780-0.994; $p<0.001$) and second ($\kappa = 0.859$, 95%CI 0.739-0.979; $p<0.001$) assessments. There were four participants whose evaluations did not match, accounting for 10% of the total. Among the 10 participants whom the physician evaluated as needing assistance, the evaluations of the SaLT matched in 6 cases, differed by evaluating 3 participants as independent, and 1 as needing complete assistance. The reliability between a SaLT and caregivers was also moderate for the first ($\kappa = 0.542$, 95%CI 0.0.365-0.719; $p<0.001$) and second ($\kappa = 0.507$, 95%CI 0.320-0.694; $p<0.001$) assessments. Of the 22 participants that the caregivers evaluated as needing assistance, complete agreement with the SaLT was found in 6 cases; the SaLT evaluated 11 participants as independent and 5 as needing complete assistance. The reliability between a physician and caregivers was moderate ($\kappa = 0.636$, 95%CI 0.461-0.812; $p<0.001$) for both assessments. Similarly, of the 22 participants that the caregivers

evaluated as needing assistance, complete agreement with the physician was found in 10 cases; the physician evaluated 8 participants as independent and 4 as needing complete assistance. Complete agreement among a physician, a SaLT, and caregivers was observed in 24 participants, accounting for 60% of all participants. In the first assessment, among the 16 participants where the SaLT and caregivers did not agree, 11 participants (68.8%) were evaluated as needing less assistance by the caregivers. Among the 12 participants where the physician and caregivers did not agree, 8 participants (66.6%) were evaluated as needing less assistance by the caregivers. Additionally, the maximum difference in assessments between evaluaters was one level. (Table 3)

Table 3 Agreement on EDACS level of assistance between physician, speech-language therapist, and caregivers

	Physician*			
SaLT*	Independent	Requires assistance	Totally dependent	Total
Independent	20	3	0	23
Requires assistance	0	6	0	6
Totally dependent	0	1	10	11
Total	20	10	10	40
	SaLT†			
Caregiver†	Independent	Requires assistance	Totally dependent	Total
Independent	12	0	0	12
Requires assistance	11	6	5	22
Totally dependent	0	0	6	6
Total	23	6	11	40
	Caregiver‡			
Physician‡	Independent	Requires assistance	Totally dependent	Total
Independent	12	8	0	20
Requires assistance	0	10	0	10
Totally dependent	0	4	6	10
Total	12	22	6	40

* $\kappa = 0.887$, 95%CI 0.780-0.994; $p<0.001$. † $\kappa = 0.542$, 95%CI 0.0.365-0.719; $p<0.001$. ‡ $\kappa = 0.636$, 95%CI 0.461-0.812; $p<0.001$. EDACS : Eating and Drinking Ability Classification System. SaLT : Speech and language therapist.

3.3. INTRARATER RELIABILITY

For each of the two assessments, the reliability was very high, with a physician showing a kappa value of 0.979, a SaLT 0.980, and caregivers 0.980. The physician had discrepancies with two participants, while the SaLT and caregivers each had discrepancies with one participant. Moreover, the reliability for the level of assistance was perfect between a physician and caregivers, with a value of 1.0 across all participants, and kappa value of 0.972 for a SaLT. Almost perfect agreement was observed among all evaluators for both the levels and the level of assistance.

3.4. ASSESSMENTS OF EDACS VERSUS OTHER CLASSIFICATION TOOLS

Table 4 represents the distribution of EDACS and other functional classification of the participants. The validity between the FOIS assessed by physicians during the first EDACS assessment and EDACS itself showed a significant negative correlation (K_{τ} = -0.863). The Kendall's tau values were 0.656 for GMFCS, 0.720 for MACS, and 0.616 for CFCS, indicating high correlation with MACS and moderate with GMFCS and CFCS. The relationship between the EDACS levels of assistance and other CP functional assessments was confirmed with FOIS (Kτ = -0.595), GMFCS (K_{τ} = 0.629), MACS (K_{τ} = 0.741), and CFCS (K_{τ} = 0.353). (Table 5)

Table 4 Distribution of EDACS level compared with FOIS, GMFCS, MACS, CFCS

	EDACS				
	I	II	III	IV	Total
FOIS					
IV	0	0	0	1	1
V	0	0	3	3	6
VI	1	3	2	4	10
VII	21	2	0	0	23
Total	22	5	5	8	40
GMFCS					
I	11	1	0	0	12
II	7	0	1	1	9
III	3	1	0	0	4
IV	1	3	3	3	10
V	0	0	1	4	5
Total	22	5	5	8	40
MACS					
I	10	1	0	0	11
II	8	0	0	0	8
III	4	3	2	3	12
IV	0	1	2	1	4
V	0	0	1	4	5
Total	22	5	5	8	40
CFCS					
I	13	0	0	0	13
II	3	1	0	0	4
III	21	1	0	0	3
IV	1	1	0	0	2
V	3	2	5	8	18
Total	22	5	5	8	40

EDACS : Eating and Drinking Ability Classification System
FOIS : Functional Oral Intake Scale
GMFCS : Gross Motor Function Classification System.
MACS : Manual Ability Classification System.
CFCS : Commuication Function Classification System.

Table 5 Distribution of EDACS level of assistance compared with FOIS, GMFCS, MACS, CFCS

	EDACS			
	Independent	Requires assistance	Totally dependent	Total
FOIS				
IV	0	0	3	2
V	0	3	2	6
VI	1	4	4	9
VII	19	3	1	23
Total	20	10	10	40
GMFCS				
I	11	1	0	12
II	7	1	1	9
III	1	3	0	4
IV	1	5	4	10
V	0	0	5	5
Total	20	10	10	40
MACS				
I	11	1	0	12
II	7	0	0	7
III	2	8	2	12
IV	0	1	3	4
V	0	0	5	5
Total	20	10	10	40
CFCS				
I	11	2	0	13
II	3	1	0	4
III	2	1	0	3
IV	1	0	1	2
V	3	6	9	18
Total	20	10	10	40

EDACS : Eating and Drinking Ability Classification System
FOIS : Functional Oral Intake Scale
GMFCS : Gross Motor Function Classification System.
MACS : Manual Ability Classification System.
CFCS : Commuication Function Classification System.

IV. DISCUSSION

First, we were able to confirm a high level of agreement regarding the hypothesis that the EDACS evaluation results would be consistent among professionals from different fields. Second, we found a significant level of agreement between professionals and non-professionals as well.

4.1. INTER- AND INTRA-RATER RELIABILITY

In this study, the inter-rater reliability of the EDACS level represented perfect agreement between professionals, physicians, and SaLTs, with scores above 0.9. Absolute agreement was observed in 37 of the 40 participants. The agreement between physicians and caregivers, and between SaLTs and caregivers, showed moderate correlations. In cases of disagreement, caregivers tended to evaluate the participants' function lower than physicians in 10 out of 15 cases of disagreement, and similarly evaluated lower than SaLTs in 11 out of 15 cases.

When considering the reasons for these discrepancies, it is difficult to conclude that the function is evaluated higher or lower based on relative familiarity. The classification of familiarity was mostly based on whether regular encounters were considered more familiar than non-regular encounters, or on the relative degree between the two evaluators.[6, 10, 11] This is supported by a study comparing evaluations between a more familiar SaLT who observed regularly and a less familiar SaLT who observed at least one mealtime, where out of 46 participants, 4 were rated lower function by the familiar SaLT and 3 by the less familiar SaLT, declaring little difference in evaluation trends based on familiarity.[6] Another study found that out of 149 participants, the relatively more familiar professional rated 31 participants lower function, while the less familiar professional rated 22 participants lower funtion, indicating a higher tendency for the familiar professional to rate function lower.[10] There is a study that show the opposite results. In a study that classified raters based on familiarity, out of a total of 53 patients, there were 7 patients who rated function lower with less familiar raters and 5 patients who rated function lower with more familiar raters.[11]

It is also difficult to conclude that experts or non-experts consistently evaluate function lower depending on expertise. In some studies, professionals tend to evaluate the function as lower than parents.[5,10] In 81 participants in Netherlands, professionals rated 25 participants lower than parents, while parents rated 14 participants lower than professionals.[10] Similarly, another study showed that out of 48 participants in UK, professionals rated 18 participants lower, while parents rated 2 participants lower.[5] There were also opposite trend. In 52 participants, familiar professionals rated 6 participants as lower function than parents, while parents rated 10 participants lower than professionals with german EDACS.[6] One explanation for parents rating function lower is that the child may be exposed to a wider variety of foods at home.[6] On the other hand, studies concluding that professionals rated function lower suggest that parents may perceive risks less than professionals do.[10] In the original EDACS study, despite parents tending to rate

function higher, it was recommended that professionals consider the parents' opinions as parents are more aware of their child's abilities to eat and drink beyond environmental limitations.[5]

Compared to other studies with similar findings on EDACS evaluation trends based on evaluator familiarity and expertise, this study showed a greater tendency for parents to rate EDACS levels as lower function than professionals.[6] A previous study found that parents rated function lower than professionals in 4 out of 52 cases (7.7%), with only one case (2%) showing a discrepancy of two or more levels.[6] However, in this study, parents rated function lower than professionals in 10 out of 40 cases (25%) and 11 out of 40 cases (27.5%), with discrepancies of two or more levels observed in 5 cases (12.5%) and 6 cases (15%). This suggests that other factors, beyond the increased exposure to diverse foods at home, may be influencing these evaluations.

This discrepancy can be understood in the context of cultural differences. In East Asian cultures, independence in eating is often achieved later, leading caregivers to perceive a child's eating function as worse and to expect that more assistance is required.[16, 17] There is a cultural tendency to believe that independence in eating is delayed. This perception aligns with the broader protective practices in East Asian societies, where family members tend to provide more practical assistance compared to Western cultures.[16] For example, studies on East Asian parenting styles have shown that due to a more authoritarian approach within the family, parents may be more involved in daily activities, including meals. This approach helps explain why, in this study conducted in Korea, caregivers assessed children as needing more assistance with eating within a cultural context.[17] In contrast, Western countries like the UK and the Netherlands may have cultural tendencies that emphasize independence and individual autonomy, which could influence caregivers to assess a patient's functional abilities more optimistically.[18] Such cultural backgrounds may shape their expectations of the patient's capabilities, leading Western caregivers to recognize higher functional abilities or to adopt an attitude that promotes the patient's independence.[19]

Particularly, children who represented a two-level discrepancy in EDACS were those with GMFCS and MACS levels of II or III, indicating relatively preserved function but an ambiguous age range of 5–6 years where independence in daily life had not yet been achieved. Notably, when both the physician and SaLT assessed participants as EDACS level I, the caregivers evaluated the same participants as EDACS level III in 4 and 5 cases, respectively. Four of these cases were same patients between the caregiver-physician and caregiver-SaLT comparisons. Considering the cultural background, caregivers may tend to assess these children with such ambiguous functional abilities at a lower functional level. Additionally, two of these participants are twins, and for the remaining two, while both the physician and the SaLT assessed them as "EDACS level I, independent," the caregivers evaluated them as "EDACS level III, requires assistance." In these four cases, it is difficult to rule out the possibility that the parents may have had an insufficient understanding of EDACS or that their evaluations were overly cautious, influenced by their personal experiences.

Meanwhile, regarding the level of assistance, professionals tended to give more extreme evaluations compared to caregivers. Among 22 participants whom caregivers evaluated to require assistance, SaLTs evaluated 11 as independent, 5 as totally dependent, and only 6 as requiring assistance. Similarly, physicians evaluated 8 participants as independent, 4 as totally dependent, and 10 as requiring assistance. This suggests that caregivers may be more conservative in judging whether a child eats and drinks independently, which can be understood in the cultural context. In contrast, cases where professionals rated the function lower than caregivers suggest that professionals may have underestimated the abilities of participants, indicating that while a participant may have been totally dependent at the time of evaluation, they might have been less

dependent during other meals.

The inter-rater reliability for EDACS levels and independence observed in this study was higher compared to previous studies that reported almost perfect reliability. In the study on the intra-rater reliability of eating assessments for pediatric CP, an interval ranging from 48 hours to 2 months was adopted.[11, 14, 20-24] This study set the interval of more than one week but less than two weeks for CP children who regularly visited the hospital, minimizing memory bias and changes in patient health status. However, considering the storage period of food and ingredients during this interval, it is possible that the same or similar textured foods were provided in both evaluations.

An additional aspect of this study is that physicians participated as expert evaluators. The results of physicians' EDACS evaluations play a crucial role in the interdisciplinary team approach in rehabilitation medicine. This is especially important for ensuring the safety of eating and drinking in children with CP, identifying aspiration risks, and guiding further diagnostic assessments and treatment plans. Therefore, the direct participation of physicians as evaluators to understand the extent of differences between their assessments and those of therapists or caregivers could be significant. However, in previous studies, expert evaluators such as occupational therapists and SaLTs were involved, whereas there was a lack of involvement of physicians as evaluators.[6, 10-12, 24]

The strong reliability demonstrated in this study between the evaluations conducted by physicians, SaLTs, and caregivers emphasizes the potential for effective coordination in the rehabilitation approach for children with CP. Such coordination facilitates appropriate and smooth communication across homes, rehabilitation facilities, and hospitals, ultimately maximizing the therapeutic outcomes related to the child's feeding and drinking abilities.

4.2. RELATIONSHIPS BETWEEN EDACS AND OTHER CLASSIFICATION TOOLS

In previous studies, the correlation between various eating and swallowing assessment tools and EDACS was reported to be considerable, such as Dysphagia Severity Scale ($K\tau$ =0.74), Bogenhausener Dysphagiescore 2 ($K\tau$ =0.79), FOIS ($K\tau$ =-0.346).[6, 12, 14] Furthermore, other studies have shown that the correlation between MACS and EDACS is stronger than with GMFCS, and this tendency is more pronounced in spastic CP.[6, 11, 12, 22]

In this study, the correlation of EDACS compared to other CP functional classification systems was moderate or higher. Particularly, there was a strong correlation with FOIS, which directly assesses eating and drinking functions. Previous adult studies have suggested that even with similar levels of swallowing function, the level of food intake may vary due to social and personal factors, resulting in a low kappa value with FOIS.[6, 12] However, in this study, the younger age of the participants may indicate that there are fewer social factors and types of food that influence similar feeding functions. In previous studies, it was ultimately found that the difference between FOIS and EDACS lies in what is eaten (FOIS) versus how it is eaten (EDACS), which resulted in low correlation.[12] However, in patients of the age group studied, there appears to be little

difference between these two measures. In this study, 21 patients were assessed as FOIS level 7 and EDACS level I. Of the 22 patients assessed as EDACS level I, only one was evaluated as FOIS level 6, and among the patients assessed as FOIS level 7, only two were evaluated as EDACS level II. This contrasts with findings in adult CP, where it was reported that individuals with similar swallowing function may consume different types of food depending on their medical condition and personal environment.[12] In studies involving pediatric CP patients, it can be inferred that children with similar levels of eating function tend to consume similar types of food. For example, none of the patients in this study had a history of conditions such as pediatric diabetes or anorexia that might affect food choices, aside from CP-related issues like seizures, developmental delays due to genetic disorders, or intellectual disabilities. Furthermore, compared to school-aged children, the preschool-age group, which accounted for 65% of the participants (24 children aged 3-6), has access to a more limited range of foods.

Additionally, the relationship between EDACS level of assistance and CFCS in this study was relatively low ($K\tau = 0.353$). This was similar to the findings of other studies, which reported a low correlation ($K\tau = 0.30$)[11] In this study, there were 18 patients classified as CFCS level V, but their EDACS levels were varied: 3 were EDACS level I, 6 were EDACS level II, and 9 were EDACS level III. CFCS, which assesses whether effective communication between speaker and listener is possible, often shows discrepancies in studies like this one, which include many young children with developmental delays. While their communication skills may be rated as low, their eating functions may be relatively preserved, leading to the observed gaps between these assessments. As noted in other studies, oral motor development typically occurs between 10-30 months of age, which may explain why patients in this study were assessed with relatively higher eating function compared to their CFCS level.[6]

Additionally, in previous research, the proportion of dyskinetic CP, which tends to have a lower correlation with other functional classification systems, was higher than that of spastic CP. In contrast, this study primarily involved children with spastic CP, which may have also influenced the results. The relatively higher correlation observed with MACS may be attributed to the assessment item in EDACS related to mealtime.[6, 11, 12] In this study, correlation with MACS was the highest ($K\tau = 0.741$) than other functional classification system. It is considered because MACS reflects proficiency in tool use. Since the evaluation of assistance level reflects support in bringing food or drink to the mouth during meals, it is also closely related to posture and hand function. This is supported by the greater correlation observed with GMFCS and MACS.

4.3. LIMITATIONS

In this study, relatively high-functioning children with CP were selected as participants, particularly those with proficient eating and drinking abilities. Among the children evaluated using EDACS, only one was identified as level V based on caregiver assessment, aligning with the absence of children relying solely on tube feeding. Furthermore, in the first EDACS evaluation, 15 children (37.5% of the total) were assessed at level I by all three evaluators. However, across GMFCS, MACS, CFCS, distributions ranging from levels I to V were observed. These highlights need to consider EDACS as distinct from other functions, specifically eating and drinking, as

suggested in previous reports and clinically relevant findings.[5,24] While evaluating EDACS using video recordings were deemed methodologically favorable, conducting recordings at home may be difficult, especially if additional assistance during mealtime is required. This may explain why a greater number of children with better functioning according to the EDACS assessment were included as participants in this study.

IV. CONCLUSION

The Korean version of the EDACS exhibits excellent reliability in evaluating feeding capabilities among children with CP. Consequently, it proves valuable for fostering communication among physicians, therapists, and caregivers within the field of rehabilitation medicine. Moreover, it demonstrates close correlations with other functional assessment tools used for children with CP.

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Appendices1

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EDACS

EATING AND DRINKING ABILITY CLASSIFICATION SYSTEM

PURPOSE

The purpose of the Eating and Drinking Ability Classification System (EDACS) is to classify how individuals with cerebral palsy eat and drink in everyday life using distinctions that are meaningful. EDACS provides a systematic way of describing an individual's eating and drinking in five different levels of ability.

The focus is on the functional activities of eating and drinking such as sucking, biting, chewing, swallowing and keeping food or fluid in the mouth. The different parts of the mouth include the lips, jaw, teeth, cheeks, tongue, palate and throat. The distinctions between the different levels in the EDACS are based upon functional ability, the need for adaptations to the texture of food and drink, the techniques used and some other features of the environment. It classifies overall performance in eating and drinking, which includes both motor and sensory elements.

The system provides a broad description of different levels of functional ability. The scale is ordinal. The distances between the levels are not equal and individuals with cerebral palsy will not be distributed equally across the levels.

EDACS is not an assessment tool to look in detail at the component parts of eating and drinking. It does not provide the comprehensive mealtime guidance required by some individuals with cerebral palsy to eat and drink safely and efficiently.

Changes to eating and drinking performance occur as someone grows as a result of physical development and experience. This current version of EDACS describes the eating and drinking abilities of children with cerebral palsy from the age of 3 years.

BACKGROUND

EDACS classifies an individual's usual performance rather than what can be done to the best of their ability. The focus of EDACS is to determine which level most accurately represents an individual's present abilities and limitations. An individual may eat and drink differently in different settings, be influenced by personal factors and the skill and familiarity of the carer, and other environmental features.

The way an individual balances, controls head movements and sits upright influences their oral skills whilst eating and drinking. Some individuals will require close attention to positioning in sitting, standing and lying, and adapted equipment to optimise their eating and drinking abilities. The manner and degree of postural management required by individuals will depend upon their gross motor abilities.

We encourage users of EDACS to be aware of how other factors associated with cerebral palsey can influence an individual's performance whilst eating or drinking. These might include seizures and disturbances to cognition, communication, sensation, vision and hearing, as well as behaviour. Illness, tiredness, pain or medication will also have an effect. A wide range of personal factors and social, emotional and behavioural issues can become associated with eating and drinking. Features of the environment may also have an influence such as a familiar or new carer, background or sudden noises, quality of lighting and sudden movements. If an individual requires assistance with eating and drinking, a highly significant feature will be the quality of the relationship between the individual and the carer, including how well they each communicate with the other.

Disturbances of the digestive system such as gastro-oesophageal reflux or constipation will have an impact upon appetite and interest in food.

KEY FEATURES OF EATING AND DRINKING

Key features of the process of eating and drinking are **safety** and **efficiency**.

Safety refers to the risks of **choking** and **aspiration** associated with eating and drinking.

Choking occurs when a piece of food becomes lodged in the airway; this may be connected to limitations in chewing and biting as well as co-ordinating the movement of food in the mouth with swallowing.

Aspiration occurs when food or fluid enters the lungs; this may be connected to limitations in co-ordinating breathing and swallowing, controlling food or fluid in the mouth or an impaired swallow reflex. Some aspects of eating and drinking are impossible to observe, especially swallowing. Even if you know someone really well it is not always easy to notice the **signs of aspiration**; this is known as **silent aspiration**.

Aspiration may trigger respiratory illnesses and is potentially harmful. If **aspiration** is suspected, it is helpful to seek further assessment from a suitably qualified professional such as a speech and language therapist.

Efficiency refers to the length of time and effort required to eat or drink, as well as whether food or drink is kept in the mouth without loss. Limitations to the quality and speed of movement of the different parts of the mouth will affect how efficiently food and drink is consumed. The amount of effort required for eating and drinking will have an impact upon how quickly an individual tires during a meal.

The **efficiency** with which someone uses the parts of the mouth to eat and drink has an impact upon the amount of food and fluid they are able to consume. This is one of a number of factors that influence whether an individual is able to take in enough food and drink to grow and remain in good health. It is considered good practice to assess individual nutrition and hydration requirements and decide whether these are being met adequately.

USER INSTRUCTIONS

From the different descriptions given below, choose the level that best describes an individual's overall usual performance when eating and drinking.

To identify the level of eating and drinking ability of an individual with cerebral palsy, it is necessary to involve someone who knows that person well such as a parent or carer. Some aspects of eating and drinking are not possible to see, so it may be helpful to assign a level together with a professional who has knowledge about the necessary skills for safe and efficient eating and drinking.

In borderline cases the level of the EDACS which describes the greater level of limitation should be assigned.

Different degrees of assistance will be needed when eating or drinking depending upon age and the ability to bring food or drink to the mouth. The level of assistance required may change throughout life, beginning with the total dependence of the young infant. The EDACS level assigned to an individual is supplemented with an indication of whether an individual is Independent whilst eating and drinking, Requires Assistance in bringing food and drink to the mouth or is Totally Dependent.

DEFINITIONS

Age appropriate food textures refers to textures of food typically given to a particular age group (e.g. in some cultures, nuts and tough meats are not given to young children).

Aspiration is defined as the entry of material (e.g. food or fluid) into the airway or lungs below the vocal cords. This may occur when there is weak or uncoordinated movement of food or fluid from the mouth to the oesophagus whilst eating. This is usually accompanied by coughing, breathing changes and other signs of aspiration; the term **silent aspiration** is used if outward signs of aspiration such as coughing are not obvious when a person aspirates. Aspiration may cause harm by contributing to respiratory illness and chronic respiratory diseases.

Breathing changes might be noticed during eating or drinking which might suggest difficulty clearing food or fluid away from the airway and throat. The changes observed may be linked to the sound of the breathing (e.g. wheezy, rattly, noisy or wet) or may be linked to changes to the way someone breathes (e.g. changes to the rate of breathing or laboured, effortful breathing).

Choking is the partial or complete blocking of the airway due to a foreign object becoming lodged in the throat or windpipe. The blockage may be relieved by coughing. If not, the individual will require assistance (e.g. UK Resuscitation Council recommendations).

Fluid Consistency refers to how thick or thin a fluid is. Fluid consistency changes the speed at which fluid moves. It may mean the difference between fluid being swallowed safely and fluid entering the airway or lungs. Thin fluids, such as water, are fast flowing and require quick co-ordination of the movements of swallowing and breathing. Smooth thicker fluids flow more slowly and may be recommended to individuals with slower movements during swallowing in order to reduce the risk of fluid entering the airway or lungs, and / or to reduce loss of fluid from the lips. Thick fluids may be prepared by using diluted yoghurts or thick soups; thin fluids may be thickened using commercially available thickening agents.

Food textures will affect how easy it is to eat something. Different foods have a range of qualities requiring different degrees of effort, strength and co-ordination to eat. Features to consider include the shape and size of the food, how hard it is to bite and chew the food into small enough pieces ready for swallowing and what happens once bitten – foods can dissolve, splinter, crumble or lump together. Most foods can be modified to change the texture to one that is easier to manage (e.g. mixed textures can be mashed down, tough meats blended, large pieces cut into smaller pieces). Some individuals may need to avoid certain foods if they cannot be modified.

EDACS refers to:

- **Firm bite and effortful chew textures** which are the most challenging to eat (e.g. tough meats, molluscs, hard nuts, crunchy fibrous fruit and vegetables.
- **Mixed textures** where different food textures and fluid consistencies are combined (e.g. lumps of food in a thin soup, watery puree which separates into fluid and food, meat and salad sandwich).
- **Slippery textures** of food are particularly challenging to control in the mouth and eat safely (e.g. melon or grapes).
- **Sticky foods** can cause problems if an individual has difficulty clearing the mouth (e.g. nut butters, halva, tahini and toffee).
- **Hard chew textures** require effort, strength and co-ordination to eat (e.g. raw fruit and vegetables, meat, crackers, crusty bread).
- **Soft chew textures** require less effort, strength and co-ordination to eat (e.g. well cooked non fibrous vegetables, very ripe peeled fruit without seeds, well cooked pasta and soft cake).
- **Well mashed foods** require very little chewing (e.g. well cooked meat mashed with potato or well cooked vegetables, well cooked pasta or cake mashed with cream).
- **Puree** has a smooth uniform consistency which requires no chewing.
- **Tastes or Flavours** may be offered when eating or drinking is not safe. **Tastes** are a minute amount of puree to be swallowed. A **flavour** has nothing of substance to be swallowed (e.g. what remains on a finger dipped in fluid with the drips shaken off).

Gastrostomy or PEG (Percutaneous Endoscopic Gastrostomy) is a surgical opening into the stomach usually for the long term placement of a feeding tube.

Oesophagus is the name of the tube which connects the mouth and back of the throat to the stomach.

Postural Management Programme is a planned approach encompassing all activities and interventions which impact on an individual's posture and function. Programmes are tailored specifically for each child and may include special seating, night time support, standing supports, orthotics, active exercise, surgery and individual therapy sessions.

Signs of Aspiration are clinical observations that have been linked to Aspiration: coughing, wet sounding voice, breathing changes (sound of breathing as well as the rate and manner of breathing), changes in skin colour, whole body reactions, eye widening or watering, or panic reactions evident in facial expression.

Silent Aspiration is the term given when aspiration takes place but outward signs of aspiration such as coughing do not occur. Other Signs of Aspiration such as eye widening or watering, or panic reactions evident in facial expression may be observed.

Suction is when secretions are cleared from an individual's airway through the use of a specifically designed suction pump.

Tube Feeding is when a tube is passed through the nose (or mouth) or through a surgical incision into the body (e.g. naso-gastric tube or gastrostomy). Medication, fluid or a liquid feed may be passed down this tube.

GENERAL HEADINGS

Level I	Eats and drinks safely and efficiently.
Level II	Eats and drinks safely but with some limitations to efficiency.
Level III	Eats and drinks with some limitations to safety; there may be limitations to efficiency.
Level IV	Eats and drinks with significant limitations to safety.
Level V	Unable to eat or drink safely – tube feeding may be considered to provide nutrition.

Fuller descriptions of the levels are given below along with distinctions between the levels. These are to assist in determining the level that most closely resembles an individual's current eating and drinking ability.

LEVEL OF ASSISTANCE REQUIRED

An individual's eating and drinking ability will be expressed as a level I-V followed by an indication of the degree of help needed at mealtimes. For example, a child who is able to eat safely with some limitations to efficiency and requires assistance in loading the spoon or steadying a cup would be **EDACS Level II Requires Assistance (RA)**; a child who has an unsafe swallow and is able to bring food and drink to the mouth would be **EDACS Level V Independent (Ind)**.

Independent (Ind) indicates that individuals are able to bring food and drink to their own mouth without any assistance. It does not indicate that individuals are able to modify food to the required texture for safe and / or efficient eating and drinking. It also does not indicate that individuals are able to sit independently.

Requires Assistance (RA) indicates that an individual needs help to bring food or drink to the mouth, either from another person or through the use of adapted equipment. Help may be needed loading the spoon, placing food in the hand or guiding the individual's hand to the mouth, holding a cup steadily, providing close supervision or verbal prompts.

Totally Dependent (TD) indicates that an individual is totally dependent upon another to bring food or drink to the mouth.

DESCRIPTIONS OF DIFFERENT LEVELS

Level I Eats and drinks safely and efficiently

- Eats a wide range of different texture foods that are age appropriate.
- May be challenged by some very firm bite and chew foods.
- Moves food from one side of the mouth to the other; may close lips whilst chewing.
- Drinks thin or thick fluids from range of cups with consecutive swallows, including through a straw.
- May cough or gag for very challenging textures.
- Eats and drinks at a similar speed to peers.
- Retains most food or fluid in the mouth.
- Clears food from most tooth surfaces and dislodges most foods from the sides of the mouth.

Distinctions between I and II: Compared with Level I, individuals in Level II will have some limitations with more challenging food textures. Eating and drinking will take longer for individuals at Level II.

Level II Eats and drinks safely but with some limitations to efficiency

- Eats a range of food textures that are age appropriate.
- Challenged by some firm bite, effortful chew, mixed and sticky textures.
- Moves food slowly from one side of the mouth to the other using the tongue.
- May chew with lips open.
- Drinks thin or thick fluids from most cups with consecutive swallows; may drink through a straw.
- Coughs or gags on new or challenging textures or when tiring.
- May sometimes cough if fluid is fast flowing or large quantity taken in the mouth.
- May tire if textures challenging and mealtimes will take longer than for peers.
- Loses small amounts of food or fluid especially challenging textures.
- Some foods will collect on some tooth surfaces and between cheeks and gums.

Distinctions between II and III: Individuals in Level II manage most age appropriate food textures and drink with some slight modifications. Individuals at Level III will need more food textures to be modified in order to reduce risk of choking.

Level III Eats and drinks with some limitations to safety; there may be limitations to efficiency

- Eats puree and mashed food and may bite and chew some soft chew food textures.
- Challenged by large lumps, firm bite and effortful chew textures which may lead to choking and reduced efficiency.
- It is challenging to move food from one side of the mouth to the other, to keep food in the mouth, and to bite and chew for safe eating.
- Eating and drinking performance is variable and depends upon overall physical ability, positioning or assistance given.
- May drink from an open cup but drinking from cup with a lid or spout may be required to control the flow of fluid.
- May drink thickened fluids more easily than thin and may need time between sips.
- May choose to drink only in certain situations such as with a trusted carer or with no distractions.
- Specific food textures and positioning of food in mouth are required to reduce the risk of choking.
- May cough or aspirate if fluid is fast flowing or large quantity taken in the mouth.
- May tire whilst eating if food requires chewing and mealtimes will be prolonged.
- Food and fluid loss is likely and food will collect on tooth surfaces, roof of the mouth and between cheeks and gums.

Distinctions between III and IV: Individuals at Level III manage to chew soft lumps. Individuals at Level IV will need close attention given to a number of different factors to swallow food and drink safely because of the significant aspiration and choking risk.

Level IV Eats and drinks with significant limitations to safety

- Eats smooth purees or well mashed food.
- Challenged by food that requires chewing; choking may occur if lumps are eaten.
- May at times be difficult to co-ordinate swallowing and breathing when eating and drinking as shown by signs of aspiration.
- It is challenging to control the movement of food and fluid in the mouth, to control mouth opening and closure, and to control swallowing, biting and chewing.
- May swallow lumps whole.

- May find it easier to drink thickened fluids than thin fluids; thickened fluids taken slowly and in small quantities from an open cup may increase control whilst drinking.
- May choose not to drink fluids or to drink only in certain situations such as with trusted carer.
- Likely to need time between mouthfuls to swallow repeatedly before continuing.
- Will require specific food textures, fluid consistency, techniques, skilled carers, positioning and modified environment to reduce risks of aspiration and choking and increase efficiency.
- May tire whilst eating and mealtimes are likely to be prolonged.
- Significant food and fluid loss from the mouth.
- Food may become stuck on tooth surfaces, roof of the mouth and between teeth and gums.
- Supplementary tube feeding may be considered.

Distinctions between IV and V: Individuals at Level IV are able to swallow safely only if close attention is given to food texture and fluid consistency as well as the way in which food or drink is offered. Individuals at Level V cannot swallow safely so that taking food or drink in to their mouths will cause harm.

Level V Unable to eat or drink safely – tube feeding may be considered to provide nutrition

- May manage very small tastes or flavours.
- Ability to manage small tastes and flavours will be affected by positioning, personal factors and environmental features.
- Unable to swallow food or drink safely due to limitations to the range and co-ordination of movement for swallowing and breathing.
- It is likely to be challenging to control mouth opening and tongue movement.
- Aspiration and choking are very likely.
- Harm from aspiration is evident.
- May require suction or medication to keep airway clear of secretions.
- Alternative means of providing nutrition such as tube feeding may be considered.

Project Team

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Appendices2

EDACS

먹기와 마시기 기능 분류 시스템

EATING AND DRINKING ABILITY CLASSIFICATION SYSTEM

Reference: Sellers, D., Mandy, A., Pennington, L., Hankins, M. & Morris, C. Development and reliability of a system to classify eating and drinking ability of people with cerebral palsy. Developmental Medicine and Child Neurology, 2014;56(3):245-251. DOI: 10.1111/dmcn12352.

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목적

먹기와 마시기 기능 분류 시스템(EDACS)의 목적은 뇌성마비가 있는 사람이 일상생활에서 어떻게 먹고 마시는지 의미 있게 구별하여 (단계를) 분류하는 것이다. EDACS 는 개개인의 먹기와 마시기 능력을 다섯 단계로 설명하는 체계적인 방법을 제공한다.

EDACS 는 빨기, 베어 물기, 씹기, 삼키기, 음식 혹은 유동식을 입안에 머금고 있기와 같이 먹기와 마시기의 기능적 활동에 초점을 두고 있다. 입의 여러 부위에는 입술, 턱, 이, 볼, 혀, 입천장, 목구멍이 포함된다. EDACS의 각 단계 간 구분은 기능적 능력, 음식/음료의 질감에 대한 조정이 필요한지, 어떤 테크닉이 사용되는지, 그 밖의 환경적 특색에 기초하였다. EDACS 는 운동과 감각 요소를 포함하는 먹기와 마시기의 전반적인 수행능력을 분류한다.

EDACS 는 단계별 기능적 능력에 대한 개괄적인 설명을 제공한다. 다섯 단계는 순서 척도이다. 단계 사이 간격은 같지 않으며 뇌성마비가 있는 사람들이 각 단계에 균등하게 분포되지 않을 것이다.

EDACS 는 먹고 마시기의 구성 요소들을 자세히 살펴보기 위한 평가 도구가 아니다. EDACS 는 일부 뇌성마비가 있는 사람이 안전하고 효율적으로 먹고 마시는 데 필요한 포괄적인 식사 지도를 제공하지 않는다.

신체적 발달과 경험의 결과로 (사람이) 성장함에 따라 먹고 마시기 수행에 변화가 생긴다. 현재 버전의 EDACS 는 3 세 이상의 뇌성마비 아동의 먹기와 마시기 능력을 기술하고 있다.

배경

EDACS는 사람이 능력을 최대로 발휘했을 때 무엇을 할 수 있느냐보다는 평상시 수행을 분류한다. EDACS는 그 사람의 현재 능력과 제한점을 가장 정확하게 묘사하는 단계를 결정하는 데에 초점을 두고 있다. 사람은 다른 상황에서 다른 방법으로 먹고 마실 수 있으며 개인적 요인들, 간병인의 기술과 친숙함, 기타 환경적 특성들에 영향을 받을 수도 있다.

사람이 균형을 잡고, 머리의 움직임을 조절하고, 똑바로 앉는 방법은 그 사람이 먹고 마시는 동안의 구강 기능에 영향을 미친다. 어떤 사람들은 앉기, 서기, 눕기 등 자세를 잡는데 세심한 주의를 기울여야 하며 먹고 마시는 능력을 최대화시켜줄 보조 장비가 필요하다. 개개인에게 필요한 자세 조절의 방법과 정도는 그 사람의 대 동작 운동 능력에 의해 결정된다.

우리는 EDACS 이용자들이 뇌성마비와 관련된 다른 요인들이 어떻게 한 사람의 먹고 마시기 수행에 영향을 미칠 수 있는지 의식하고 있기를 권장한다. 이 요인들에는 발작, 인지, 소통, 감각, 시각, 청각, 그리고 행동 장애가 포함될 수 있다. 질병, 피로, 통증 또는 약 등이 영향을 미친다. 다양한 개인적 요인들, 사회적, 감정적, 행동적 문제들이 먹고 마시기와 관련될 수 있다. 친숙한 또는 낯선 간병인, 배경 소음 또는 갑작스러운 소음, 조명의 질, 그리고 갑작스러운 움직임과 같은 환경적 특성들 또한 영향을 미칠 수 있다. 만약, 한 사람이 먹고 마시는 데 도움이 필요하다면, 그 사람과 간병인이 서로 얼마나 잘 소통하는가를 포함하여 두 사람 간의 관계의 질이 매우 중요한 특성이 될 것이다.

위 식도 역류나 변비와 같은 소화계통의 장애는 식욕과 음식에 대한 흥미에 영향을 미칠 것이다.

먹기와 마시기의 주요 특성

안전과 **효율**은 먹고 마시기 과정의 주요 특성들이다.

안전은 먹고 마시기와 관련된 **질식**과 **흡인**의 위험을 가리킨다.

질식은 음식 조각이 기도를 막았을 때 발생한다. 이것은 음식물을 삼킬 때 입속 음식물의 움직임을 조정하는 능력뿐만 아니라 씹기와 베어 물기의 제한과 연관이 있을 수도 있다.

흡인은 음식이나 유동식이 폐에 들어갔을 때 발생한다. 이것은 호흡과 삼키기를 조화롭게 조정하고 입 안의 음식/유동식을 조절하는 능력의 제한, 또는 삼킴 반사의 손상과 관련될 수 있다. 먹기와 마시기의 일부 측면, 특히 삼키기는 관찰할 수 없다. 설령 당신이 누군가를 매우 잘 알고 있다고 해도, **흡인의 증후**를 알아차리는 것이 항상 쉬운 것은 아니다. 이것은 **무증상 흡인** (silent aspiration)이라고 알려져 있다.

흡인은 호흡계 질환을 촉발할 수 있고 잠재적으로 유해하다. 만약 **흡인**이 의심되면, 언어치료사와 같은 적절한 자격이 있는 전문가에게 추가적인 평가를 의뢰하는 것이 도움이 된다.

효율은 먹거나 마시는 데 필요한 시간과 노력의 정도, 음식이나 음료를 흘리지 않고 입안에 담고 있을 수 있느냐를 가리킨다. 입의 여러 부위가 움직이는 속도와 질에서의 제한은 음식과 음료를 얼마나 효율적으로 섭취하느냐에 영향을 줄 것이다. 먹고 마시는 데 필요한 노력의 정도는 개인이 식사 중에 얼마나 빨리 지치느냐에 영향을 미친다.

어떤 사람이 먹고 마시기 위해 입의 여러 부위를 효율적으로 사용하는 것은 그들이 섭취할 수 있는 음식과 음료의 양에 영향을 미친다. 효율은 사람이 성장하고 건강을 유지할 수 있을 정도의 충분한 음식을 먹고 마실 수 있느냐에 영향을 미치는 여러 요소 중 하나이다. 개인에 필요한 영양과 수분량을 평가하고 이들이 적절히 충족되고 있는지 판단하는 것은 좋은 (임상적) 관행으로 여겨진다.

사용자를 위한 지침

아래 다섯 개의 다른 설명 중에서, 먹고 마실 때 그 사람의 평상시 수행을 가장 잘 묘사한 단계를 선택한다.

뇌성마비가 있는 사람의 먹기와 마시기 능력 단계를 알기 위하여, 부모나 간병인과 같이 그 사람을 잘 아는 누군가를 참여시킬 필요가 있다. 먹기와 마시기의 일부 측면은 관찰할 수 없으므로 안전하고 효율적으로 먹고 마시기에 필요한 기술에 대해 잘 알고 있는 전문가와 함께 단계를 결정하는 것이 도움이 될 수 있다.

두 단계의 경계에 있는 경우, 제한의 정도가 더 높은 단계로 배정해야 한다.

먹거나 마실 때 필요한 도움의 정도는 개인의 나이, 음식이나 음료를 입으로 가져갈 수 있는 능력에 따라 다를 수 있다. 필요한 도움의 정도는 영유아기의 완전 의존 상태에서 시작하여 일생에 걸쳐 변화할 수 있다. 개개인에게 배정되는 EDACS의 단계와 함께 그 사람이 먹고 마실 때 독립적인가(Independent), 음식이나 음료를 입으로 가져가는 데 도움이 필요한가(Requires Assistance), 혹은 완전히 의존하고 있는가(Totally Dependent)를 나타내는 지표가 추가된다.

정의

나이에 적절한 음식 질감(Age appropriate food textures)은 특정한 연령층에 일반적으로 주어지는 음식의 질감을 가리킨다 (예. 어떤 문화권에서는 어린 아동에게 견과류와 질긴 고기를 주지 않는다).

흡인(Aspiration)은 물질(예. 음식이나 유동식)이 성대 아래의 기도나 폐 속으로 들어가는 것으로 정의된다. 흡인은 음식을 먹을 때 음식이나 유동식이 입에서 식도로 넘어가는 움직임이 약하거나 조절이 잘 안 될 때 발생할 수 있다. 보통 기침, 호흡의 변화, 그 밖의 흡인 징후와 함께 나타난다. **무증상 흡인(silent aspiration)**이라는 용어는 흡인이 일어났으나 기침과 같이 겉으로 나타나는 증상이 명확하지 않을 때 사용된다. 흡인은 호흡기 질환과 만성 호흡기 질병의 원인이 됨으로써 해를 끼칠 수 있다.

호흡(Breathing)의 변화가 먹고 마시는 동안 관찰될 수 있는데, 이것은 음식이나 유동식을 기도와 목구멍에서 깨끗하게 비우기가 어려움을 나타내는 것일 수도 있다. 관찰된 호흡의 변화는 호흡 소리(예. 빽빽거리는, 덜그럭거리는, 시끄러운 혹은 젖은)와 관련이 있을 수도 있고 혹은 호흡하는 방식의 변화(예. 호흡률의 변화 또는 힘들고 많은 노력이 필요한 호흡)와 관련이 있을 수도 있다.

질식(Choking)은 외부 물질이 목구멍 또는 (호흡) 기관에 박혀서 기도가 부분적으로 혹은 완전히 막힌 상태이다. 막힘은 기침으로 완화될 수 있다. 만약, 기침으로도 나아지지 않는다면, 그 사람은 도움이 필요할 것이다.

유동식의 농도(Fluid Consistency)는 유동식이 얼마나 걸쭉한지 혹은 묽은지를 가리킨다. 농도는 유동식이 움직이는 속도를 바꾼다. 이는 안전하게 삼켜지는 유동식과 기도나 폐로 들어가는 유동식 사이의 차이를 의미할 수도 있다. 물처럼 묽은 유동식은 빠르게 흐르기 때문에 삼킴과 호흡 간의 신속한 협응이 필요하다. 매끈하고 걸쭉한 유동식은 좀 더 느리게 흐르고, 삼키는 움직임이 느린 사람에게 권장되는데 이는 유동식이 기도나 폐로 들어가는 위험을 줄이거나 유동식이 입 밖으로 흐르는 것을 줄이기 위함이다. 걸쭉한 유동식은 희석한 요거트나 걸쭉한 수프로 준비할 수 있고 묽은 유동식은 시판되는 농후제(예. Thick & Easy)를 사용하여 걸쭉하게 만들 수 있다.

음식의 질감(Food textures)은 무언가를 먹기가 얼마나 쉬운가에 영향을 미친다. 다른 음식들은 다양한 특성을 가지고 특성에 따라 그것을 먹는 데 필요한 노력, 근력, 협응의 정도가 다르다. 고려해야 할 특성은 음식의 크기와 모양, 음식을 베어 물고 삼킬 수 있을 만큼 작은 크기로 씹기에 얼마나 딱딱한지, 음식을 베어 물었을 때 어떻게 되는지 - 음식은 녹거나 쪼개지거나 부스러지거나 덩어리로 뭉쳐질 수 있다 - 를 포함한다. 대부분의 음식은 다루기 쉽게 질감을 바꿀 수 있다 (예. 여러 질감이 혼합된 것을 부드럽게 으깨고 질긴 고기를 분쇄하고 큰 조각을 작은 조각으로 자를 수 있다). 만약, 어떤 사람에게 맞게 질감을 바꿀 수 없다면, 그 사람은 특정 음식을 피해야 할 수도 있다.

먹고 마시기 기능분류체계(EDACS)는 다음의 음식 질감들을 참조한다:

- **베어 물기에 딱딱하고 씹기에 힘든 (많은 노력이 필요한) 질감**은 먹기에 가장 힘들다 (예. 질긴 고기, 오징어, 딱딱한 견과류, 섬유질이 많은 아삭한 과일과 채소).
- **혼합된 질감**은 질감이 다른 음식과 농도가 다른 유동체가 섞인 것이다 (예. 묽은 수프 속 음식물 덩어리, 유동체와 음식으로 분리되는 물기가 많은 퓌레*, 고기와 샐러드 샌드위치).
  (*퓌레: 익히고 으깨고 채에 걸러서 일정한 농도의 부드러운 크림 혹은 걸쭉한 액체 형태로 만든 음식)
- **미끈거리는 질감**은 음식물을 입속에서 조절하고 안전하게 먹기에 특히 힘들다 (예. 멜론, 포도).
- **끈적한 음식**은 입안을 비우는 데 어려움이 있는 사람에게 문제가 될 수 있다 (예. 땅콩버터, 엿, 조청, 캐러멜).
- **딱딱하게 씹히는 질감**은 먹는 데 노력, 근력, 협응이 필요하다 (예. 생과일과 채소, 고기, 크래커, 껍질이 딱딱한 빵).
- **부드럽게 씹히는 질감**은 먹는 데 노력, 근력, 협응이 적게 필요하다 (예. 잘 삶아진 섬유질이 없는 채소, 씨가 없고 잘 익었으며 껍질을 벗긴 과일, 잘 삶아진 파스타, 부드러운 케이크).
- **잘 으깬 음식**은 씹기가 거의 필요 없다 (예. 잘 익은 고기를 감자나 잘 삶은 채소와 함께 으깬 것, 잘 삶아진 파스타나 케이크를 크림과 함께 섞은 것).
- **퓌레**는 부드럽고 균일한 농도를 가지고 있어 씹을 필요가 없다.
- **맛보기 또는 맛**은 먹거나 마시기가 안전하지 않을 때 제공될 수 있다. **맛보기**는 미세한 양의 퓌레를 삼키는 것이다. **맛**은 삼켜지는 것이 아무것도 없다 (예. 손가락을 유동식에 담근 후 손가락에 묻은 액체를 털어낸 후 남은 것).

위 창냄술(Gastrostomy, PEG; Percutaneous Endoscopic Gastrostomy)은 영양공급 튜브를 장기간 삽입할 수 있도록 위에 구멍을 뚫는 수술이다.

식도(Oesophagus)는 입과 목구멍 뒤쪽을 위와 연결하는 관이다.

자세 조절 프로그램(Postural Management Programme)은 개인의 자세와 기능에 영향을 미치는 모든 활동과 중재를 포괄하는 계획된 접근법이다. 프로그램은 각각의 아동에게 맞게 조정되고, 특수 의자, 야간시간 지지대, 기립 지지대, 보조기, 능동적 운동, 수술, 개인 치료가 포함될 수 있다.

흡인의 징후(Signs of Aspiration) 흡인과 관련되어 임상적으로 관찰된 것을 말한다: 기침, 젖은 목소리, 호흡의 변화 (호흡률, 호흡 방법, 호흡 소리), 피부색의 변화, 전신 반응, 눈이 커지거나 눈물이 남, 표정으로 나타난 공황 반응.

무증상 흡인(Silent Aspiration) 은 흡인이 일어났으나 기침과 같이 겉으로 나타나는 증상이 없을 때 사용되는 용어이다. 커지거나 눈물이 나는 눈, 표정에서 명백히 나타나는 공황 반응과 같은 흡인의 다른 징후들이 관찰될 수 있다.

흡입(Suction)은 특별히 제작된 펌프를 사용하여 기도에서 분비물을 제거하는 것이다.

튜브 영양법(Tube feeding) 은 코나 입 혹은 수술로 절개한 신체 부위로 튜브를 넣는 것이다 (예. 코-위 영양관, 위 창냄술). 이 튜브를 통해 약물, 유동식, 액상식이 흘러내려 갈 수 있다.

개괄적 제목

1 단계 안전하고 효율적으로 먹고 마신다.

2 단계 안전하게 먹고 마시지만, 효율에서 약간의 제한이 있다.

3 단계 안전하게 먹고 마시는데 약간의 제한이 있으며, 효율에서 제한이 있을 수도 있다.

4 단계 안전하게 먹고 마시는데 현저한 제한이 있다.

5 단계 안전하게 먹거나 마실 수 없다- 영양 공급을 위해 튜브 영양법을 고려할 수도 있다.

단계별 상세한 설명은 단계 간 차이점과 함께 아래에 서술하였다. 이는 개개인의 현재 먹고 마시기 능력과 가장 근접한 단계를 판별하는 데 도움을 주려는 것이다.

필요한 도움의 수준

개인의 먹고 마시기 능력은 1-5 단계와 식사시간 동안 필요한 도움의 정도에 따른 지표로 표시될 것이다. 예를 들면, 안전하게 먹을 수 있지만 효율에서는 약간의 제한이 있어 숟가락으로 음식을 뜨거나 컵을 흔들림 없이 드는 데에 도움이 필요한 아동이라면 **EDACS 2 단계 도움 필요(RA)**로 분류될 것이며, 삼키는 것은 안전하지 않지만 음식이나 음료를 입으로 가져갈 수 있는 아동이라면 **EDACS 5 단계 독립(Ind)**으로 분류될 것이다.

독립(Independent, Ind)은 아무런 도움 없이 혼자 음식이나 음료를 본인의 입으로 가져갈 수 있음을 의미한다. 이는 그 사람이 안전한 그리고/또는 효율적인 먹고 마시기를 위하여 음식의 질감을 조정할 수 있음을 의미하는 것은 아니다. 또한, 독립적으로 앉아 있을 수 있는 것을 의미하지도 않는다.

도움 필요(Requires Assistance, RA)는 음식이나 음료를 입으로 가져가는 데에 도움이 필요하여, 다른 사람의 도움을 받아야 하거나 개조된 도구를 이용하는 경우를 의미한다. 숟가락으로 뜨기, 손에 음식을 쥐여주기, 손을 입으로 가져가는 동작을 안내해주기, 컵을 흔들리지 않게 들기, 가까이에서 감독하거나 구두지시로 유도를 하는 것 등의 도움이 필요할 수 있다.

완전 의존(Totally Dependent, TD)은 음식이나 음료를 입으로 가져가기 위해 다른 사람에게 완전히 의존하는 경우를 의미한다.

단계별 설명

1 단계 안전하고 효율적으로 먹고 마신다.

- 나이에 알맞은 매우 다양한 질감의 음식들을 먹는다.
- 아주 딱딱한 음식을 베어 물고 씹는 데에 어려움을 겪을 수도 있다.
- 음식을 입의 한쪽에서 다른 한쪽으로 옮긴다. 음식을 씹는 동안 입술을 다물 수도 있다.
- 다양한 컵에 담긴 걸쭉하거나 묽은 유동식을 연속적으로 삼키면서 (빨대로 삼키는 것을 포함) 마신다.
- 매우 힘든 질감의 음식을 먹을 때, 기침을 하거나 구역반사가 나타날 수도 있다.
- 또래와 비슷한 속도로 먹고 마신다.
- 음식이나 유동식 대부분을 (흘리지 않고) 입안에 머금고 있다.
- 대부분의 치아 표면에서 음식을 깨끗하게 치우고, 입의 양쪽 측면에서 끼인 음식을 대부분 빼낸다.

단계 1 과 2 의 차이: 1 단계와 비교하여 2 단계의 사람들은 힘든 질감의 음식을 먹는 데에 약간의 제한이 있다. 2 단계의 사람들은 먹고 마시는 데에 더 많은 시간이 소요된다.

2 단계 안전하게 먹고 마시지만, 효율에서 약간의 제한이 있다.

- 나이에 알맞은 다양한 질감의 음식을 먹는다.
- 베어 물기에 딱딱하고 씹기 힘든 질감, 혼합되어 있고 끈적한 질감의 음식을 먹는 데에 어려움이 있다.
- 입속의 음식을 입의 한쪽에서 다른 한쪽으로 혀를 이용해 천천히 옮긴다.
- 음식을 씹는 동안 입술이 열려있을 수도 있다.
- 대부분의 컵에 담긴 걸쭉하거나 묽은 유동식을 연속적으로 삼키면서 마신다. 빨대를 이용해 마실 수도 있다.
- 처음 접해보거나 먹기 힘든 질감의 음식을 먹을 때, 또는 (먹는데 많은 노력을 기울여서) 피곤해졌을 때 기침을 하거나 구역반사가 나타난다.
- 유동식이 빠르게 흘러들어 가거나 입안에 많은 양이 들어갔을 때 때로는 기침할 수도 있다.
- 먹기 힘든 질감의 음식을 먹을 때 지칠 수 있고, 식사 시간이 또래들보다 오래 걸릴 것이다.
- 음식이나 유동식 (특히 먹기 힘든 질감인 경우)을 조금 흘린다.

- 일부 음식은 치아 표면, 볼과 잇몸 사이에 쌓일 것이다.

2 단계와 3 단계의 차이: 2 단계의 사람들은 나이에 알맞은 질감의 음식을 대부분 먹을 수 있고, 약간의 경미한 조정을 해서 마실 수 있다. 3 단계의 사람들은 질식의 위험을 줄이기 위해서 더 많은 음식 질감들을 조정해야 할 것이다.

3 단계 안전하게 먹고 마시는데 약간의 제한이 있으며 효율에서 제한이 있을 수도 있다.

- 으깬 음식을 먹고, 부드럽게 씹히는 질감의 음식을 베어 물고 씹을 수도 있다.
- 큰 덩어리, 베어 물기에 딱딱하고 씹기 힘든 질감의 음식을 먹는 데에 어려움이 있으며 이러한 음식의 섭취는 질식이나 효율 저하를 초래할 수도 있다.
- 음식을 입의 한쪽에서 다른 쪽으로 옮기기, 음식을 흘리지 않고 입안에 머금고 있기, 안전하게 먹기 위해 음식을 베어 물고 씹기가 어렵다.
- 먹고 마시기 수행에 변동이 있고, 이는 전반적인 신체능력, 자세, 혹은 주어진 도움에 따라 달라진다.
- 뚜껑이 없는 컵으로 마실 수도 있지만, 유동식의 흐름을 조절하기 위하여 뚜껑이 있거나 젖병식 컵이 필요할 수도 있다.
- 걸쭉한 유동식을 마시는 것이 묽은 것보다 쉬울 수 있으며, 한 모금을 마신 뒤 다음 모금을 마실 때까지 시간이 필요할 수도 있다.
- 신뢰할 수 있는 보호자가 동석하고 있거나, 주의집중에 방해되는 것이 없는 등 특정한 상황에서만 마시기를 선택할지도 모른다.
- 질식의 위험을 줄이기 위해서 특정한 질감의 음식을 입안에 위치시켜 줘야 한다.
- 유동식이 빠르게 흘러들어 가거나 입안에 많은 양이 들어가면 기침을 하거나 흡인이 생길 수도 있다.
- 씹어야 하는 음식을 먹는 동안 지칠 수 있고, 식사 시간이 길어질 것이다.
- 음식과 유동식을 흘리는 경향이 있고, 음식이 치아 표면이나 입천장, 볼과 잇몸 사이에 쌓일 것이다.

3 단계와 4 단계의 차이: 3 단계의 사람들은 부드러운 덩어리를 씹을 수 있다. 4 단계의 사람들은 흡인과 질식의 위험이 현저하므로 음식을 안전하게 삼키고 마시기 위하여 다양한 요소들에 각별한 주의를 기울일 필요가 있다.

4 단계 안전하게 먹고 마시는데 현저한 제한이 있다.

- 부드러운 퓌레나 잘 으깬 음식을 먹는다.
- 씹어야 하는 음식을 먹는 데 어려움이 있고 덩어리를 먹으면 질식이 일어날 수 있다.

- 먹고 마실 때 가끔 삼키기와 호흡 간의 협응이 힘들 수 있는데, 이는 흡인의 징후로 나타난다.
- 입안에서 음식과 유동식의 이동을 조절하는 것, 입을 여닫는 것, 삼키기, 베어 물기, 씹기를 조절하는 것이 어렵다.
- 음식 덩어리를 통째로 삼킬지도 모른다.
- 묽은 유동식보다 걸쭉한 유동식을 마시는 것이 쉬울 수 있다. 뚜껑이 없는 컵에 담긴 걸쭉한 유동식을 천천히 조금씩 섭취하는 것이 마시는 동안 조절력을 높일 수도 있다.
- 유동식을 마시지 않거나 신뢰할 수 있는 보호자가 동반하는 것과 같은 특정한 상황에서만 유동식을 마실 수도 있다.
- 입안의 음식을 여러 차례에 걸쳐 삼키고 다음 음식을 먹기까지 시간이 필요할 가능성이 크다.
- 흡인과 질식의 위험을 줄이고 효율을 높이기 위해서 특정 질감의 음식, 유동식 농도, 테크닉(기법), 숙련된 보호자, 자세, 환경의 수정 등이 필요할 것이다.
- 먹는 동안 지칠 수 있고, 식사 시간이 길어질 가능성이 크다.
- 입 속의 음식과 유동식을 상당히 흘린다.
- 음식이 치아 표면, 입천장, 치아와 잇몸 사이에 붙어 있을 수도 있다.
- 추가적인 튜브 영양법을 고려할 수도 있다.

4 단계와 5 단계의 차이: 4 단계의 사람들은 음식의 질감, 유동식의 농도와 더불어 음식이나 음료가 제공되는 방법 등에 세심한 주의를 기울인 경우에만 안전하게 삼킬 수 있다. 5 단계의 사람들은 안전하게 삼킬 수 없으므로 음식이나 음료를 입을 통해 먹는 것은 해가 된다.

5 단계 안전하게 먹거나 마실 수 없다 - 영양 공급을 위해 튜브 영양법을 고려해야 할 수도 있다.

- 매우 적은 양의 맛보기 혹은 맛을 먹을 수도 있다.
- 적은 양의 맛보기와 맛을 먹을 수 있는 능력은 자세, 개인적 요인과 환경적 특성에 영향을 받을 것이다.
- 삼킴과 호흡에 필요한 움직임의 범위와 협응에 제한이 있어 음식이나 음료를 안전하게 삼킬 수 없다.
- 입 벌리기와 혀의 움직임을 조절하는 데 어려움을 겪을 가능성이 크다.
- 흡인과 질식이 발생할 가능성이 매우 크다.
- 흡인에 따른 피해가 명백하다.
- 기도에서 분비물을 제거하기 위해서 흡입이나 약물이 필요할 수 있다.
- 공급을 위해 튜브 영양법과 같은 대체 수단을 고려해야 할 수도 있다.

Abstract in Korean

뇌성마비 소아에서 한글판 먹기와 마시기 기능 분류 시스템의 신뢰도 및 타당도 조사

본 연구는 소아 뇌성마비(CP)를 위한 한국어판 먹기와 마시기 시스템(Eating and Drinking Ability Classification System, EDACS)의 신뢰도와 타당도를 평가하는 것을 목적으로 하였다. 이를 위해 40명의 뇌성마비 아동을 대상으로 소아 재활 전문의, 언어치료사, 보호자가 참여하여 한국어로 번역된 EDACS 의 신뢰도를 가중 카파 계수(κ)로 분석하였다. EDACS 와 기능적 구강 섭취 척도(FOIS), 대동작 기능 분류 체계 (GMFCS), 손 기능 분류 체계 (MACS), 의사소통 기능 분류 체계 (CFCS) 간의 상관관계는 Kendall 의 타우-b (Kτ)를 사용하여 평가되었다. 그 결과, EDACS 의 각 단계 및 독립성 평가에서 소아 재활 전문의와 언어치료사 간 거의 완벽한 수준의 일치도(κ = 0.940, 0.919)가 확인되었으며, 의사와 보호자 간에는 상당한 일치도(κ = 0.618, 0.592), 언어치료사와 보호자 간에는 중간 수준의 일치도(κ = 0.557, 0.556)가 나타났다. 또한, 평가자 내 신뢰도는 모든 비교에서 거의 완벽한 수준을 유지하였다. EDACS 와 FOIS(Kτ = −0.863), GMFCS(Kτ = 0.656), MACS(Kτ = 0.720), CFCS(Kτ = 0.616) 간에는 중간에서 높은 수준의 상관관계가 나타났다. 이와 같은 결과는 한국어판 EDACS 가 소아 재활 전문의, 언어치료사, 보호자 간의 일관성을 바탕으로 소아 뇌성마비 아동의 식이 수준을 효과적으로 전달하는 임상적 유용성이 높음을 시사하며, 다른 기능적 분류 시스템들과의 유의미한 상관 관계를 통해 그 타당성 또한 입증되었음을 보여준다.

핵심되는 말 : 뇌성마비, 소아, 먹기, 마시기, 안전성, 효율성, 신뢰도, 타당도