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Turkish Adaptation of Modified Mann Swallowing Ability Test in Patients with Acute Stroke: A Validity and Reliability Study

Akut İnmeli Hastalarda Modifiye Mann Yutma Değerlendirme Testinin Türkçeye Uyarlanması: Geçerlik ve Güvenirlik Çalışması

Hilal BERBER ÇİFTCİ[a], Seyhun TOPBAŞ[a]

[a]Department of Speech and Language Therapy, İstanbul Medipol University Faculty of Health Sciences, İstanbul, Türkiye

ABSTRACT Objective: The aim of the dysphagia screening test is to identify as many cases as possible before aspiration occurs. In Türkiye, there is a need for a practical and non-invasive screening test that evaluates swallowing pre-skills apart from comprehensive clinical tests. For this purpose, the Turkish validity and reliability of the Modified Mann Assessment of Swallowing Ability (MMASA) test were examined. **Material and Methods:** The test was translated into Turkish, and its content validity index was calculated. Then, the test was re-translated to English, and its compliance with the original version was evaluated. The generated Turkish MMASA (TR-MMASA) test was applied to 90 patients with acute stroke. Similar scale validity was evaluated by checking its compliance with the Turkish Mann Assessment of Swallowing Ability (T-MASA) test. The test-retest and interrater reliability methods were used for reliability analysis. Internal consistency (IC) and item-total correlation were examined. **Results:** Reliability was calculated according to intraclass correlation (ICC) coefficients (ICC=0.92, ICC=0.97). IC and item-total correlation coefficients were examined (Cronbach's alpha=0.91). For convergent and discriminant validity, T-MASA test was applied, and the Spearman's rho correlation coefficient was examined (r=0.88). As a result of the receiver operating characteristic analysis, the sensitivity (87%), specificity (88%), positive predictive value (0.77), negative predictive value (0.93), positive likelihood ratio (7.14) and negative likelihood ratio (0.14) percentages of the test were found valid. **Conclusion:** TR-MMASA test was found to be a valid and reliable screening test for bedside clinical evaluation in patients with acute stroke.

Keywords: Dysphagia; stroke, bedside screening test; Modified Mann Assessment Swallowing Ability; TR-MMASA

ÖZET Amaç: Disfaji tarama testinde amaç, aspirasyon meydana gelmeden olabildiğince çok riskli vakayı belirlemektir. Türkiye'de kapsamlı klinik testlerin dışında yutma ön becerilerini değerlendiren pratik ve girişimsel olmayan bir tarama testine ihtiyaç duyulmaktadır. Bu amaçla çalışmada, Modifiye Mann Yutma Yeteneği [Modified Mann Assessment of Swallowing Ability (MMASA)] testi, Türkçeye uyarlanarak geçerlik ve güvenirliği incelenmiştir. **Gereç ve Yöntemler:** Test, ilk olarak Türkçeye çevrilerek sonrasında kapsam geçerlik indeksi hesaplanmıştır. İngilizceye geri çevirisi yapılarak orijinal hâliyle olan uyumuna bakılmıştır. Oluşturulan Türkçe MMASA (TR-MMASA) testi, akut inmeli 90 hastaya uygulanmıştır. Benzer ölçüt geçerliliği için Türkçe Mann Yutma Yeteneği Değerlendirmesi [Turkish Mann Assessment of Swallowing Ability (T-MASA)] testi kullanılmıştır. Güvenirlik analizi için test-tekrar test ve klinisyenler arası güvenirlik yöntemleri uygulanmıştır. İç tutarlılık ve madde-toplam madde korelasyonu incelenmiştir. **Bulgular:** Güvenirlik, sınıf içi korelasyon katsayısına [intraclass correlation coefficients (ICC)] göre (ICC=0,92, ICC=0,97) hesaplanmıştır. İç tutarlılık ve madde-toplam madde korelasyon katsayıları incelenmiştir (Cronbach alfa=0,91). Yakınsak ve ayırt edici geçerlik için T-MASA testi uygulanarak Spearman rho korelasyon katsayısı bulunmuştur (r=0,88). Alıcı işletim karakteristiği analizi sonuçlarına göre duyarlılık (%87), özgüllük (%88), pozitif öngörü değeri (0,77), negatif öngörü değeri (0,93), pozitif olabilirlik oranı (7,14) ve negatif olabilirlik oranı (0,14) tespit edilmiştir. **Sonuç:** TR-MMASA testi, akut inmeli hastalarda yatak başı klinik değerlendirme için geçerli ve güvenilir bir tarama testi olarak bulunmuştur.

Anahtar Kelimeler: Disfaji; inme; yatak başı tarama testi; Modifiye Mann Yutma Değerlendirme Testi; TR-MMASA

Dysphagia is a symptom defined as impaired bolus formation or failure of safe passage of the bolus from the mouth into the stomach.[1] The incidence of dysphagia is 23% to 50% after stroke, and aspiration pneumonia resulting from dysphagia increases the mortality rate by 6 times.[2] Dysphagia causes life-threatening complications and increase in hospitalisation/care durations and treatment

Correspondence: Hilal BERBER ÇİFTCİ
Department of Speech and Language Therapy, İstanbul Medipol University Faculty of Health Sciences, İstanbul, Türkiye
E-mail: hilalberber1@gmail.com

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costs.[3] Malnutrition may adversely affect the energy level of the patient, leading to a compromised immune system.[4] Studies of patients with acute stroke in Türkiye have shown that early-phase dysphagia is frequently seen in such patients and adversely affects their quality of life.[5-7]

In studies of patients with stroke, the frequency of pneumonia was found higher in subjects that were not screened for swallowing than in those that were screened for swallowing.[8-10] The swallowing screening test, which is recommended to be performed within the first 48 hours after stroke, should be carried out before starting oral medication or food intake. It may also be necessary to repeat the screening test based on the patient's status over time to determine the need for instrumental assessment (IA).[11]

IA such as videofluoroscopy (VFS) and fiberoptic endoscopic evaluation of swallowing (FEES) that are used in the detection of dysphagia are definitive diagnostic methods; however, they are not only interventional and expensive, but also require special equipment and personnel. Prior to such evaluations, the determination of the risk of dysphagia with a quick and practical screening method in the acute stage may allow both the determination of the need for IA and the prevention of complications.

In Türkiye, although the Turkish translation of the screening tests are available, some of these are self-scored and swallowing assessment is based on subjective measures of the client.[12,13] Turkish version of Gugging Swallowing Screen, which is a comprehensive clinical test that includes swallowing trials with different consistencies for the purpose of designing the therapy program, is different from screening tests by its nature.[14] The Barnes Jewish Hospital Stroke Dysphagia Screening test, which includes the 3 oz water swallow test, may cause us to misinterpret the current potential of the patient by evaluating swallowing function only while drinking water.[15] In addition, it is included in recent studies that evaluation with fluid intake in the patient profile who is vulnerable to aspiration may cause serious complications such as aspiration pneumonia.[16] The Turkish Mann Assessment of Swallowing Ability (T-MASA) test, which includes 24 items in total, also differs from the screening test with its comprehensive clinical assessment of swallowing in patients with acute stroke.[17] Therefore, a screening test that does not include a swallowing trials before the comprehensive clinical evaluation, but that evaluates swallowing pre-skills, should be used before complications of dysphagia occur.

The Modified Mann Assessment of Swallowing Ability (MMASA) test was developed to screen acute patients with stroke for the risk of dysphagia by speech and language therapists (SLTs), or in the absence of an SLT, by physicians and experienced healthcare professionals to refer the patient to an SLT.[18] MMASA consists of 12 items of the 24-item comprehensive MASA test.[19] According to the score obtained at the end of the test, the patient is referred to an SLT, and further evaluation methods and swallowing rehabilitation are immediately applied. The test, which does not involve a swallowing trial, is easily used by clinicians because it contains the components of general physical and neurological examinations. The first step of the comprehensive swallowing evaluation of the patient with acute stroke can be completed in a few minutes during the routine examination. Recent studies have shown that the MMASA test is advantageous and useful for various patient population because it is practical and quick to perform.[20,21]

Dysphagia is a relatively newly growing field among medical professionals by the efforts of increasing SLTs in Türkiye. However, the availability of IA in all the hospitals are still not efficient enough to detect dysphagia accurately. Accordingly, there is a need in Türkiye for a simple, repeatable, rapid, SLT-observed, valid and reliable dysphagia screening test that is adapted to Turkish to prevent the various complications, especially aspiration pneumonia, in acute patients with stroke. In the light of this, an accurate consideration of SLT screening is warranted and should not be underestimated. Thus, the aim of this study was to adapt MMASA to Turkish as a dysphagia screening test in acute patients with stroke and evaluate its validity and reliability.

MATERIAL AND METHODS

The sample of this prospective study consisted of 90 stroke patients in the İstanbul Training and Research Hospital's Department of Neurology between December 2018-May 2019 who were hospitalised for one week after a cerebrovascular accident. The inclusion criteria included the diagnosis of acute stroke by the chief consultant neurologist along with radiologic confirmation cranial computed tomography (CT) or a magnetic resonance imaging. The exclusion criteria included (1) a history of head and neck cancer or trauma, and had received radiotherapy in the last 12 months, (2) a current or previous neurological or neurodegenerative disorder independent of the stroke that affect the swallowing function, (3) a previous history of stroke that impacted the swallowing function, and (4) evidence of dementia in medical history.

The participants were seen within the first 1 week after being admitted to the inpatient neurology clinic. The mean administration day was x=3.63 (±1.97) days and x=87.12(±47.38) hours after the neurologist called for consultation of SLT. Demographic information forms were filled in and data collection was completed with the administration of the forms for the T-MASA and Turkish MMASA (TR-MMASA) tests. The medical records of all the patients were collected from the patient files by the first author, who is an SLT, to form a complete database for the clinical history record.

ETHIC APPROVAL AND PERMISSIONS

The study protocol was approved by the Istanbul Medipol University Non-Interventional Clinical Research Ethics Committee (Date: 05.10.2018, Approval code: 511). Permission was obtained by e-mail from Carnaby Mann, the developer of the test, to use the original English version of the MMASA test. Written permission for SLT consultation was obtained from the İstanbul Training and Research Hospital's Department of Neurology, as there were no SLT employed in the hospital. Patients with stroke provided written consent via an informed consent form and verbal consent to participate in the study. If the patient was unable to give consent, it was obtained from his/her authorized spouse. The study was performed in accordance with the principles of Helsinki Declaration.

TRANSLATION

Three SLTs translated the MMASA test into Turkish separately. The translations were compared, and after necessary corrections were made, the Turkish version of the test was generated. The Turkish version and expert opinion forms were submitted to 6 SLTs experienced in dysphagia, and their opinions were received. The experts filled out their opinions on the items of the scales and sent them back with a note in the remarks section for the inappropriate items. The content validity index (CVI) was obtained by dividing the total number of "appropriate" and "item should be reviewed slightly" in the form filled out by the experts for each item by the number of experts to whom the form was sent. Since the CVI calculated for each item was appropriate, the translation was finalised by the translation team based on the feedback received. Then, the Turkish version of the test was translated back into English by an SLT with advanced proficiency in English. The meaning and format were compared between the retranslated version of the TR-MMASA test into English and the original English version of the test, and the compliance between the two tests was examined and concluded.[22]

VALIDITY

In this study, content validity and criterion validity were used.[23,24] CVI was calculated for the content validity. The criterion validity method is a way of determining validity to examine the compliance of the scores with one or more prespecified evaluation criteria. The T-MASA test was chosen as an external criterion, and the correlation between the TR-MMASA and T-MASA tests was evaluated and determined. Receiver operating characteristic (ROC) analysis was performed to determine the diagnostic accuracy of TR-MMASA.[25]

RELIABILITY

The reliability of the test was provided using internal consistency (IC), test-retest and interrater reliability methods. Cronbach's alpha and item-total correla-

tions were calculated for the IC of the test. In the test-retest method, the TR-MMASA test was applied by the first author to the same patient group 48 hours after the first application, similar to the practices in the literature. The 48-hour period was chosen as no substantial change in the swallowing function was expected during this interval.[11,26-28] Of the 90 stroke patients, 25 were randomly selected for the retest. For randomization, the patients were coded by number and the patients were selected according to odd numbers.

For the interrater reliability method, TR-MMASA was rescored by a second clinician to another 25 patients again randomly selected by eleven numbers from the sample. For this procedure, the patients' testing was videotaped and the second therapist reviewed and rescored from the recordings of the patient. Then the inter-rater reliability for the TR-MMASA was established by examining agreement between rater scores.

Statistical Package for Social Sciences (SPSS) 24.0 (IBM Corporation, Armonk, NY, USA) was used to analyse the data. Descriptive statistics were used to express the data obtained from the study. The intraclass correlation (ICC) was calculated by selecting the one-way random effect model for test-retest consistency. The ICC was calculated by selecting the two-way random effect model for interrater reliability, and the resulting values of Cronbach's alpha and ICC were then interpreted. Cronbach's alpha coefficient and item-total point correlations were calculated for the IC. In the study, ROC analysis was performed to determine the diagnostic accuracy of TR-MMASA. The confidence interval was accepted as 95% ($p<0.05$).

RESULTS

The detailed demographics of the acute stroke participants are presented in Table 1. As depicted in the table, 41.1% (n=37) of them were female and 58.9% (n=53) were men. Overall, the mean age of the patients was 69.60±11.13 years with a range from 45 to 90 years. The 50% of the participants had a paralysis on the right side, 38.9% (35) had a paralysis on the left side and 11.1% had (10) no obvious motor deficit.

TABLE 1: Demographics of the participants.

Demographics	n (%)
Sex	
Male	53 (58.9%)
Female	37 (41.1%)
Age (years)	
45-60	23 (25.6%)
61-75	36 (40%)
76-90	31 (34.4%)
Educational status	
Illiterate	34 (37.8%)
Primary education	31 (34.4%)
Secondary education	25 (27.8%)
Infarct region	
Right	45 (50%)
Left	35 (38.9%)
No motor deficit	10 (11.1%)
Stroke type	
Ischemic	67 (74.4%)
Hemorrhagic	23 (25.6%)

VALIDITY

Six experts rated the content validity of the Turkish version of the TR-MMASA. The CVI value for all items of the TR-MMASA test was calculated as over 0.83 and found to be highly appropriate.

For criterion validity, the mean and standard deviations were compared and the correlations between the TR-MMASA and T-MASA are calculated by Spearman rho (Table 2). Two hours between the testings of scales was considered to be sufficient enough to prevent swallowing function that may change over time as well as prevent learning. As can be seen from the table, the total scores of the T-MASA correlated highly positively with the total scores of the TR-MMASA ($r=0.88$, $p<0.05$). Eleven of the 13 subscale scores of the TR-MASA had a very high positive correlation with the subscale scores of the T-MASA; only the 2 subscale correlation coefficients for dysarthria ($r=0.59$, $p=0.002$), and cough ($r=0.67$, $p=0.00$) were found to be moderately correlated.

RELIABILITY

The content reliability of the questionnaire calculated by Cronbach's alpha coefficients and item-total cor-

TABLE 2: Correlation of T-MASA and TR-MMASA.

Items	TR-MMASA (Mean±SD)	T-MASA (Mean±SD)	r value	p value
Alertness	9.52±0.871	9.60±0.81	0.89	0.000
Cooperation	9.16±1.70	9.28±1.48	0.995	0.000
Respiration	8.72±2.15	8.80±2.08	0.997	0.000
Expressive speech	4.24±0.87	4.40±0.76	0.901	0.000
Auditory comprehension	8.88±1.64	9.28±1.27	0.822	0.000
Dysarthria	4.28±0.79	4.28±0.73	0.599	0.002
Saliva	4.68±0.69	4.68±0.69	0.99	0.000
Tongue movement	9.44±1.08	9.28±1.27	0.912	0.000
Tongue strength	9.40±1.22	9.52±0.87	0.995	0.000
Gag	4.56±0.91	4.72±0.45	0.989	0.000
Cough	8.44±2.41	9.00±1.70	0.678	0.000
Palate	9.28±1.40	9.28±1.40	0.833	0.000
Total	90.60±11.74	179.640±22.87	0.88	0.000

T-MASA: Turkish Mann Assessment of Swallowing Ability; TR-MMASA: Turkish Modified Mann Assessment of Swallowing Ability; SD: Standart deviation; r: Correlation coefficient.

relation values that determine the degree of relationship between each item and total score to assess IC are presented in Table 3. The IC coefficient obtained by Cronbach's alpha coefficient was 0.908 for total scale was very high, (>0.70) indicating that the items are sufficiently homogeneous.[29]

The TR-MMASA assessment was first administered by the SLT within x=3.63 days, and x=87.12 hours of stroke onset, respectively. The retest administration was done 48 hours apart to the randomly coded 25 patients. The ICC computed for test-retest reliability is shown in Table 4. The scores of 2 measurements were statistically highly significant for all the items as well as for the item total scores.

Inter-rater reliability analysis was performed by 2 independent SLT's and agreement between them was analysed using ICC. As a result of the ICC analysis, as shown in Table 5, the relationship between the scores of both clinicians are significantly correlated within 95% confidence interval.

TABLE 3: Internal consistency and item-total correlation.

Items	Item-total correlation	Cronbach's alpha coefficient
Alertness	0.616	
Cooperation	0.749	
Respiration	0.648	
Expressive speech	0.752	
Auditory comprehension	0.639	
Dysarthria	0.749	0.908
Saliva	0.346	
Tongue movement	0.800	
Tongue strength	0.754	
Gag	0.612	
Cough reflex	0.669	
Palate	0.712	

RECEIVER OPERATING CHARACTERISTIC ANALYSIS

Table 6 presents the sensitivity, the specificity, likelihood ratio (LR) LR+, LR-, positive predictive value (PPV), negative predictive value (NPV) of the different TR-MMASA thresholds in detecting dysphagia compared with the T-MASA. The sensitivity of TR-MMASA was 0.85 and identified correctly those patients who have dysphagia. The specifity of 0.88 and identified correctly those patients who does not have dysphagia. PPV was 0.77 and the NPV was 0.93. Accordingly, when TR-MMASA was administered to a large group of prevalence, it will be able to diagnose those who have true dysphagia by 77% and those who have not by 93%. Figure 1 presents the graphic results of these analyses. The area under the curve in the ROC analysis

TABLE 4: Test- retest correlation.

Items	Test (Mean±SD)	Retest (Mean±SD)	Cronbach's alpha coefficient	ICC
Alertness	8.80±2.34	9.00±2.21	0.975	0.974
Cooperation	8.12±2.47	8.88±1.50	0.750	0.717
Respiration	8.08±2.34	8.32±2.05	0.977	0.975
Expressive speech	3.52±1.32	3.92±1.11	0.941	0.915
Auditory comprehension	7.72±2.82	7.80±2.61	0.947	0.949
Dysarthria	3.40±1.35	3.76±1.2	0.948	0.929
Saliva	4.52±0.91	4.80±0.70	0.793	0.766
Tongue movement	8.08±2.73	8.24±2.47	0.989	0.988
Tongue strength	7.64±2.99	8.20±2.64	0.930	0.922
Gag	3.88±1.61	3.92±1.63	0.996	0.996
Cough reflex	7.88±2.97	8.24±2.63	0.939	0.937
Palate	8.24±3.23	8.32±3.09	0.996	0.996
Total	79.88±21.78	84.84±14.95	0.939	0.922

SD: Standart deviation; ICC: Intraclass coefficient.

TABLE 5: Interrater correlation.

Items	1st SLT (Mean±SD)	2nd SLT (Mean±SD)	Cronbach's alpha coefficient	ICC
Alertness	9.92±0.4	9.64±1.11	0.712	0.712
Cooperation	9.64±1.11	9.44±1.44	0.750	0.750
Respiration	9.44±1.47	9.36±1.49	0.796	0.706
Expressive speech	4.04±1.09	4.48±0.96	0.724	0.724
Auditory comprehension	9.44±1.68	9.00±2.30	0.898	0.816
Dysarthria	4.00±1.08	4.20±1.04	0.941	0.889
Saliva	4.44±0.91	4.44±0.91	0.890	0.802
Tongue movement	8.96±2.00	8.56±2.12	0.938	0.883
Tongue strength	8.92±2.37	8.04±2.54	0.815	0.788
Gag	4.28±1.10	3.36±1.84	0.710	0.710
Cough	8.76±2.20	9.00±2.21	0.885	0.793
Palate	9.28±1.81	9.12±1.92	0.952	0.908
Total	90.64±11.26	87.36±14.01	0.977	0.977

SLT: Speech and language therapist; SD: Standart deviation; ICC: Intraclass coefficient.

TABLE 6: Receiver operating characteristic analysis results.

Sensitivity	Specificity	+PV	-PV	+LR	-LR
0.875 (a/a+b)	0.882 (d/c+d)	0.777 (a/a+c)	0.93 (a/b+d)	7.415 (1-specificity)	0.141 (1-specificity)

PV: Predictive value; LR: Likelihood ratio.

was found to be 0.879 (0.716-1.0, 95% confidence interval). Thus, the ROC curve showed that the TR-MMASA had a good performance in identifying dysphagia efficiently. The optimal cut point on the TR-MMASA to identify dysphagia was accepted as 92 points.

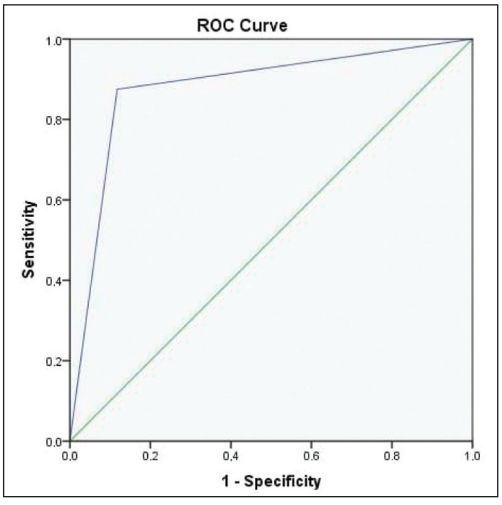

FIGURE 1: ROC curve. ROC: Receiver operating characteristic.

DISCUSSION

Screening assessments must be performed in the first 24 hours in patients with stroke to prevent malnutrition and pneumonia and to assist in the preparation of the nutrition plan. The patient should be referred to the IA performed by the physician or SLT after the initial assessment, which can be performed easily and quickly by the healthcare personnel.[30] The MMASA test was preferred because the screening test should be performed rapidly in addition to a routine evaluation in the hospital setting and should not be invasive.[30] By applying the MMASA screening test, acute stroke patients can be differentiated in terms of dysphagia risk while waiting for comprehensive evaluation. In addition, MMASA can be easily added to research to quickly measure the impact of medical therapeutic interventions or drug trials on dysphagia.[18]

In a study, the authors conducted a swallowing rehabilitation program in combination with the repetitive transcranial magnetic stimulation procedure in patients with dysphagia after stroke.[20] In that study, the MMASA test was included in the swallowing evaluation criteria including pre-and post-treatment VFS, laryngeal elevation delay time, penetration-aspiration scale, functional oral intake scale, and repetitive saliva swallowing test to provide information about the current swallowing function of patients. According to post-treatment evaluation tests, swallowing function was observed to be improved in patients. The results of the MMASA test were observed to be similar to those of other tests. In a study, the authors applied tongue pressure measurement (TPM) and MMASA test to patients with acute stroke once a week for 10 weeks until discharge from hospital.[21] Clinically, patients were evaluated for the risk of pneumonia by chest X-ray and CT. In the study, it was emphasised that the MMASA test is reliable and applicable in correlation with the results of TPM in the detection of the risk of swallowing disorder.

As the correlation between consciousness and dysphagia has been shown in the literature, the MMASA test, which is widely used in clinical settings, also evaluates consciousness, unlike other screening tests. In a study, in addition to the evaluation of swallowing skills by the MMASA test and VFS, cognitive status was also evaluated by 4 different scales in individuals with moderate and mild severe dementia.[31] As a result of that study, the MMASA test results were complied with the results of both VFS and other cognitive tests. In a study examining the necessity of the cough item in clinical swallow evaluation tests, it was reported that only a small part of the validated screening tests included a cough item.[32] It was emphasised that MMASA, which was among such tests, is the most detailed test containing the instructions for the detection of cough and perceptual cough evaluation.

The screening test to be used to determine the need for further evaluation methods based on the patient's current swallowing status should be valid and reliable. Different clinicians should be able to obtain similar results from the test, and it should be easy to perform and teach. Moreover, the test should have high sensitivity and specificity to distinguish healthy individuals from those with dysphagia. Antonios et al. applied the ROC analysis according to the MASA and MMASA test results of the patients with acute stroke. They found that the diagnostic accuracy of the MMASA test in detecting dysphagia was high. Nakamori et al. used the MMASA test to determine the diagnostic accuracy of TPM by ROC analysis. As a result of the calculation of correlation between the 2 measurements and the ROC analysis, the MMASA test was found to be consistent with.[21] In the present

study, we evaluated the similar validity and diagnostic accuracy of TR-MMASA by the T-MASA test, which was previously confirmed to have a high level of validity, is widely used in clinical setting around the world, and was adapted to Turkish by Umay et al. Based on the Spearman's rho correlation coefficient between the TR-MMASA and T-MASA tests and the ROC analysis, the calculated values for diagnostic accuracy indicate a strong positive correlation. Cut-off value of MMASA to identify dysphagia is 94 of 100 possible points.[18] In our study, we found the cut-off value of 92 for TR-MMASA. The reason why the cut-off values were so similar_may be that the MASA test was used to identify dysphagia in both studies. The minimal difference between the values may be that the cut-off score of the T-MASA test used in our study differs minimally from the cut-off score of the MASA test used in the original study.[17,19] In addition, while the number of participants in the MMASA development study was 150, the mean age was 64, and the mean administration hours was 84 hours, the number of participants in our study was 90, the mean age was 69, and the mean administration hours was 87 hours.[18] There are minimal differences between the demographic information of both studies.

In clinical validity and reliability studies, ICC is a frequently preferred method and IC analyses are interpreted according to Cronbach's alpha coefficient values. It is reported in the literature that the number of participants should be at least 5 times the number of items in the test to calculate the item-total correlation.[29] The adapted TR-MMASA test included 12 questions and the recommended number of participants (n=90) meets the prerequisite for the item-total analysis. In their study on patients with acute stroke, Cronbach's alpha value calculated for the IC of the MMASA test was 0.94, and they emphasised that the items had high IC between each other. The Cronbach's alpha reliability coefficient of the TR-MMASA test was 0.90, and the item-total coefficients were between 0.34 and 0.80. The mentioned values show that the items in the test have high IC and reliability with each other. Only among all items, the item-total item coefficient was found to be the lowest in the saliva item (0.34). Similarly, in the reliability study of the T-MASA test used in our research, the item-total item correlation coefficient of the saliva item was found to be 0.30.[17] In both tests, it was determined that the agreement of saliva with the total item expressing the presence of dysphagia was lower than the other items. The reason for this may be that we could not_determine the patient's saliva status during the day, as instant evaluation was made during clinical observation.

The interrater reliability technique was used for the reliability analysis of the MMASA test.[18] As a result of the application, the interrater consistency was high. In order to ensure the reliability of the TR-MMASA test, ICC were examined using the test-retest method and interrater reliability, and ICC coefficients were over 0.70 for all items and the total score, which was considered sufficient for reliability.[22]

The absence of a control group and the lack of IA such as VFS or FEES may be the limitations of the study.

CONCLUSION

In conclusion, the TR-MMASA test adapted to Turkish is a valid and reliable test that can be efficiently performed by SLT professionals on patients with acute stroke. By means of the TR-MMASA test, patients can be evaluated for dysphagia risk within the first 24-48 hours and be referred to an experienced SLT for further IA and swallowing rehabilitation without wasting time. Additionally, to demonstrate that better health outcomes are obtained with the use of the TR-MMASA test adapted to Turkish, it should be performed by SLT clinicians throughout Türkiye in the long term.

Source of Finance

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Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or mem-

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Authorship Contributions

Idea/Concept: *Hilal Berber Çiftçi, Seyhun Topbaş;* ***Design:*** *Hilal Berber Çiftçi, Seyhun Topbaş;* ***Control/Supervision:*** *Hilal Berber Çiftçi, Seyhun Topbaş;* ***Data Collection and/or Processing:*** *Hilal Berber Çiftçi;* ***Analysis and/or Interpretation:*** *Hilal Berber Çiftçi, Seyhun Topbaş;* ***Literature Review:*** *Hilal Berber Çiftçi;* ***Writing the Article:*** *Hilal Berber Çiftçi;* ***Critical Review:*** *Hilal Berber Çiftçi, Seyhun Topbaş;* ***References and Fundings:*** *Hilal Berber Çiftçi, Seyhun Topbaş;* ***Materials:*** *Hilal Berber Çiftçi, Seyhun Topbaş.*

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