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Adaptation and validation of the Barnes-Jewish Hospital-Stroke Dysphagia Screen for the portuguese version

Adaptação e validação do Barnes-Jewish Hospital-Stroke Dysphagia Screen para versão portuguesa

Adaptación y validación del Barnes-Jewish Hospital-Stroke Dysphagia Screen para la versión portuguesa

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ABSTRACT

***Objective**: adapt and validate the Barnes-Jewish Hospital-Stroke Dysphagia Screen (BJH-SDS) instrument to European Portuguese speakers. **Method**: BJH-SDS underwent a rigorous process of cross-cultural adaptation and was validated with acute stroke patients in five stroke units from February 2018 to April 2019. For data analysis, SPSS 25 was used. Nurses performed the screening on admission, and inter-rater reliability was established. Results of clinical bedside evaluation were compared with those provided by BJH-SDS. **Results**: cross-cultural adaptation was performed and completed successfully without difficulties. For validation, 226 acute stroke patients were enrolled. The incidence of dysphagia using BJH-SDS was 72.1%, and a highly significant relationship (x2 = 87.81; p <0.001) was observed compared to clinical bedside evaluation, with an area under the ROC curve of 0,765. Excellent inter-rater reliability*

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(k=0.977) was reached. ***Conclusion****: results suggest that the Portuguese version of the BJH-SDS is a reliable dysphagia screening test. It is straightforward to be administered bedside by nurses with minimal training required. It was also shown to have adequate sensitivity to assist in decision-making to refer stroke patients for a more comprehensive evaluation.*
Descriptors*: Deglutition Disorders; Stroke; Reproducibility of Results; Pneumonia, Aspiration.*

RESUMEN
Objetivo*: adaptar y validar el Barnes-Jewish Hospital-Stroke Dysphagia Screen (BJH-SDS) para portugués de Portugal.* ***Método****: se realizó un riguroso proceso de adaptación transcultural y validación con pacientes con accidente cerebrovascular agudo en cinco hospitales entre febrero de 2018 y abril de 2019. El análisis de datos se realizó con SPSS 25. El cribado fue realizado por enfermeras. Los resultados de la evaluación clínica a pie de cama se compararon con los de BJH-SDS.* ***Resultados****: se realizó la adaptación transcultural y completado con éxito sin dificultades. Para la validación, se incluyeron 226 pacientes. La incidencia de disfagia por BJH-SDS fue del 72,1% y se observó una relación muy significativa con la evaluación clínica a pie de cama (x2 = 81,87; p <0,001), un área bajo la curva ROC de 0,765. La fiabilidad entre examinadores fue excelente (k = 0,977).* ***Conclusión****: los resultados sugieren que la versión portuguesa de la BJH-SDS es una prueba de detección fiable para la disfagia. Es fácil y simple de usar junto a la cama por parte de enfermeras con una formación mínima requerida. Mostró una sensibilidad adecuada para ayudar en la toma de decisiones para derivar a estos pacientes para una evaluación más completa.*
Descriptores*: Trastornos de Deglución; Accidente Cerebrovascular; Reproducibilidad de los Resultados; Neumonía por Aspiración.*

RESUMO
Objetivo: adaptar e validar o Barnes-Jewish Hospital-Stroke Dysphagia Screen (BJH-SDS) para o português de Portugal. **Método:** realizado um rigoroso processo de adaptação transcultural e validação com pacientes com acidente vascular cerebral agudo em cinco hospitais entre fevereiro de 2018 e abril de 2019. A análise dos dados foi realizada com SPSS 25. O rastreio foi realizado por enfermeiras na admissão. Os resultados da avaliação clínica à beira do leito foram comparados com os fornecidos pelo BJH-SDS. **Resultados:** a adaptação transcultural foi realizada e completada com sucesso sem dificuldades. Para validação, 226 pacientes foram incluídos. A incidência de disfagia pelo BJH-SDS foi de 72,1% e uma relação altamente significativa foi observada quando comparada aos resultados da avaliação clínica à beira do leito (x2 = 81,87; p <0,001), com uma área abaixo da curva ROC de 0,765. A confiabilidade inter examinador alcançada foi excelente (k = 0,977). **Conclusão:** os resultados sugerem que a versão portuguesa do BJH-SDS é um teste de rastreio da disfagia confiável. É de utilização fácil e simples à beira do leito por enfermeiras com mínimo de treinamento necessário. Demonstrou ter sensibilidade adequada para auxiliar na tomada de decisão de encaminhar estes pacientes para uma avaliação mais abrangente.
Descritores: Distúrbios de Deglutição; Acidente Vascular Cerebral; Reprodutibilidade dos Resultados; Pneumonia Aspirativa.

INTRODUCTION

Dysphagia is a common complication after a stroke, and is generally associated with an increased risk of pneumonia, dehydration, and malnutrition, resulting in worse functional outcomes and worse quality of life[1].

For dysphagia assessment, instrumental evaluation (videofluoroscopy swallowing study) has been considered the gold standard[2]. Ideally, all patients should be evaluated with reference tests; however, there are several limitations: not all patients can undergo an invasive examination, nor all hospitals have trained professionals available 24 hours a day to perform them, and not all hospitals have the necessary equipment[1,3]. As a result, instrumental assessment is not accessible to all acute stroke patients. Therefore, swallow screening is recommended for all patients admitted with stroke, as early as clinically possible, before any oral administration of liquids, food, or medication[4].

Evidence suggests that early screening reduces the incidence of pneumonia after stroke[5]. The delay in screening is detrimental to outcomes, probably due to postponing nutritional provision or inappropriate feeding that can lead to aspiration[6]. Thus, screening does not allow to diagnose dysphagia unequivocally but is the first step to identifying patients at risk and who need a more comprehensive clinical or instrumental assessment[4].

In Portugal, guidelines for stroke patients highlight the need for early assessment of any clinical condition that might negatively influence the outcomes[7], namely dysphagia. However, no recommendation on any dysphagia screening tool is made, which in practice may suggest a non-standardized assessment, as identified in a study developed in Portuguese stroke units[8]. Another reason contributing to this may be that no validated dysphagia screening tool in the Portuguese language was found available for nurses in clinical practice for acute stroke patients[9].

In a systematic review of the literature, three screening tools for dysphagia are identified[9]. One of these instruments is the Barnes-Jewish Hospital-Stroke Dysphagia Screen (BJH-SDS), developed in English in the United States of America. It is a simple (timed to take less than two minutes) and reliable screening tool for dysphagia in acute stroke patients that was primarily validated against clinical bedside

swallowing test[10] and, a few years later, was validated against video-fluoroscopic swallowing study[11]. It can be quickly used by nurses or other health care professionals, with minimal training needed to become proficient in its administration. The sensitivity and specificity of this screening tool to detect dysphagia and aspiration are, respectively, 94%/66% and 95%/50%, and inter-rater reliability is high, k=0,94. It is a "fail/pass" test of four non-swallowing items (Glasgow Coma Scale <13; facial/tongue/palatal asymmetry or weakness) and one swallowing item (signs of aspiration on the three-ounce water test) with a result of "pass" only if all five items tested are normal. No increase in respiratory infections was acknowledged during the application of the BJH-SDS.

Among the instruments identified in the systematic literature review[9], the choice of the BJH-SDS for cross-cultural adaptation and validation was due to its simplicity of application and because it requires minimal training for health professionals to be proficient in its use. In the presence of instruments that have already been validated, cross-cultural adaptation is a strategy that allows for a faster result, assuming that it produces an equivalent measure[12], enhances the reproducibility of research, equity, and generalization of the evaluation of the same construct among diverse cultures[13]. Validation studies have been previously used in other studies in the field of nursing with good results[14]. Therefore, the objective of this study was to adapt and validate the Barnes-Jewish Hospital-Stroke Dysphagia Screen (BJH-SDS) instrument for European Portuguese speakers.

METHODS

The translation and cultural adaptation process of the BJH-SDS was performed according to the International Society for Pharmacoeconomics and Outcomes Research principles of good practice[15].

Phase 1 - Preparation

The first step was obtaining authorization from the original version's author, which was contacted by email and permitted the translation and validation process. At this point, two independent certified translators, native to the European Portuguese language, were selected to translate the BJH-SDS, and a third certified translator, native to the English

language, was chosen for backward translation. All translators had previous experience in translation in the field of health. The main researcher held a meeting with each of the translators to explain the basic concepts, aiming to make the information about the conceptual structure of the instrument clear and therefore enabling a meaningful translation and not simply a literal translation.

Phase 2 – Translation

Two translations were developed independently in the European Portuguese language since a single translation could be biased by the individual style of a single translator.

Phase 3 – Reconciliation

The two versions were consensualized by two researchers, a rehabilitation nurse and a speech-language pathologist, with extensive experience with stroke patients. The reconciliation allowed to resolve discrepancies by consensus, obtaining a version free of biases in writing styles. It also allowed resolving erroneous interpretations obtained in the translation. A comparative table with the two translations was used to reconcile both versions, and researchers agreed on every aspect of the reconciliation.

Phase 4 – Retroversion

A single independent translator, native to the English language, performed a backward translation of the reconciled version of the BJH-SDS, blinded to the original English version. This process served as a control of the quality of the European Portuguese translation version, demonstrating that the quality of the translation is such that the exact meaning remains when translated into the original language.

Phase 5 – Review of the retroversion

Two researchers, a rehabilitation nurse and a speech-language pathologist with extensive experience with stroke patients, reviewed the backward translation and compared it to the original version to identify any discrepancies. No discrepancies were identified. At this stage, retroversion was also sent to its author for a review process. The BJH-SDS retroversion was accepted by the author as sent.

Phase 6 – Clinical review

This process allowed researchers to check for eventual misunderstandings or inconsistent interpretations and establish whether respondents will understand the question and the associated task[12] consistently. This step is crucial considering that understanding the words is not enough to guarantee that the professionals who will use the instrument (nurses) can accurately answer the question raised.

Experts with relevant professional experience, either from academic or clinical practice in stroke, of three distinct groups, nursing, medicine, and speech therapy (Table 1), were invited, by email, to participate in the clinical review process. They all had more than ten years of working experience with stroke patients.

Each of them was asked to analyze with particular attention the technical terms included in the European Portuguese version of the BJH-SDS, in particular how they would describe or discuss such terminology. It was also highlighted that their opinion and perspective on the best way to write a question that nurses will later answer is critical considering that the translation can include some degree of subjectivity.

Table 1 – Profile of clinical reviewers.

Reviewer	***Profession/exercise***
Reviewer 1	*Nurse/clinical practice*
Reviewer 2	*Physician (physiatrist)/clinical practice*
Reviewer 3	*Rehabilitation nurse/academic*
Reviewer 4	*speech-language pathologist/clinical practice*
Reviewer 5	*Rehabilitation nurse/clinical practice*
Reviewer 6	*Rehabilitation nurse/academic*
Reviewer 7	*speech-language pathologist/clinical practice*

This step allowed to ensure the facial validity of the instrument, ensuring that it makes sense (comprehensibility and cognitive equivalence) for those who administer it (nurses) and for those who use the results to support decision-making (health professionals). It also allowed identifying inappropriate items or other aspects that could confuse. The expert's suggestions on the reconciled version of BJH-SDS had minimal impact on the final version since all experts agreed on the reconciled version of the translation.

The experts made three suggestions to improve the instrument. These suggestions were mainly to adjust the wording to those more frequently used in clinical practice: standardization on the use of the term "patient" (doente), that in European Portuguese has several wordings (paciente, doente, cliente, pessoa, utente), and "doentes admitidos no serviço" instead of "doentes que derem entrada no serviço". A third one was made in the instrument's format, which was incorporated.

The European Portuguese version was then used in a cross-sectional study performed at five stroke units of four teaching hospitals and one central hospital from February 2018 to April 2019, with patients consecutively admitted on weekdays. Ethics committee of the five hospitals approved the study (Centro Hospitalar Universitário de S. João, 272/17; Centro Hospitalar Universitário do Porto, 2017/177; Centro Hospitalar Cova da Beira, 83/2017; Centro Hospitalar Universitário de Coimbra, 005-18; Unidade Local de Saúde da Guarda, unassigned code). Inclusion criteria were: a) adults (≥ 18 years), diagnosed with first stroke (either ischaemic or intracerebral hemorrhage), confirmed by imaging, b) without clinical history of swallowing impairment, c) who have not previously been tested for swallowing or given fluids, food or medication orally and d) who have consent in written to participate in the study (or the ones whose consent was obtained from next of kin whenever the patient was unable to provide it due to communication or understanding impairment). Stroke severity was assessed with National Institute Health Stroke Scale (NIHSS)[16], and other demographic and clinical data were collected.

Nurses recruited for data collection were experienced clinical stroke nurse specialists with more than ten years of clinical practice and therefore considered experts. Two nurses were recruited in each stroke unit. As experienced stroke nurses, researchers asked nurses to rate patients according to dysphagia severity (no dysphagia, mild, moderate, or severe) based on clinical bedside evaluation before administering the screening tool. Acknowledging that nurses already had experience using Glasgow Coma Scale, no further training for the use of BJH-SDS was required in addition to a brief information session on the use of BJH-SDS provided by the research team. BJH-SDS was performed at the bedside when admission according

to the steps indicated in the original publication[10]. The failure in any non-swallowing or swallowing items would determine a positive result (risk of dysphagia/aspiration) and, therefore, the screen would be stopped. A second evaluator would perform screening, blinded for the results of BJH-SDS, within 24 hours of first assessment, for inter-rater calculation purposes.

This study was not funded. Therefore, instrumental assessment of all enrolled patients for validity purposes was not possible. However, researchers were authorized to access instrumental assessment results (either video-fluoroscopic or fiberoptic endoscopic swallow study) if patients had to perform such tests during the hospital stay, which was not performed in any of the enrolled patients during the hospital stay.

IBM Statistical Package for the Social Sciences Software 25 for Windows was used for statistical analysis. Descriptive analysis was performed for demographic and clinical data. Screening categorical data and results from clinical bedside evaluation were analyzed using a 2x2 test, and the area under the ROC curve was also calculated, which is a measure of the accuracy of a test in general[17]. Cohen's kappa coefficient (κ) was used to measure inter-rater reliability. It is important to emphasize that the items together form the construct in a formative model; therefore, they do not need to be correlated, resulting in the internal consistency calculation of the BJH-SDS being irrelevant[18].

RESULTS

The European Portuguese version of the BJH-SDS comprises four non-swallowing items and a swallowing item, the three-ounce water test, as the original version. The instrument is available on request. The European Portuguese version was then used in five health institutions in the central and northern regions of the country for validation. All professionals involved in data collection were asked to apply the instrument for one month before the start of data collection to become familiar with it and clarify any doubts arising from its application. During this period, which was used as a pre-test, all the questions and response options were considered satisfactorily understandable by the nurses enrolled for data collection.

During the study period, 226 acute stroke patients provided informed

written consent (or by proxy) and were prospectively enrolled according to inclusion criteria. Demographic and clinical data are presented in Table 2. The mean time of application between evaluators was 6,7±6,1 hours, and most patients, 117 (51.7%), were assessed in the first 24 hours after stroke onset.

No complications occurred during the application of BJH-SDS, and results showed that 163 (72.1%) of patients failed the screening and therefore were identified as dysphagic. In Table 3 results of each item are presented.

The patient's dysphagia ratings obtained by clinical judgment were compared with screening results. A highly significant correlation was found (x2=81,87; p<0,001), with 60 of the 63 participants being identified as non-dysphagic by BJH-SDS rated as no-dysphagia or mild dysphagia by stroke nurses (Table 4).

The area under the ROC curve was 0.765, using clinical bedside evaluation as a reference, indicating the instrument's reasonable predictive ability in identifying the risk of swallowing impairment (Figure 1). Sensitivity and specificity were respectively 97,1% and 48,8%.

For inter-rater reliability purposes, the application of the BHJ-SDS was repeated by a second evaluator, blinded to the result of the first assessment, from either clinical bedside evaluation and results of the BJH-SDS, in 42(18.6%) patients. The inter-rater reliability analysis test obtained excellent k values (k = 0.977).

Table 2 - Demographic and clinical data (n=226)

Age (mean±SD)	*69,4±14,2*
Men (n/percentage)	*115(50,9)*
Glasgow Coma Scale (median/range)	*15/4-15*
NIHSS† (median/range)	*6/0-25*
Stroke type (n/percentage)	
ischaemic	*185/81,9*
hemorrhage	*39/17,2*
missing	*2/0,9*
Risk factors (n/percentage)	
Hypertension	*140/61,9*
Hyperlipidemia	*98/43,4*
Diabetes	*51/22,5*
Smoking	*37/16,4*
Heart disease (not arrhythmia)	*34/15,0*
Arrhythmia	*22/9,7*
Alcoholism	*21/9,3*

†18 records were missing.

Table 3 - Results by item of the BJH-SDS.

BJH-SDS items	***n***	***%***
All answers NO	*63*	*27,9*
Glasgow Coma Scale <13	*25*	*11,1*
Facial asymmetry/weakness	*131*	*57,9*
Signs of aspiration in the water test	*7*	*3,1*
Total	*226*	*100,0*

Table 4 - Clinical judgment x BJH-SDS.

	No	*Yes*	*Total*
No dysphagia	*23*	*4*	*27*
Mild	*37*	*59*	*96*
Moderate	*3*	*50*	*53*
Severe	*0*	*50*	*50*
Total	*63*	*163*	*226*

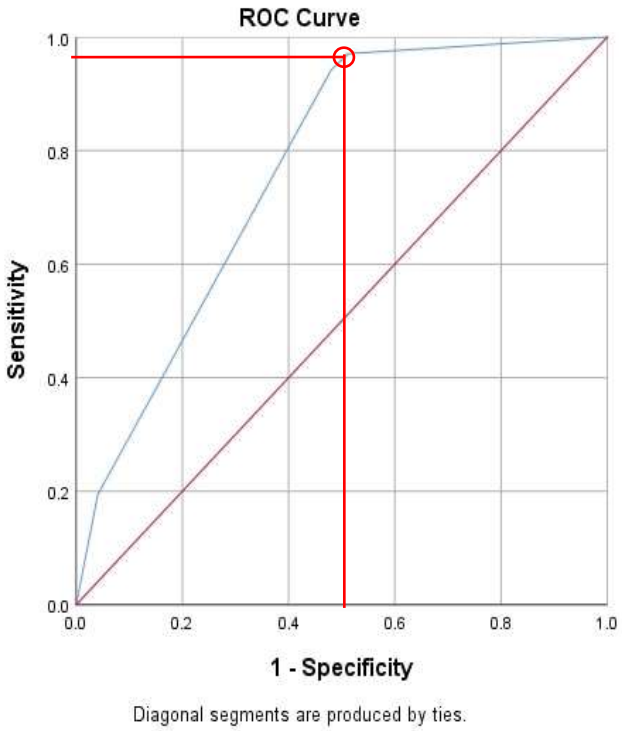

Figure 1 - ROC curve.

DISCUSSION

The cross-cultural adaptation process was conducted successfully and resulted in a reasonably acceptable and understandable European Portuguese version of the BHJ-SDS, with the contents maintained. The process ensures that any study that uses the European Portuguese version and references this validation paper can publish and compare the results with the BJH-SDS used in any other research in European Portuguese or any different

language that has validated the instrument.

The validation findings show a high incidence of dysphagia in stroke patients in the acute phase. Incidence is higher than in the study by Edmiaston et al[11] 72.1% vs. 62.2%, which may be related to the mean age of the participants, which was also higher (69.4 vs. 63.0) since age increases the incidence of dysphagia[19]. The incidence of dysphagia after stroke varies between 8.1 and 80%, depending on the evaluation technique used[20].

The results found for the participants' sociodemographic data and clinical background were in line with the incidence found in the Portuguese population, in which ischemic stroke has a much more significant expression than hemorrhagic stroke, in a proportion of approximately 1:4[21]. Regarding age and sex, results corroborate findings of the epidemiological study developed in Portugal showing higher prevalence and risk factors in men (2.3% vs. 1.9%), and an increase with age[22], with most of the participants in this study with 65 years of age or more. It should be noted that these data reinforce the high incidence of arterial hypertension, dyslipidemia, and diabetes in the Portuguese population and its impact as the most important modifiable risk factors for stroke[22,23], also in line with international data[24].

Another relevant aspect is related to the fact that, of all participants identified as being at risk of dysphagia, none of them has been subjected to instrumental evaluation. As instrumental evaluation is considered the reference test for diagnosing dysphagia[1] and knowing that screening does not diagnose the clinical condition, a subsequent clinical and instrumental evaluation is required. A delay in the diagnosis will have a negative impact, increasing the risk of pneumonia and hospital readmissions and postponing an appropriate and timely nutritional intervention[25]. In addition, instrumental evaluation is the only strategy capable of identifying aspiration[26]. Without this evaluation, the definition of a therapeutic plan is impaired by the failure to accurately determine the physiological and structural causes for dysphagia[4]. Implementation of instrumental assessment has as barriers its cost and the lack of adequately trained professionals[1,3]. However, these arguments have been refuted when compared with the costs of thickeners, enteral feeding, hospital readmissions

for complications related to dysphagia, and expenses of institutionalization[27].

The results for sensitivity were superior to those found in the original study (97.1% vs. 94.0%) but with lower specificity (48.8% vs. 66.0%). The difference in these findings may be related to clinical judgment used as a reference. It is understandable that nurses, in case of doubt, due to patient safety issues (e.g., respiratory complications), classify patients as dysphagic. This behavior justifies the lower specificity values and suggests prioritizing respiratory complications by professionals in dysphagic patients[1]. It also reinforces a higher incidence of dysphagia using clinical assessment[28]. The area under ROC suggests a reasonable predictive capacity of this instrument to identify the risk of dysphagia, whereas, in the initial study, this data was not presented. A subsequent BJH-SDS validation study for the Turkish population, using swallowing fibroendoscopy as a reference test, obtained a sensitivity of 78.6% and a specificity of 82.6%. The authors conclude that the Turkish version is useful and accurate for dysphagia screening[29]. This study was the only BHJ-SDS validation study identified so far in addition to its original validation in the United States.

Ideally, a dysphagia screening tool should have high sensitivity and specificity so that all dysphagic patients are correctly identified, and non-dysphagic ones can start oral feeding as early as possible[30,31]. Sensitivity is particularly relevant since the failure to identify patients with dysphagia has immediate serious repercussions, namely pneumonia[32]. In this study, sensitivity results were high compared to nurses' clinical judgment. Any margin of false negatives, i.e., patients not identified as at-risk through screening, interrupt the diagnostic process. Screening, clinical evaluation, and, eventually, instrumental evaluation are ruled out early after stroke onset, leading to severe respiratory and nutritional implications for patients[9]. On the other hand, this screening tool has relatively low specificity, translating into many patients with dietary modifications or diet and enteric hydration without being dysphagic, which was also found for other screening tools[30]. This is recognized as a disadvantage but considered acceptable as a safety margin for an increased risk of aspiration[10].

In determining inter-rater reliability, the results obtained were higher than those achieved in the BJH-SDS original study (k = 0.977 vs. k = 0.94), with an almost perfect level of agreement (k> 0.90) between raters. These findings may be related to all nurses who participated in the data collection having extensive clinical experience with stroke patients. In the validation study for the Turkish population[29], excellent inter-rater reliability values (k = 0.970) were also obtained, approximately in the same measure as those now found. The consistency of the results obtained by the different raters reflects the extent to which the Portuguese version of this instrument is consistently understood by its users, making their results reliable, thus minimizing the error resulting from observation by different evaluators.

This study has limitations, mainly due to financial restrictions, resulting in the lack of instrumental assessment for a more accurate determination of psychometric properties, specifically for criterion validity and from the fact that the first evaluator was not blinded for the results of clinical bedside evaluation, which the second evaluator minimized. Another limitation is related to the fact that, although there were no adverse events during the application of the BJH-SDS, there are no data available on other outcomes such as pneumonia or death. Therefore, it is relevant to develop more research to consolidate the validity and reliability of this screening tool to strengthen these results.

CONCLUSION

This paper concludes the process of cross-cultural adaptation and validation of the BJH-SDS for European Portuguese-speaking health professionals to screen dysphagia in acute stroke patients. The translation and cross-cultural adaptation process was completed without any difficulty and resulted in a version in European Portuguese with the contents maintained. Results of the validation process suggest that the European Portuguese version of BJH-SDS is a sensitive and reliable screening test, with particular emphasis on excellent inter-rater reliability. It is straightforward to administer bedside by nurses with minimal training needed and showed adequate sensitivity to assist in the decision-making process to refer stroke patients to a more

comprehensive clinical and instrumental assessment. The short duration for its application and the fact that it does not require intensive training for its administration make this instrument suitable for its use in time-sensitive clinical settings or with less experienced/trained professionals.

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