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Original Article

Psychometric Properties of the Behavioral Pain Scale in Traumatic Brain Injury

Caíque J.N. Ribeiro, RN, MSc [*], Alanna G.C. Fontes Lima, RN, MSc [*], Raphael A. Santiago de Araújo, BSc (DR) [†], Mariangela da Silva Nunes, RN, PhD [‡], José A. Barreto Alves, RN, PhD [‡], Daniele Vieira Dantas, RN, PhD [‡], Maria do C. de Oliveira Ribeiro, RN, PhD [‡]

[*] Postgraduate Program of Health Sciences, Federal University of Sergipe, Sergipe, Brazil
[†] Department of Medicine, Federal University of Sergipe, Sergipe, Brazil
[‡] Postgraduate Program of Nursing, Federal University of Sergipe, Sergipe, Brazil

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ABSTRACT

Background: Pain assessment of patients with traumatic brain injury is a challenge because they are unable to self-report their pain experience.
Aims: To investigate the psychometric properties of validity, reliability, and responsiveness of the Brazilian version of the Behavioral Pain Scale (BPS-Br) in patients with traumatic brain injury.
Methods: This was an observational, cross-sectional, repeated-measure and analytical study. This study was developed at the medical and surgical ICUs in a high-complexity public hospital at Aracaju, Sergipe, Brazil. Thirty-seven adult patients with moderate or severe TBI were included. This study was completed with 444 independent observations, a pairwise comparison, and was performed simultaneously before, during, and after eye cleaning and endotracheal suctioning of 37 adult patients with moderate to severe traumatic brain injury.
Results: The BPS-Br had good internal consistency ($.7 \leq \alpha \leq .9$), good discriminant validity ($p < .001$), moderate to excellent reliability based on inter-rater agreement (intraclass correlation coefficient = 0.66-1.00; $\kappa = 0.5$-1.0), and high responsiveness (0.7-1.7). The upper limbs subscale had the highest score during the nociceptive procedure (1.8 ± 0.9). Deep sedation affected the increase of grading during painful procedures ($p < .001$).
Conclusions: Our results suggest the BPS-Br is a useful tool for clinical practice to evaluate the pain experienced by patients with traumatic brain injury. Further studies of different samples are needed to evaluate the benefits of systematic pain assessment of critically ill patients.

Self-reporting is considered the gold standard for assessing pain; however, certain conditions, such as delirium, artificial airway insertion, unconsciousness, sedative therapy, and mechanical ventilation, complicate efforts at communication, making the pain assessment of nonverbal patients a challenge (Czarnecki et al., 2011; IASP, 2012; Puntillo et al., 2001).

Critically ill patients need intensive care arrangements to ensure their basic physiologic functions. In addition to the pain related to disease processes and being restrained in bed, intensive care units (ICUs) perform large numbers of invasive and painful procedures such as turning, wound care, and endotracheal suctioning (Puntillo et al., 2001, 2004).

The inability to report one's pain neither denies its existence nor waives the right to proper treatment (Barr et al., 2013). Therefore studies on pain in critical care have gained importance in recent years, and several observational tools to assess pain have been created for patients who are unable to self-report (Gélinas, 2016). However, few services adopt protocols to prioritize pain management in the ICU.

The Behavioral Pain Scale (BPS) (Payen et al., 2001) is the only instrument to be translated and adapted to Brazilian Portuguese (Arbour & Gélinas, 2014). Several studies describe successful results

Address correspondence to Caíque J.N. Ribeiro, RN, MSc, Postgraduate Program of Health Sciences, Federal University of Sergipe Teaching Hospital, Federal University of Sergipe, Cláudio Batista St., Sanatório, Aracaju, Sergipe, Brazil.
E-mail address: caiquejordan_enf@yahoo.com.br (C.J.N. Ribeiro).

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on its validity and reliability in other languages (Aïssaoui, Zeggwagh, Zekraoui, Abidi, & Abouqal, 2005; Azevedo-Santos et al., 2017; Chen et al., 2011; Hylén, Akerman, Alm-Roijer, & Idvall, 2016; Navarro-Colom, Sendra-Lluis, Castillo-Masa, & Robleda, 2015). However, the evidence related to the Brazilian version of BPS (BPS-Br) is still scarce, especially in patients with traumatic brain injury (TBI).

Usually, victims of moderate or severe TBI experience pain along with their hospitalization, but it can be disguised because of unconsciousness and deep sedation to avoid neurologic complications (Chen et al., 2011). Thus this study aimed to analyze the psychometric properties (validity, reliability, and responsiveness) of the BPS-Br in victims of TBI.

Materials and Methods

Study Design

The present work is an observational, cross-sectional, repeated-measure, analytical study developed at the medical and surgical ICUs in a high-complexity public hospital at Aracaju, Sergipe, Brazil. The data collection period was from September 2015 through June 2016.

Sample

We required a total of 25 to 30 patients via a nonprobabilistic convenience sampling method based on a calculation of the Cronbach α coefficient of .90 ± .05 (Aïssaoui et al., 2005; Azevedo-Santos et al., 2017).

Eligible participants were aged 18 years or older, had moderate or severe TBI, and had received mechanical ventilation for at least 48 hours. The exclusion criteria included conditions that interfere with the observation of pain-related behaviors, such as quadriplegia, neuromuscular blockade, underlying neurologic disease, diagnosis of brain death, shock, and/or receiving resuscitation (hemodynamically unstable).

Variables and Measures

Sociodemographic and clinical data, such as sex, age, race, marital status, education, comorbid conditions, resident address, initial Glasgow Coma Scale and APACHE (Acute Physiologic Assessment and Chronic Health Evaluation) II scores (Azevedo-Santos et al., 2017), location and mechanism of injury, clinical classification of TBI, and safety device use, and information regarding analgesia and sedation were collected through an analysis of medical records. The Ramsay and Richmond Agitation-Sedation Scale (RASS) was used for the evaluation of depth of sedation (Ramsay, Savege, Simpson, & Goodwin, 1974; Sessler et al., 2002). Physiologic parameters, including heart rate (HR) and blood pressure (systolic [SBP] and diastolic [DBP]), were collected through a bedside cardiac monitor.

Pain assessment was performed with the BPS-Br, which is divided into three subscales: facial expression (FE), upper limbs, and compliance with ventilation. Each subscale has indicators ranging from 1 to 4, and the total BPS score is the sum of the partial results, ranging from 3 (no pain) to 12 (unacceptable pain).

Training

The assistants received theoretical training, which explained general concepts about pain and its measurement, physiologic and behavioral indicators of pain in unconscious and mechanically ventilated patients, and the correct completion of BPS-Br scores. A pilot test was conducted with three patients for practical training and evaluation of the adequacy of the collection form. The data from the pilot patients were discarded and were not included in the final analysis.

Procedure

BPS scores were obtained through simultaneous paired testing by two independent observers, as reported in the methodologic procedures of previous studies (Aïssaoui et al., 2005; Azevedo-Santos et al., 2017; Hylén et al., 2016).

Assessments occurred 5 minutes before, during, and 10 minutes after nonpainful and painful procedures. The baseline BPS score was the value obtained during the rest period; that is, for 5 minutes before non-nociceptive (eye cleaning [EC]) or nociceptive stimuli (endotracheal suctioning [ES]). EC was always performed before ES to diminish eventual interferences of nociceptive stimuli in the results.

Statistical Analysis

Categorical variables are presented in absolute and relative frequencies, and quantitative variables are expressed as central tendency and dispersion (mean ± standard deviation). The data distributions did not indicate symmetry according to the Kolmogorov-Smirnov test. At all stages of analysis, we used a statistical significance level of 5% ($p < .05$). Pearson's correlation coefficient was used to check the existence of associations among clinical, physiologic, ventilation, and sedative and analgesic drugs and the total BPS score during ES. The discriminant validity of physiologic parameters and BPS scores were evaluated by nonparametric tests such as Friedman (comparison between measures before, during, and after EC or ES) and Wilcoxon signed-rank tests (comparison between pairs of different measures). Reliability was verified by measures of interobserver agreement and internal consistency. An intraclass correlation coefficient was calculated, and results ≥0.75 were considered good; for Cohen's κ, results between 0.61 and 0.80 were considered substantial and ≥0.81 excellent; for percentage agreement (%) and Cronbach's α, measures ≥.7 were considered good (Gélinas et al., 2008). Responsiveness was estimated through the effect size—in other words, dividing the difference between the mean scores obtained at rest and during painful procedures by the standard deviation of the mean scores during rest. Coefficient values ≥ 0.8 were considered satisfactory (Aïssaoui et al., 2005; Gélinas et al., 2008).

Ethical Aspects

This study followed the recommendations set forth by the Declaration of Helsinki and was approved by the Research Ethics Committees of Federal University of Sergipe (CAAE: 38567714.1.0000.5546). Informed consent was given by one of the eligible patient's guardians by signing the consent form. ES was performed exclusively by physiotherapists according to the needs presented by each patient. No additional procedures were performed for the benefit of this study.

Results

Clinical and Sociodemographic Data

The sample consisted of 37 patients, and their sociodemographic and clinical characteristics are described in Table 1. Each patient was evaluated in paired comparisons before, during, and after EC and ES, for a total of 444 observations (37 patients × 2 observers × 2 procedures × 3 measures).

Table 1
Sociodemographic and Clinical Data

Categorical Variables	n (%)
Gender	
Male	34 (91.9)
Female	3 (8.1)
Race	
Nonwhite	25 (67.6)
White	12 (32.4)
Marital status	
With life partner	19 (51.3)
No life partner	18 (48.7)
Residence	
Countryside	27 (73.0)
Metropolitan area	10 (27.0)
Mechanism of injury	
Automotive collision*	28 (75.6)
Being run over	3 (8.1)
Fall	2 (5.4)
Other	4 (10.8)
Safety device use* (n = 28)	
Yes	4 (14.3)
No	20 (71.4)
Not registered	4 (14.3)
TBI clinical classification	
Severe	34 (91.9)
Mild	3 (8.1)
Incident site	
Countryside	29 (78.4)
Metropolitan area	8 (21.6)
Quantitative variables	mean ± SD
Age	37.7 ± 13.1
Education level	4.6 ± 3.9
Length of hospital stay	7.2 ± 3.7
Length of ICU stay	4.5 ± 3.4
Length in mechanical ventilation	7.1 ± 3.8
Initial ECG	6.7 ± 2.8
APACHE II	15.4 ± 5.4

TBI = traumatic brain injury; ICU = intensive care unit; ECG = electrocardiogram; APACHE = Acute Physiologic Assessment and Chronic Health Evaluation.
* Use of a safety device of the patients involved in motor vehicle collisions (n = 28).

Participants were predominantly male (91.0%), nonwhite (67.6%), working-age adults (37.7 ± 13.1 years) with low educational level (4.6 ± 3.9 years); they were largely countryside residents (73.0%) without any history of diseases or preexisting comorbidities (97.3%). They all experienced hospital stay and mechanical ventilation for more than a week and an average stay in the ICU of 4.5 ± 3.4 days.

Severe TBI was predominate (91.9%), and the main mechanism of injury was blunt trauma (89.1%), especially as a result of automotive collisions that occurred in the countryside (78.4%), mainly involving motorcycles; more than two thirds of patients had not used safety devices (helmet or seat belt).

Analgesia and Sedation

Participants were sedated with moderate to heavy intensity (Ramsay = 5.5 ± 0.8; RASS = −3.7 ± 1.7). Midazolam and fentanyl were the most commonly used drugs for sedation and analgesia, with their active infusions used in 67.6% of cases during ES, under medical prescription, whereas simple analgesics such as acetaminophen and dipyrone were the most prescribed in systematic schemes (i.e., at a fixed time) (Table 2). The total BPS score during ES was correlated significantly with sedation scores (Table 3).

Physiologic Parameters

On average, significant increases were observed ($p < .001$): 14 mm Hg in SBP, 13 mm Hg in DBP, and 26 beats per minute HR during ES in relation to baseline. Ten minutes after the completion of the procedure, physiologic indicators returned approximately to baseline (Table 4). According to the analysis conducted by the Wilcoxon test between physiologic parameter pairs during the EC and ES procedures, scores for ES were significantly higher ($p < .001$). However, a significant positive correlation was not identified between these parameters and total score BPS during ES.

Table 2
Analgesia and Sedation.

Variables	Specification
Sedation score (mean ± SD)	
Ramsay	5.5 ± 0.8
RASS	−3.7 ± 1.7
Prescribed analgesia [n (%)]	
Fentanyl	31 (83.7)
Dipyrone	34 (91.9)
Acetaminophen	14 (37.8)
Methadone	7 (18.9)
Morphine	1 (2.7)
Prescribed sedation [n (%)]	
Midazolam	30 (81.1)
Propofol	1 (2.7)
No prescribed sedation	7 (18.9)
Active sedoanalgesic infusion during evaluation [n (%)]	
Yes	25 (67.6)
No	12 (32.4)

SD = standard deviation; RASS = Ramsay and Richmond Agitation-Sedation Scale.

Validity

BPS scores during ES were higher than the others in different measures of evaluation ($p < .001$). The upper limb movements subscale had the greatest increase during the painful procedure (1.8 ± 0.9). Although there was a rise in BPS scores for EC, post hoc analysis with the Wilcoxon test that indicated BPS scores were higher during the ES ($p < .001$), as shown in Table 5.

Responsiveness

Overall effect sizes and of all subscales were moderate to high (0.8-1.7), especially for the upper limbs subscale, indicating the ability of the instrument to detect pain, even when the changes were small (Table 5).

Reliability

A reliability analysis is presented in Table 6. The BPS had high percentages agreement (59.4%-100.0%), Cohen's κ coefficient values were moderate to excellent (0.50-1.00), and intraclass correlation coefficient was mostly satisfactory. In addition, all subscales had acceptable to excellent internal consistency according to Cronbach's α ($.7 \leq \alpha \leq .9$).

Discussion

Pain management in TBI patients is complex and challenging as a result of their inability to verbalize pain because of decreased levels of consciousness and a need for continuous sedation to prevent complications in the acute state of trauma (Oddo et al., 2016). Recent guidelines have advocated for the benefits of proper assessment and management of pain based on the use of valid and reliable instruments (Barr et al., 2013).

According to our results, both total scores and BPS-Br scores subscales increased substantially during the ES for TBI patients and ascertained satisfactory results of interobserver agreement and

Table 3
Correlations between Clinical, Physiologic, and Sedoanalgesic Parameters and BPS Total Scores during Endotracheal Suctioning

Parameters	BPS ES O1		BPS ES O2	
	Correlation Coefficient	*p*	Correlation Coefficient	*p*
APACHE II	−0.059	.730	−0.057	.737
SBP	0.040	.816	0.078	.646
DBP	0.210	.211	0.267	.111
HR	−0.102	.550	−0.009	.960
Infusion rate of analgesia	0.058	.796	0.108	.633
Infusion rate of sedation	−0.090	.692	−0.160	.478
Ramsay	−0.564	<.001	−0.448	.005
RASS	0.709	<.001	0.421	<.001
Length in mechanical ventilation	0.174	.302	0.151	.374

BPS = Behavioral Pain Scale; BPS ES O1 = BPS total score during endotracheal suctioning by observer 1; BPS ES O2 = BPS total score during endotracheal suctioning by observer 2; APACHE = Acute Physiologic Assessment and Chronic Health Evaluation; SBP = systolic blood pressure; DBP = diastolic blood pressure; HR = heart rate; RASS = Ramsay and Richmond Agitation-Sedation Scale.

responsiveness, suggesting that the scale is an appropriate tool for assessing pain in this population.

Although the scores also rose during EC, the higher level of the ES scores prevailed, suggesting the scale's ability to discriminate between painful and nonpainful procedures (Wilcoxon $p < .001$). Furthermore, the BPS-Br had a satisfactory ability to detect slight changes throughout the evaluation. Similar results were found in previous studies featuring English (Payen et al., 2001), Chinese (Chen et al., 2011), Swedish (Hylén et al., 2016) and Portuguese (Azevedo-Santos, Alves, Badauê-Passos, Santana-Filho, & DeSantana, 2016) versions of the BPS.

The FE subscale yielded the lowest score for ES. FE is one of the best-known behavioral indicators used by health professionals to assess pain, even in conscious patients, and has been used in several observational assessments (Arif-Rahu & Grap, 2010; Rahu et al., 2013). Darwish et al. (2016) found conflicting results in a study involving 47 ICU surgical and coronary patients. Their FE score had higher elevation during nociceptive procedures and was the subscale with the best responsiveness (Darwish, Hamdi, & Fallatah, 2016).

Recent studies have found that TBI patients may have unconventional behavioral manifestations during a painful procedure, such as eye opening and a relaxed face. Thus researchers have been devoted to investigating more accurate descriptors and valid assessments of FE in TBI patients (Arbour, Choinière, Topolovec-Vranic, Loiselle, Puntillo, & Gélinas, 2014; Le, Gélinas, Arbour, & Rodrigue, 2013). Roulin and Ramelet (2015) identified 23 specific behavioral descriptors for these patients.

There were significant correlations between total BPS-Br scores and sedation (Ramsay and RASS), revealing a possible reduction in the ability to detect manifestations of pain. Similar results were found in the preliminary study of the adaptation of BPS-Br (Azevedo-Santos, Alves, Badauê-Passos, Santana-Filho, & DeSantana, 2016). This may be related to obsolete management practices of excessive analgesics and sedatives without a systematic pain assessment, a typical situation that occurs in some areas of the country. It is not yet clear if intense sedation reduces pain intensity, but it seems to interfere substantially with the manifestation of related behaviors (Stites, 2013).

Assessment based on valid and reliable tools is the first step toward proper pain management. Guidelines for pain, agitation, and delirium in the ICU have suggested that pain management should be a priority (Barr et al., 2013; Herr et al., 2006). In addition to providing comfort and dignity to patients, evidence suggests that proper pain management can be associated with reduced needs of sedation and rates of hospital infection, shorter ICU stays, decreased time on mechanical ventilation, and increased patient participation in care, including analgesic therapy goals. However, excessive sedation is associated with respiratory depression, microaspirations, delirium, immunosuppression, and high risk of pressure injuries and pneumonia (Georgiou, Hadjibalassi, Lambrinou, Andreou, & Papathanassoglou, 2015; Sigakis & Bittner, 2015; Wiatrowski, Norton, & Giffen, 2016).

Research has found that even after ICU discharge, patients may report pain persistence (Choi et al., 2014). Constant nociceptive stimuli during routine ICU procedures, such as ES, can be a contributing factor for the transition from acute to chronic pain. Therefore TBI is often associated with chronic pain and impaired quality of life for patients (Corrigan & Hammond, 2013). Thus pain should be carefully evaluated and treated during these procedures to reduce the chances of progression to chronic pain.

The reliability analysis indicated satisfactory results, which may have been derived from the rigorous and methodical training of evaluators in the period before data collection. Therefore proper training of health care professionals is an important step to implementing systematic assessment protocols about pain in the ICU. A Norwegian study reported the feasibility of using BPS and BPS for nonintubated patients on an algorithm to guide management of pain in the ICU (Olsen et al., 2015a). For this, professional education and awareness are needed to ensure the best possible reproducibility of the tools (Olsen et al., 2015b).

Table 4
Fluctuations in Physiologic Parameters over the Evaluation

Physiologic Parameters	Mean ± SD						*P**	
	Before		During		After			
	EC	ES	EC	ES	EC	ES	EC	ES
SBP (mm Hg)	138.3 ± 19.1	141.1 ± 25.1	144.1 ± 26.0	154.9 ± 35.4	138.5 ± 19.0	140.0 ± 20.4	.025	<.001
DBP (mm Hg)	80.0 ± 10.7	80.0 ± 11.9	81.7 ± 11.9	92.7 ± 13.7	80.5 ± 11.9	81.1 ± 10.8	.111	<.001
HR (bpm)	92.5 ± 17.2	92.9 ± 19.2	94.2 ± 15.3	118.9 ± 24.6	91.2 ± 18.4	95.1 ± 16.5	.091	<.001

SD = standard deviation; EC = eye cleaning; ES = endotracheal suctioning; SBP = systolic blood pressure in millimeters of mercury; DBP = diastolic blood pressure in millimeters of mercury; HR = heart rate; bpm = beats per minute.
* Friedman's test.

Table 5
Pain Assessment with BPS-Br and its Discriminant Validity

Items	Mean ± SD						P^*		Effect Size
	Before		During		After				
	EC	ES	EC	ES	EC	ES	EC	ES	
Facial expression									
Observer 1	1.0 ± 0.2	1.1 ± 0.5	1.1 ± 0.3	1.5 ± 0.8	1.0 ± 0.0	1.1 ± 0.5	.097	<.001	0.8
Observer 2	1.0 ± 0.2	1.1 ± 0.5	1.1 ± 0.3	1.5 ± 0.8	1.0 ± 0.0	1.1 ± 0.5	.039	<.001	0.8
Upper limbs									
Observer 1	1.1 ± 0.3	1.1 ± 0.4	1.2 ± 0.4	1.8 ± 0.9	1.0 ± 0.2	1.1 ± 0.4	.030	<.001	1.7
Observer 2	1.1 ± 0.3	1.1 ± 0.4	1.2 ± 0.4	1.8 ± 0.9	1.0 ± 0.2	1.1 ± 0.4	.011	<.001	1.7
Compliance with ventilation									
Observer 1	1.2 ± 0.5	1.2 ± 0.6	1.2 ± 0.5	1.6 ± 0.7	1.1 ± 0.5	1.1 ± 0.5	.368	<.001	0.7
Observer 2	1.2 ± 0.5	1.2 ± 0.6	1.2 ± 0.5	1.7 ± 0.8	1.1 ± 0.5	1.1 ± 0.5	.368	<.001	0.8
BPS total score									
Observer 1	3.3 ± 0.8	3.3 ± 1.2	3.4 ± 0.8	4.9 ± 1.8	3.1 ± 0.4	3.2 ± 1.2	.013	<.001	1.3
Observer 2	3.3 ± 0.8	3.4 ± 1.2	3.4 ± 0.8	5.0 ± 1.7	3.1 ± 0.4	3.2 ± 1.2	.002	<.001	1.3

BPS-Br = Behavioral Pain Scale, Brazilian version; SD = standard deviation; EC = eye cleaning; ES = endotracheal suctioning.
* Friedman's test used in three distinct moments of both procedures.

However, as in previous studies, interobserver agreement during the painful procedure was lower compared with nonpainful procedures. Similar results were found in the study that compared the psychometric properties of the BPS and the Critical Care Pain Observation Tool (Rijkenberg, Stilma, Endeman, Bosman, & Oudemans-van Straaten, 2015). One possible explanation for this it is that some health professionals do not associate the discomfort caused by ES pain. Thus observers may have occasionally underestimated patient pain.

Although the investigated physiologic parameters (HR, SBP, and DBP) have been found to have substantial increases during painful stimulus versus nonpainful stimuli, we did not find a significant correlation with BPS scores. For a long time, fluctuation in these parameters was considered indicative of pain (Chen & Chen, 2015). However, research has found that there is no evidence to support this hypothesis (Chen & Chen, 2015; Gélinas & Arbour, 2009; Kapoustina, Echegaray-Benites, & Gélinas, 2014). Only respiratory rate was found to have discriminant validity in the study of TBI patients, though it is still lacking further investigation (Arbour, Choinière, Topolovec-Vranic, Loiselle, & Gélinas, 2014).

Several studies have reported that vital signs are not specific to pain detection because they are influenced by other factors such as underlying pathologic condition, vasoactive drug use, fear, anxiety, and any other stressor that may trigger the cascade activation of catecholamines. Therefore these physiologic indicators should be used only as initial clues for further investigation of the pain phenomenon (Boitor, Fiola, & Gélinas, 2015; Chen & Chen, 2015; Gélinas & Arbour, 2009; Kapoustina et al., 2014).

Table 6
BPS-Br Reliability Analysis

BPS	EC			ES		
	PA (%)	ICC	κ	PA (%)	ICC	κ
Before						
FE	100.0	1.00	1.00	100.0	1.00	1.00
UL	94.6	0.72	0.72	94.6	0.82	0.64
CWV	100.0	1.00	1.00	97.3	0.96	0.88
Total	94.6	0.95	0.81	91.9	0.97	0.73
During						
FE	97.3	0.85	0.84	89.2	0.91	0.80
UL	91.9	0.75	0.75	81.0	0.88	0.70
CWV	100.0	1.00	1.00	81.0	0.77	0.69
Total	89.2	0.92	0.76	59.4	0.90	0.50
After						
FE	100.0	1.00	1.00	100.0	1.00	1.00
UL	97.3	0.66	0.65	100.0	1.00	1.00
CWV	100.0	1.00	1.00	100.0	1.00	1.00
Total	97.3	0.92	0.85	100.0	1.00	1.00

BPS-Br = Behavioral Pain Scale, Brazilian version; EC = eye cleaning; ES = endotracheal suctioning; PA = percentage agreement; ICC = intraclass correlation coefficient; FE = facial expression; UL = upper limbs; CWV = compliance with ventilation; κ = Cohen's kappa.

Clinical Implications

The BPS-Br is a promising pain assessment tool in critically ill patients, especially patients with TBI. We suggest further studies on the usefulness of the BPS-Br in clinical trials involving analgesic therapies, especially nonpharmacologic therapies, as well as the relation between systematic pain evaluation to the BPS-Br and the impact on patient outcomes. Furthermore, it is necessary that this scale be disseminated in undergraduate courses and Brazilian ICUs because there is scarce knowledge of pain observation tools among students and professionals.

Limitations

Study limitations included the inability to analyze criterion validity because there is no gold standard for this population. Furthermore, the evaluators were not blinded as to the nature of the procedure. However, the main researchers were excluded from the stage of data collection to reduce the bias.

Conclusions

Our results suggest that the BPS-Br is a valid, reliable, and useful tool for pain assessment of TBI patients. We strongly recommend its adoption in the daily clinical practice of intensive care, especially during notoriously painful procedures, to evaluate the adequacy of analgosedation.

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