










Montreal Communication Evaluation Brief Battery – MEC B: reliability and validity

Bateria Montreal de Avaliação da Comunicação Breve – MAC B: fidedignidade e validade

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ABSTRACT

Purpose: Search for reliability and validity evidence for the Montreal Communication Evaluation Brief Battery (MEC B) for adults with right brain damage. **Methods:** Three hundred twenty-four healthy adults and 26 adults with right brain damage, aged 19-75 years, with two or more years of education were evaluated with MEC B. The MEC B Battery contains nine tasks that aim to evaluate communicative abilities as discourse, prosody, lexical-semantic and pragmatic process. Two sources of reliability evidence were used: internal consistency (Cronbach's alpha) and interrater reliability. Construct validity was evaluated comparing the Montreal Communication Evaluation Battery (MEC), expanded version and MEC B tasks. **Results:** Internal consistence was satisfactory and the interrater reliability was considered excellent, as were correlations between MEC Battery and MEC B Battery tasks. **Conclusion:** The MEC B Battery showed satisfactory reliability and validity evidences. It can be used as outcome measure of intervention programs and assist speech therapists to plan rehabilitation programs.

RESUMO

Objetivo: Buscar evidências de validade e fidedignidade da Bateria Montreal de Avaliação da Comunicação Breve (MAC B) para adultos com lesão do hemisfério direito. **Método:** Trezentos e vinte e quatro adultos saudáveis e 26 adultos com lesão cerebral direita, com idades de 19 a 75 anos, com dois ou mais anos de escolaridade, foram avaliados com a Bateria MAC B. Essa bateria contém nove tarefas que visam avaliar habilidades comunicativas, como: discurso prosódico; processo léxico-semântico e pragmática. Duas fontes de evidências de fidedignidade foram utilizadas, ou seja, a consistência interna (alfa de Cronbach) e a concordância entre avaliadores. A validade foi avaliada comparando as tarefas da Bateria MAC na versão expandida e da MAC B. **Resultados:** Em relação à fidedignidade, a consistência interna foi satisfatória e as taxas de concordância entre os avaliadores foram consideradas excelentes, assim como as correlações entre as tarefas da Bateria MAC e Bateria MAC B. **Conclusão:** A Bateria MAC B apresentou evidências de fidedignidade e validade satisfatórias, podendo ser usada como medida para resultado de programas de intervenção, e também auxiliar o fonoaudiólogo a planejar o programa de reabilitação.

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INTRODUCTION

There is now general agreement among the scientific community that both hemispheres are needed to reach appropriate language skills^(1,2). This view comes as a progression of the initial theories that proposed an exclusive role of the left hemispheric for language. Modern rationale rather concedes that all parts of the brain constantly interact to accomplish any task, regardless of its linguistic contents⁽¹⁾.

Initial reports from clinicians of the mid twentieth century described individuals who showed preserved formal linguistic abilities but inappropriate communication behaviors in their interactions with others⁽³⁾. This apparent dissociation between language skills and the actual utilization of those skills in context contributed to the elaboration of the concept of pragmatics. Pragmatic can be considered as another language domain among communication, semantic or syntactic functions⁽⁴⁾. The right hemisphere assists in the processing of pragmatic aspects⁽⁵⁾. Pragmatic also offered the necessary framework to appropriately describe and study impairments of communication such as those happening after a right brain damage (RBD).

Following a right hemisphere (RH) stroke, studies estimate that 75% of RH stroke patients in rehabilitation facilities present some form of communication impairments⁽⁶⁾. Alterations in discourse⁽⁷⁾ and lexical-semantic processes⁽⁸⁾ have been reported in patients with RBD as well as left brain damage (LBD). However, there are qualitative differences between the types of language impairment observed following lesions in each hemisphere. LBD is associated with impairments in structural language abilities, leading to anomia, agrammatism, neologisms, jargon, paraphasia, suppression and other similar clinical conditions^(9,10). Cases of RBD, on the other hand, were initially described as impairment of “extralinguistic” aspects of communication⁽⁹⁾, that is, these individuals may have difficulty understanding the listener’s needs through emotional cues in his intonation, comprehending humor or non-literal meanings. Such problems can affect both receptive and expressive abilities, sometimes severely impacting inter-individual interactions and social integration⁽¹¹⁾.

Given the high likelihood of language impairment following strokes, patients must undergo comprehensive language assessment procedures, which can identify dissociations between impaired and unimpaired processes. There are presently many more instruments designed to evaluate patients with aphasia (LBD) than with RBD. In Brazil there is only one battery designed to assess communication disorders following a RBD: The Montreal Communication Evaluation Battery – MEC Battery⁽¹²⁾. However, this instrument involves a long administration time. Its average duration is 90 minutes, requiring two sessions of 45 minutes, which increases general fatigue in patients with more severe deficits. It also complicates administering the test to patients who are bedridden due to their clinical condition.

Taking this into consideration, it was verified the need to develop a brief instrument with the same psychometric rigor as the MEC Battery⁽¹²⁾. The Montreal Communication Evaluation Brief Battery – MEC B^(13,14) adapted to provide rapid and effective detection of communication disorders. Adaptation process was

made by a group of experts (neuropsychologists, psychologists, speech language pathologists and one linguistic) that constructed new items and tasks for this version⁽¹³⁾.

MEC B has the same purpose of MEC that is to evaluate discourse, prosody, lexical-semantic and pragmatic components of communication. Although, this brief version represents a completely new set of tasks under each category and has two new tasks the expanded version does not have: reading and writing. Since the goal of the MEC B is to screen (to orientate more thorough assessment), it was decided that all components of communication possibly affected by RBD were to be presented in this brief/first intention version.

The psychometrics properties obtained by an assessment represent a starting point after the construction or adaptation of a battery. Therefore, it is important that clinicians consider reliability and validity when selecting any type of assessment tools to guarantee the quality of the data obtained⁽¹⁵⁾.

Clinicians who utilize MEC B Battery will benefit from a rapid understanding of their patients after a RBD. It will contribute to the interpretation of quantitative and qualitative data obtained^(13,16). Our purpose was to search for reliability and validity evidence of the MEC B for adults with RBD.

METHODS

Participants

The internal consistence sample was composed of 324 neurologically healthy adults, aged 19-75 years ($M = 44.57$, $SD = 15.57$), 65.7% female and 34.3% male, and 26 adults with RBD, aged 20-73 years ($M = 56.85$, $SD = 12.76$), 53.8% female and 46.2% male. All participants have at least 2 years of formal schooling ($M = 11.42$, $SD = 5.14$) and are native speakers of Brazilian Portuguese.

Neurologically healthy participants were recruited through convenience sampling from university and community environments. RBD patients were recruited from hospitals and had been previously diagnosed with ischemic unilateral strokes confirmed by neurological examination and computer tomography and/or magnetic resonance imaging.

Inclusion criteria, besides the amplitude criteria age, were: absence of any uncorrected sensory disturbances, visual or hearing (assessed by self-report); no signs of dementia assessed by the Mini-Mental State Examination⁽¹⁷⁾ and symptoms suggestive of depression assessed by the Beck Depression Inventory – BDI⁽¹⁸⁾; absence of current or prior alcohol or drug abuse and psychiatric diagnoses/neurological lesions (based on self-report during interview)⁽¹⁹⁾.

Forty-five neurologically healthy adults were randomly drawn from the internal consistency sample to be analyzed by raters. The verbal responses of all tasks of the MEC B Battery were judged independently by two expert raters with an average of eight years of experience in the area. When there was no concordance among judgments, a third expert with 11 years of experience re-evaluated the protocols, entering into consensus with one of the previous reviewers.

Construct validity sample consisted of 40 neurologically healthy adults from the internal consistency sample. Participants were between 19 and 75 years old ($M = 46.55$, $SD = 16.15$) and more than 5 years of schooling ($M = 13.23$, $SD = 5.64$).

Procedures and instruments

The present study was approved by the Research Ethics Committee of the Pontifícia Universidade Católica do Rio Grande do Sul (protocol number 1679/09). All participants were volunteers (unpaid) and provided written informed consent prior to study participation.

All participants were administered the MEC B that assesses four communicative processes: discourse, pragmatic, lexical-semantic and prosodic through nine tasks, in this order:

1. Conversational discourse: evaluates discursive abilities through spontaneous speech. Two different conversational themes are introduced by the examiner during four minutes. Four themes are suggested: family, work, leisure, and current news. Various linguistic components are observed *a posteriori*: pragmatic aspects (e.g. indifference to metaphors), lexico-semantic (e.g. word search), discursive (e.g. imprecise exposure of ideas) and/or prosodic (e.g. monotonous);
2. Metaphor interpretation: contains 10 metaphorical sentences, 5 new metaphors, or unconventional metaphors used in Brazilian Portuguese, and 5 idiomatic expressions. At first, the participant is instructed to explain what the phrase means in their own words (explanation score, 0, 1 or 2 points). After, he/she should choose the right alternative among three options (alternative score, 0 or 1 point);
3. Unconstrained verbal fluency: assesses the spontaneous production of words with no category restriction over the course of 150 seconds;
4. Emotional prosody – production: it is based on one sentence with simple grammatical structure that must be issued with three different emotional intonation patterns, happy, sad and angry (e.g. *I received a call*). The examiner reads three different stories and asks the participant to say the sentence presented, visually and verbally, with the intonation that expresses the emotion induced by the situation;
5. Semantic judgment: assesses the ability to identify semantic relationships between two words. This task consists of 6 pairs of words, being 3 pairs with no relationship and 3 pairs with categorical relation. The participant has to determine if there is a relationship between the two words (yes/no answer, identification score, 0 or 1 point); then, has to explain what the relationship is, when existing (explanation score, 0, 1 or 2 points);
6. Narrative discourse: this task presents two subtests: 1) Partial retelling: the narrative story is composed by three paragraphs that are read one by one by the examiner and the participant has to retell them. Twelve main information and 19 remembered information data are expected; 2) Narrative comprehension: the participant has to tell what he/she comprehended from the story; after he/she has to give a title for the story; finally, the examiner asks six questions about the story;
7. Indirect speech acts interpretation: contains 10 situations, being 5 indirect speeches (in which the speaker's intention is not clear) and 5 direct speeches (in which the speaker literally means what is said). At first, the participant is instructed to explain what the phrase means in their own words (explanation score, 0, 1 or 2 points). After, he/she should choose the right alternative between two options (alternative score, 0 or 1 point);
8. Reading: assesses the ability to decode and interpret a written text. The participant is asked to retell the story (maximum 4 points) and give a title (maximum 2 points) after reading aloud;
9. Writing: dictation: contains 1 sentence with 10 words (regular and irregular). The maximum attainable score is 5, with 1 point awarded to correct use of double letter; 1 point to correct writing of 'm', 'n' and 'u'; 1 point to correct use of graphic space; signature: the participant has to write his/her name at the same paper that he/she did the dictation (maximum 2 points).

In summary, the discursive tasks aim to analyze comprehension, expression, nonverbal behavior, linguistic and emotional prosody skills, language, mnemonic and executive functioning. The Metaphors and Indirect speech acts interpretation tasks evaluate the ability to interpret the figurative sense, non-literal sentences. The Unconstrained verbal fluency task assesses the ability to explore the lexical-semantic memory in free recall of words, with no established criteria (semantic or orthographic). The Emotional prosody production task evaluates the emotional intonations production capacity based on the affective context of a particular situation. The Semantic judgment task assesses the ability to identify categorical semantic relationships between words. The Reading assignment evaluates the individual's ability to read aloud and understand a text. Finally, the writing tasks involve writing a sentence under dictation and his/her own name, which helps in automatism verification and hemineglect evidence.

Administration time for the MEC B ranged from 25 min to 40 min. A test of this length should be practical even in a busy clinic environment. To use it, clinicians will need to learn the scoring system and practice making judgments, especially those related to discourse and prosody tasks.

Participants from validity sample were also evaluated by the Montreal Communication Evaluation Battery - MEC Battery⁽¹²⁾, expanded version, considered as gold standard. This battery comprises 14 subtests which assess the same constructs of MEC B Battery, except reading and writing. At first all 40 participants were assessed by MEC B, and one or two months latter by MEC Battery expanded version.

The instruments were administered by trained health professionals (Speech and Language Therapists and Psychologists) properly trained and qualified. Participants were individually assessed in well-lit, well-ventilated and quiet environments.

Statistical analyses

The internal consistency coefficient was calculated using the Cronbach's alpha. This technique was performed for all items of each task, except for Conversational discourse because it is not a task made up of items but observation categories of a discursive unity between two interlocutors. Similarly, verbal fluency, reading and writing subtests are composed of an instruction stimulus.

Interrater reliability was assessed using percentage of exact agreement between raters (number of agreements divided by the total number of items in each task), however, the authors know that this may overestimate the degree of agreement.

Construct validity was assessed using Spearman correlations between scores on MEC B Battery subtests and total scores in tasks from the MEC Battery. Analyses were conducted using the SPSS Software, version 20.0 for Windows (SPSS Inc., Chicago, USA).

RESULTS

Interrater agreement, which ranged from 77.78% to 100%, suggested satisfactory reliability (Table 1). Results regarding the internal consistency of the MEC B battery are displayed in Table 2, which contains the Cronbach's alpha of the MEC B subtests.

Table 1. Interrater agreement for the MEC B Battery tasks

	MEC B Tasks	Concordance Index (%)
	Lack initiative	95.55
	Talks a lot	97.77
	Repeats itself	100
	Exposes ideas in a way that is not precise	84.44
	Looking for words	88.88
	Change subject	93.33
	Cut speech	91.11
Conversational discourse	Misunderstand someone's intentions (speech with clinician)	95.55
	Cannot keep up the conversation; Misunderstands indirect language; do not understand jokes, loses eye contact; Immobilized facial expression; difficulties to change the subject	100
	Speech rate decreased or increased	95.55
	Makes improper pauses between words (rhythm)	100
	Monotonous intonation	100
	Poorly transmits and understands linguistic intonation	100
	Poorly transmits and understands emotional intonation	100
Metaphor interpretation- Explanations	Metaphor 1, 2 and 3	95.55
	Metaphor 4	97.78
	Metaphor 5	86.67
Unconstrained verbal fluency		93.33
Emotional prosody	Situation 1	83.25
	Situation 2	88.89
	Situation 3	84.44
	1 paragraph main ideas	88.89
	1 paragraph informations present	86.67
	2 paragraph main ideas	87.75
	2 paragraph informations present	85.50
	3 paragraph main ideas	82.22
Narrative discourse	3 paragraph informations present	88.89
	Understanding recount	93.33
	Title	86.67
	Question 1	93.33
	Questions 2 and 3	97.78
	Question 4 and 6	100
	Question 5	93.33
	Explanation 1, 5 and 6	100
Indirect speech acts interpretation	Explanation 2	95.55
	Explanation 3	97.78
	Explanation 4	86.67
	Total errors	86.67
	Errors left	93.33
Reading	Errors right	93.33
	Reading Comprehension	77.78
	Title	95.55
Writing	Dictation	97.78
	Signature	97.78

Poor to moderate correlations, ranging from 0.373 to 0.687, were found between scores on the MEC B Battery and MEC Battery tasks administered (Table 3 to 5). Exception was found among the Indirect speech act interpretation tasks (Table 3) and semantic judgment ($\rho = -0.079$, $p = 0.034$), in which there was no correlation.

Table 2. Cronbach's alpha for the MEC B Battery

Tasks	Cronbach's Alpha
Metaphor	
Explanation	0.834
Alternatives	0.808
Emotional prosody	0.811
Semantic Judgment	
Identification	0.694
Explanation	0.882
Narrative Discourse	
Main information	0.503
Remembered information	0.460
Comprehension questions	0.974
Indirect speech act interpretation	
Explanation	0.765
Alternatives	0.785

Table 3. Correlation between scores on the MEC B Battery and MEC Battery Metaphor interpretation and Indirect speech act interpretation tasks

	MEC B	MEC	
Metaphor Interpretation		Explanation	Alternative
	Explanation	0.383*	0.357*
	Alternative	0.373*	0.378*
Indirect speech act interpretation		Explanation	Alternative
	Explanation	0.067	0.058
	Alternative	0.079	0.026

* $p \leq 0.05$

Table 4. Coefficients between time and total number of words in the MEC Battery and MEC B Battery Unconstrained verbal fluency task

Unconstrained verbal fluency task	rho
MEC B	MEC
Time 1 (0-30 s)	0.621**
Time 2 (30-60 s)	0.522**
Time 3 (60-90 s)	0.611**
Time 4 (90-120 s)	0.543**
Time 5 (120-150 s)	0.674**
Total number of words	0.687**

** $p \leq 0.001$

Table 5. Correlation between total scores in the MEC Battery and MEC B Battery Narrative Discourse task

Narrative discourse	MEC				
	Total of main information	Total of present information	Story retelling	Title	Comprehension questions
MEC B					
Total of main information	0.524*	0.623**	0.453**	0.042	0.255
Total of remembered information	0.531**	0.591**	0.397**	0.029	0.222
Story retelling	0.145	0.220	0.088	0.138	0.095
Title	0.080	0.187	0.127	0.254	0.173
Comprehension questions	0.424**	0.503**	0.413**	0.247	0.425**

* $p \leq 0.05$; ** $p \leq 0.001$

Emotional prosody task showed poor and significant correlation ($\rho = 0.327$; $p = 0.05$) between the scores of MEC and MEC B Batteries. The correlation between unconstrained verbal fluency tasks is show in Table 4. The values of each 30 seconds blocks and the total score (words) of tasks were presented. Moderate (0.522 to 0.543 and 0.611 to 0.687) correlations were found.

Table 5 shows the correlation between the performance on Narrative Discourse of MEC B and MEC Batteries.

Significant moderate correlations were found between the equivalent variables of the two batteries: “total of main information” \times “total of present information”, “total of present information” \times “total of remembered information”, “questions” \times “questions”. In addition, there was no correlation between “comprehension questions” \times “story retelling”. This result may be explained by the fact that items are scored 0, 1, or 2 on the MEC B Battery, i.e., a narrow range of scores.

DISCUSSION

The MEC B Battery showed satisfactory reliability (internal consistence and interrater agreement) and validity for adults. To the best of our knowledge, this is the first brief tool for communication assessment for patients with RBD in Brazil.

Interrater reliability refers to the relative consistency of the test judgments by two or more raters⁽²⁰⁾. The classification proposal by Cicchetti and Sparrow⁽²¹⁾ proposes interrater reliability between 0.75 and 1.00 as excellent. In the present study the concordance index was more than 80% in most of the MEC B battery tasks.

Internal consistency is a measure based on the correlations between different items on the same test⁽²²⁾. For some tasks the alpha coefficient was greater than or equal to the critical value of 0.70 (Metaphor – explanation and alternatives; Emotional prosody; Semantic judgment – explanation; Narrative discourse – Comprehension questions; Indirect speech act interpretation – explanation and alternatives), while for other task (Semantic Judgment – identification) the coefficient was close to the acceptable range of internal consistency. However, for the Narrative Discourse – main information and remembered information, the Cronbach's alpha was below 0.70. These results may be related to the subjectivity inherent in the interpretation of complex verbal responses.

It should be noted, given the variability of coefficients obtained, that this method is not free from difficulties with respect

to its application in neuropsychology. Neuropsychological and speech-language tests are designed to assess the performance of persons with brain injury and can be regarded as very simple for “normal” individuals. Therefore, these participants often score high in such tests (ceiling effect), failing to provide the variability required for alpha analysis⁽²³⁻²⁵⁾. In this context, available evidence suggests satisfactory alpha levels when values greater than 0.5⁽²⁶⁾ or 0.6⁽²⁷⁾ are obtained, particularly in tasks with a narrow range of scores, such as those from the MEC B Battery.

A major advantage of the MEC B Battery is that it allows the evaluation of a large number of communication components with a short testing time, since it has a minimum necessary number of stimuli per task. However, this virtue of the MEC B Battery hinders the application of any reliability procedure, since it reduces the likelihood of variability between items. For this reason, the Cronbach’s alpha coefficient was analyzed only for tasks composed of three or more items and for tasks in which all items could be assigned the same score (for example, all items in the Narrative Discourse task allow scores of 0, 1, or 2).

Validity was assessed by correlation between similar tasks from MEC B and MEC batteries. Overall, considering the findings as a whole, significant moderate correlations were found between tasks from the two batteries. These results were expected, as the constructs assessed by both the brief and expanded versions are similar.

In sum, the values found in the correlation between the Metaphor interpretation, Verbal fluency, Narrative Discourse, and Emotional prosody subtests of MEC and MEC B batteries are close to the parameters defended by Guilford⁽²⁸⁾. These results can be characterized as indicating an adequate validity coefficient among the compared tasks. The poor correlation between the Speech act subtests might have occurred due to the reduced number of situations in the brief version, with less performance variability and different scales (0 to 12 in the brief version vs. 0 to 40 in the expanded version). The Semantic judgment task, however, which also showed poor correlation, may be explained by the fact that, in addition to the reduced number of items, the scoring system was modified in the brief version. In the expanded version, the explanations for the pairs that comprise the task and have a categorical relationship are classified as adequate or inadequate, while in the brief version they are scored 0, 1, or 2. Thus, participants may even notice the categorical relationship, but the explanation may be tangential by relating it to a less important feature.

It is worth noting that sometimes the correlation coefficients are low due to the characteristics of the neuropsychological task, such as ease of activity and low variability of scores in the tasks^(29,30).

CONCLUSIONS

The present results suggested that the MEC B battery is applicable to the Brazilian population. It has adequate reliability and validity evidence. MEC B can detect communication disorders related to discourse, prosody, lexical-semantic and pragmatic skills in adults.

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REFERENCES

1. Tzourio-Mazoyer N. Intra- and inter-hemispheric connectivity supporting hemispheric specialization. In: Kennedy H, Van Essen DC, Christen Y, editors. *Micro-, meso- and macro-connectomics of the brain*. Cham: Springer; 2016. p. 129-46.
2. Silagi ML, Radanovic M, Conforto AB, Mendonça LIZ, Mansur LL. Inference comprehension in text reading: performance of individuals with right- versus left-hemisphere lesions and the influence of cognitive functions. *PLoS One*. 2018;13(5):e0197195. <http://dx.doi.org/10.1371/journal.pone.0197195>. PMID:29795602.
3. Critchley M. Speech and speech-loss in relation to duality of the brain. In: Mountcastle VB, editor. *Interhemispheric relations and cerebral dominance*. Baltimore: John Hopkins Press; 1962. p. 208-13.
4. Joanne Y, Ansaldo AI. Clinical note: acquired pragmatic impairments and aphasia. *Brain Lang*. 1999;68(3):529-34. <http://dx.doi.org/10.1006/brln.1999.2126>. PMID:10441192.
5. Leiva S, Difalco M, López C, Margulis L, Micciulli A, Abusamra V, et al. Disociaciones entre prosodia emocional y lingüística en pacientes con lesiones cerebrales del hemisferio derecho. *Lib Rev Peru Psicol*. 2017;23(2):213-34.
6. Ferré P, Clermont MF, Lajoie C, Côté H, Abusamra V, Ska B. Clinical profiles of communication impairments after a right-hemisphere stroke: crosscultural clusters. *Neuropsicol Latinoam*. 2009;1:32-40.
7. Karaduman A, Gökşun T, Chatterjee A. Narratives of focal brain injured individuals: a macro-level analysis. *Neuropsychologia*. 2017;99:314-25. <http://dx.doi.org/10.1016/j.neuropsychologia.2017.03.027>. PMID:28347806.
8. Ferré P, Joanne Y. Communication abilities following right hemisphere damage: prevalence, evaluation, and profiles. *Perspect ASHA Spec Interest Groups*. 2016;1(2):106-15. <http://dx.doi.org/10.1044/persp1.SIG2.106>.
9. Jerônimo GM. Compreensão leitora pós-lesão cerebral de hemisfério direito : um estudo de caso. *Let Hoje*. 2013;48(3):414-23.
10. Parente MAMP, Fonseca RP, Pagliarin KC, Barreto SS, Soares-Ishigaki ECS, Hübner LC, et al. Bateria Montreal-Toulouse de avaliação da linguagem. São Paulo: Vetor Edit; 2016. Coleção MTL - Brasil.
11. Tompkins CA. Rehabilitation for cognitive-communication disorders in right hemisphere brain damage. *Arch Phys Med Rehabil*. 2012;93(1, Suppl.):S61-9. <http://dx.doi.org/10.1016/j.apmr.2011.10.015>. PMID:22202193.
12. Fonseca RP, Parente MAMP, Côté H, Ska B, Joanne Y. Bateria Montreal de Avaliação da Comunicação Bateria MAC. São Paulo: Pró-Fono; 2008.
13. Casarin FS, Ferré LC, Ska B, Joanne Y, Fonseca RP. Adaptação do Protocolo MEC de Poche e da Bateria MAC Expandida: bateria MAC Breve. *Psico PUCRS*. 2013;44:288-99.
14. Casarin FS, Scherer LC, Parente MA MP, Ferré P, Côté H, Ska B, et al. Bateria Montreal de Avaliação da Comunicação, versão abreviada: Bateria MAC Breve. São Paulo: Pró-Fono; 2014.
15. Souza AC, Alexandre NMC, Guirardello EB, Souza AC, Alexandre NMC, Guirardello EB. Propriedades psicométricas na avaliação de instrumentos: avaliação da confiabilidade e da validade. *Epidemiol Serv Saude*. 2017;26(3):649-59. <http://dx.doi.org/10.5123/S1679-49742017000300022>. PMID:28977189.
16. Angeleri R, Bosco FM, Gabbatore I, Bara BG, Sacco K. Assessment battery for communication (ABaCo): normative data. *Behav Res Methods*. 2012;44(3):845-61. <http://dx.doi.org/10.3758/s13428-011-0174-9>. PMID:22180102.
17. Chaves ML, Izquierdo Y. Differential diagnosis between dementia and depression: a study of efficiency increment. *Acta Neurol Scand*.

- 1992;85(6):378-82. <http://dx.doi.org/10.1111/j.1600-0404.1992.tb06032.x>. PMID:1642108.
18. Cunha JA. Escalas Beck. São Paulo: Casa do Psicólogo; 2001. 171 p.
19. Fonseca RP, Zimmermann N, Oliveira CR, Gindri G, Pawlowski J, Scherer LC. Métodos em avaliação neuropsicológica: pressupostos gerais, neurocognitivos, neuropsicolinguísticos e psicométricos no uso e desenvolvimento de instrumentos. In: Fukushima SS, editor. Métodos em psicobiologia, neurociências e comportamento. São Paulo: ANPEPP; 2012. p. 300-30.
20. Heale R, Twycross A. Validity and reliability in quantitative studies. *Evid Based Nurs*. 2015;18(3):66-7. <http://dx.doi.org/10.1136/eb-2015-102129>. PMID:25979629.
21. Cicchetti DV, Sparrow SA. Developing criteria for establishing inter-rater reliability of specific items in a given inventory. *Am J Ment Defic*. 1981;86(2):127-37. PMID:7315877.
22. Pasquali L. Validade dos testes. *Rev Exam*. 2017;1(1):14-48.
23. Spreen O, Risser AH. Assessment of aphasia. New York: Oxford University Press; 2003.
24. Lezak MD. Neuropsychological assessment. New York: Oxford University Press; 2012.
25. Diniz LFM, Mattos P, Abreu N, Fluentes D. O exame neuropsicológico: o que é e para que serve. In: Diniz LFM, Mattos P, Abreu N, Fluentes D, editors. Neuropsicologia: aplicações clínicas. Porto Alegre: Artmed; 2016. p. 21-34.
26. DeVellis RF. Scale development: theory and applications. Newbury Park: Sage Publications; 1991.
27. Nunnally J. Psychometric theory. New York: McGraw-Hill; 1978.
28. Guilford JP. Creativity. *Am Psychol*. 1950;5(9):444-54. <http://dx.doi.org/10.1037/h0063487>. PMID:14771441.
29. Pawlowski J, Trentini CM, Bandeira DR. Discutindo procedimentos psicométricos a partir da análise de um instrumento de avaliação neuropsicológica breve. *Psico-USF*. 2007;12(2):211-9. <http://dx.doi.org/10.1590/S1413-82712007000200009>.
30. Pagliarin KC, Ortiz KZ, Parente MA, Arteché A, Joannette Y, Nespoulous JL, et al. Montreal-Toulouse Language Assessment Battery for aphasia: validity and reliability evidence. *NeuroRehabilitation*. 2014;34(3):463-71. PMID:24473247.

Author contributions

FSC participated in the planning of the project, data collection, interpretation and writing of the manuscript; KCP participated in the data collection, data analysis and writing; RFA contributed to the writing of the manuscript; MAMPP participated in the study design and review of the manuscript; PF, HC, BS, YJ participated in the design and writing of the manuscript; RPF delineated the study, analyzed the results and contributed to the writing of the manuscript.