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Montreal–Toulouse Language Assessment Battery: Evidence of criterion validity from patients with aphasia

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ABSTRACT

Background: The Montreal–Toulouse Language Assessment Battery — Brazilian version (MTL-BR) provides a general description of language processing and related components in adults with brain injury.
Objective: The present study aimed at verifying the criterion-related validity of the Montreal–Toulouse Language Assessment Battery — Brazilian version (MTL-BR) by assessing its ability to discriminate between individuals with unilateral brain damage with and without aphasia.
Methods: The investigation was carried out in a Brazilian community-based sample of 104 adults, divided into four groups: 26 participants with left hemisphere damage (LHD) with aphasia, 25 participants with right hemisphere damage (RHD), 28 with LHD non-aphasic, and 25 healthy adults.
Results: There were significant differences between patients with aphasia and the other groups on most total and subtotal scores on MTL-BR tasks.
Conclusions: The results showed strong criterion-related validity evidence for the MTL-BR Battery, and provided important information regarding hemispheric specialization and interhemispheric cooperation. Future research is required to search for additional evidence of sensitivity, specificity and validity of the MTL-BR in samples with different types of aphasia and degrees of language impairment.

1. Introduction

The left hemisphere (LH) is traditionally considered dominant for language, and damage to this region is therefore associated with aphasia. Aphasia is characterized by a reduction or impairment in the ability to correctly process language form, structure, content, meaning, use or function [44].

Twenty to 50% of patients are diagnosed with aphasia in the acute period of ischemic stroke [15,23,27,46], and approximately 50% of these individuals exhibit some improvement in the first two years following the lesion. Such improvements may be observed starting on post-stroke day 10 [27].

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 a number of instruments designed to provide a detailed assessment of linguistic competence (e.g. *Boston Diagnostic Aphasia Examination*, [24]; *Western Aphasia Battery*, [33]; *Aachener Aphasie Test*, [60]), and these have been adapted for use in a number of different languages [35,47,52,54]. These tests allow for the identification of associations and dissociations between key components of language, and can be used to classify subtypes of aphasia based on findings regarding impairments in comprehension, expression, naming, repetition, reading and writing.

These assessment batteries have been investigated as to their validity in assessing clinical samples, generally by comparative studies of patients with aphasia and neurologically healthy participants [35,38]. Some studies, however, have used patients with right hemisphere damage (RHD) as a control for individuals with LH Damage (LHD) [40,57]. Although patients with RHD may display some functional language impairment (pragmatic competence), they still tend to outperform patients with aphasia on language assessment tasks which do not involve paralinguistic or metalinguistic processes [57,59]. The use of clinical control groups also attests to the specificity of the assessment instruments studied, as it excludes that possibility that the group

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differences detected are due to the presence of brain damage in general rather than the location of the lesion. The use of this method may lead to a reduced rate of false positives and increase clinical validity [21]. When investigating language assessment tools, as well as including a clinical control group with RHD and neurologically healthy participants, it is also important to assess individuals with aphasia and those with LHD but no language impairment. Studies have shown that patients with LHD but no aphasia are very talkative, producing more words than normal subjects [2]. As such, these patients may display impairments on verbal tasks such as directed interviews. Furthermore, even patients who do not display clinical signs of aphasia may develop latent aphasia [56]. Given these findings, comparative studies may be especially important in evaluating the diagnostic accuracy of language assessment instruments. Criterion validity reflects accuracy with which a battery determines a person has a deficit from those with intact communication abilities [39].

One of the greatest difficulties reported by health professionals who work with adults with language impairment in Brazil is the lack of standardized language assessment instruments validated for use in Brazilian Portuguese [45]. The reality of Brazilian speech clinic is the use of translated tests and informal assessments of language, because there are no commercialized instruments.

The Montreal–Toulouse Language Assessment Battery — Brazilian version (MTL-BR), originally known as the *Protocole Montréal–Toulouse d'examen linguistique de l'aphasie* (MT-86; [41]) has been adapted in order to fill this gap in language assessment [28]. The aim of the MTL-BR is to provide diagnostic information regarding language disorders associated with LHD. Although it does not aim to classify aphasia according to subtypes or severity, it may contribute to the clinical evaluation of such variables [45].

Although traditional instruments for language assessment have made great contributions to the literature, most were originally developed in the English language [29]. The MTL-BR is the only assessment tool originally developed in a Latin language (French) which is also able to assess all possible relationships between linguistic inputs and outputs, as well as praxis and arithmetical skills. Although praxis and arithmetical tasks are not part of language assessment, they were included in the battery due to the high rate of comorbidity between aphasia, apraxia and acalculia.

The adaptation of aphasia assessment instruments provides a significant contribution to the study of language impairment following acquired brain damage. Furthermore, crosslinguistic research allows for the identification of universal language features, and can greatly contribute to the enhancement of psycholinguistic models [35].

An important part of crosslinguistic adaptation of assessment instruments is the search for evidence of the validity and reliability of adapted instruments [8,29,48]. Some psychometric properties have been established for MTL-BR [43] like concurrent validity (correlation between 0.33–0.71) and reliability (test–retest mean 0.52, Cronbach's alpha between 0.79 and 0.90).

Therefore, the present study aimed to obtain the criterion validity of the MTL-BR Battery by comparing the performance of clinical groups (patients with RHD, LHD with aphasia and LHD without aphasia) to a control group with no brain damage.

2. Method

2.1. Participants

A total of 104 adults divided into three clinical groups and one healthy control group took part in the study. The clinical group was composed of 26 participants with LHD and aphasia (aphasia group — Group 1). The clinical control groups consisted of 25 patients with RHD (Group 2) and 28 individuals with LHD non-aphasic (LHDna — Group 3), while a third control group was comprised of 25 neurologically healthy participants (control group — Group 4). Participants were matched for age (total sample: M = 58.50, SD = 12.39) and number of years of education (total sample: M = 9.98, SD = 5.76). The groups did not differ by age or education.

Inclusion criteria consisted of being first language Brazilian Portuguese speakers (monolinguals) over 19 years of age, right handed according to the Edinburgh Handedness Inventory [5,42], having no uncorrected sensory deficits (visual or auditive), no symptoms of depression prior to stroke and no current or prior abuse of alcohol or drugs (self-report, [20]).

Control participants also had no history of neurological illnesses as well as no signs of dementia (according to the Mini Mental State Examination — MMSE, adapted by [9]; with cut off points by [34]); and no symptoms of depression (Geriatric Depression Scale (15 points) — GDS-15 ([61], adapted by [1]; scores below 4). It is important to highlight that GDS-15 was administered to all participants in order to obtain the same measure for all groups [16,37].

All clinical groups had been previously diagnosed with ischemic unilateral strokes (one, or at most two, strokes in the same hemisphere) confirmed by neurological examination and computer tomography and/or magnetic resonance imaging. All patients in the aphasia group had been previously diagnosed with aphasia by a speech pathologist with expertise in the assessment and treatment of acquired language disorders, using non structured strategy to evaluate auditory comprehension, naming performance, reading, writing, repetition, disfluencies, agrammatism, paraphasias and other aphasic manifestations observed in language examination. Exclusion criteria consisted of bilateral stroke and head trauma.

The LHDna group was composed only of patients with scores below −2.0 standard deviations in the oral language assessment subtests of the Brazilian Brief Neuropsychological Assessment Instrument NEUPSILIN [18,19]. This cutoff was based on the normative data for the NEUPSILIN [19]. This instrument consists of 32 subtests which assess cognitive functions such as temporal and spatial orientation, attention, perception, memory, mathematic abilities, language, praxis, problem solving and executive functions. It is the only brief instrument to evaluate oral language impairments in addition to other neuropsychological deficits. The oral language subtests of the NEUPSILIN evaluate naming (2 objects and 2 pictures), repetition (8 words and 2 non-words) and automatic speech (counting aloud from one to ten and naming the months of the year, in order), as well as the auditory comprehension of words and sentences. These tests corroborated the results of the speech pathology assessments, which found no evidence of aphasia in any of the participants included in the LHDna group.

2.2. Procedures

The present study was approved by the university Research Ethics Committee (protocol number 04908/09). Participation was voluntary and participants were not paid, and all participants or their legal representatives provided written informed consent prior to participation.

Clinical control groups were recruited from public and private hospitals in the state of Rio Grande do Sul (RS), or through doctor referral. The aphasia group was recruited from speech therapy clinics, where they were undergoing rehabilitation for aphasia. All participants had been previously assessed and diagnosed with aphasia, and were in the chronic stage of stroke. Members of the control group were selected from university, work and community settings.

Assessments were conducted during a single session lasting approximately 90 min. If participants became fatigued during the session, the assessment was interrupted and resumed after one week. All participants were administered a sociodemographic and health questionnaire. These instruments were administered by five Speech pathologists and five psychologists, all of whom had been trained in the administration of the MTL-BR.

The MTL-BR was scored by a single researcher (first author) to ensure consistency, and 20% of cases were analyzed in parallel by a speech