



## Cognitive &amp; Behavioral Assessment

# Analysis of macrolinguistic aspects of narratives from individuals with Alzheimer's disease, mild cognitive impairment, and no cognitive impairment

Cíntia Matsuda Toledo<sup>a,\*</sup>, Sandra Maria Aluísio<sup>b</sup>, Leandro Borges dos Santos<sup>b</sup>,  
Sonia Maria Dozzi Brucki<sup>a</sup>, Eduardo Sturzeneker Trés<sup>a</sup>, Maira Okada de Oliveira<sup>a</sup>,  
Letícia Lessa Mansur<sup>a</sup>

<sup>a</sup>Centro de Referência em Distúrbios Cognitivos, School of Medicine, University of São Paulo, São Paulo, São Paulo, Brazil

<sup>b</sup>Núcleo Interinstitucional de Linguística Computacional (NILC), Instituto de Ciências Matemáticas e de Computação, University of São Paulo, São Carlos, São Paulo, Brazil

**Abstract**

**Introduction:** The depiction of features in discourse production promotes accurate diagnosis and helps to establish the therapeutic intervention in cognitive impairment and dementia. We aimed to identify alterations in the macrolinguistic aspects of discourse using a new computational tool.

**Methods:** Sixty individuals, aged 60 years and older, were distributed in three different groups: mild Alzheimer's disease (mAD), amnesic mild cognitive impairment, and healthy controls. A narrative created by individuals was analyzed through the Coh-Metrix-Dementia program, extracting the features of interest automatically.

**Results:** mAD showed worse overall performance compared to the other groups: less informative discourse, greater impairment in global coherence, greater modalization, and inferior narrative structure. It was not possible to discriminate between amnesic mild cognitive impairment and healthy controls.

**Discussion:** Our results are in line with the literature, verifying a pathological change in the macro-structure of discourse in mAD.

© 2017 The Authors. Published by Elsevier Inc. on behalf of the Alzheimer's Association. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

**Keywords:**

Mild cognitive impairment; Alzheimer disease; Aging; Narration; Language disorders; Communication; Diagnosis; Automatic data processing

**1. Background**

The progressive growth of the elderly is a well-established phenomenon in most populations, with a special burden in the demographic structure of developing countries such as Brazil. Considering that the incidence of dementia increases with age, this issue becomes a central health problem [1].

Alzheimer's disease (AD) is the most common type of dementia, characterized as an irreversible and progressive syndrome that compromises functional performance [2].

In that sense, language disorders gained an important role, as they can occur in the early stages of the disease and evolve throughout time [3,4]. Moreover, it is known that the architecture of language dysfunction seen in mild cognitive impairment (MCI) originates from primary language difficulties related to the decline in the semantic and pragmatic levels of processing [5]. Discourse analysis is a sensitive resource to recognize language difficulties in individuals in the early stages of disease [6]. Their discourse is described as disorganized, empty, presenting a large number of indefinite terms and phrases without meaning [7].

At the macrolinguistic level, it is important to highlight the impairment in the emission of relevant information and

\*Corresponding author. Tel.: +5511993192189.  
E-mail address: [citoledo@hotmail.com](mailto:citoledo@hotmail.com)

in connecting units of discourse content in a cohesive way with reference to the main theme [8,9].

Therefore, early identification of language traits can be of foremost importance in preclinical stages, MCI, and early AD if we take into consideration that a significant proportion of the elderly find themselves in this spectrum [10]. MCI cases worldwide represent 6.1%, with an incidence of 13.2/1000 subjects per year, among individuals aged 60 years or more [11]. Of particular interest is the fact that MCI cases can remain stable or restore its normal status over time, but approximately 50% of individuals develop dementia over a 5-year period [12]. Language deficits in MCI have been object of scrutiny in the literature, allowing well-known disturbances in tasks of fluency, naming, and semantic knowledge [13].

Specifically, when it comes to discourse, Cuetos et al. [14] reported a decrease in the content found in early AD stages. Drummond et al. [15] analyzed the narrative of individuals with AD, MCI, and healthy control (HC) from a cognitive standpoint. The HC and AD groups differed in all parameters, except for the time taken to execute the task and the number of words. The MCI had an intermediate performance between HC and AD. In addition, the MCI and HC differed from AD in relation to the overall coherence, cohesion, and type of discourse.

Discourse is recognized as a fundamental component in language assessments and should be considered for the identification of language disorders in dementias, as well as in the follow-up for these individuals [16]. Brandão [17] states that deficits in discourse indicate where failure occurs during processing. It is indispensable, therefore, to advance in the nature of such shortcomings and obtaining cognitive and discursive markers for the differential diagnosis of pathologies.

The well-rooted theory of Kintsch and van Dijk [18] supports the analysis model of microstructure and macrostructure to study the discourse of individuals with Alzheimer's disease [17,19].

Cinderella's storytelling has been used in aphasia studies [20] and is included in the assessments of subjects because of their penetration in Western culture, including Brazil.

Advances in new techniques of Natural Language Processing combined with Data Science techniques are expanding. Computational methods are applied in texts, seeking to identify signs of neurological or psychiatric impairments and automatically extract linguistic characteristics for recognition, classification, and description of diseases [21,22].

Among the obstacles in studies about discourse, transcription and analysis are vital and reports concerning computational analysis are scarce. Because they are laborious and difficult, research on a large scale becomes challenging and reinforces the benefits from the speed and systematic nature of computerized analyzes. Hence, searching for markers and performance profiles using unbiased techniques becomes fundamental and may guide clinical practice with greater objectivity and accuracy [23].

The Coh-Metrix tool [24] was developed at Memphis University to capture cohesion and difficulty of a text. This tool was adapted to Portuguese, so-called Coh-Metrix-Port [25]. The use of the tool for the dementia population motivated the creation of Coh-Metrix-Dementia [26], used in the present study. For that matter, Coh-Metrix-Dementia adds features to the existing 48 in Coh-Metrix-Port. New features include Latent Semantic Analysis, measures of lexical diversity, syntactic complexity, and semantic density.

By means of this technology, we aimed to verify if Cinderella's storytelling, a prototypic narrative very well known in Western culture [20], distinguished individuals with AD or MCI and HC; using both quantitative parameters, such as the occurrence frequency of distinguishing traits, and qualitative parameters, to verify the nature of macrostructural aspects.

The study was justified by the need to identify and characterize the differences between groups, different diagnoses, and the possibility of creating tools that facilitate the observation of results of clinical intervention in language in dementia.

The authors hypothesized that certain metrics could differentiate the three groups with being the worst performance for mild Alzheimer's disease (mAD), followed by amnesic mild cognitive impairment (aMCI) and HC, finding performance markers for each group.

## 2. Methods

Approval by the Ethics and Research Committee of the Medical School of the University of São Paulo (CAPPesq No. 1.192.984) was obtained, as well as Free and Informed Consent Term was signed by every individual.

The sample size consisted of 60 individuals divided into 3 groups: mAD group, aMCI group, and a healthy cognitive elderly control group.

The aMCI and mAD groups were recruited either from Universidade de São Paulo's outpatient clinics of cognitive neurology (GNCC), or from its dementia reference center (CEREDIC). All individuals had their diagnosis confirmed by a neurologist that was blind to the procedure, subsequently going through the proposed protocol. The MCI group was constituted only by amnesic, single or multiple domain, individuals. HC group was comprised by age- and education-matched community-dwelling volunteers and nonconsanguineous caregivers who fulfilled criteria for inclusion and exclusion.

### 2.1. Inclusion and exclusion criteria

Table 1 presents inclusion and exclusion criteria for all groups.

For the evaluation of discourse, a book with 22 sequenced scenes, portraying the Cinderella story without subtitles, was used. Evaluations were carried out individually by the same researcher (C.M.T.). Subjects were allowed to look

Download English Version:

<https://daneshyari.com/en/article/8680293>

Download Persian Version:

<https://daneshyari.com/article/8680293>

[Daneshyari.com](https://daneshyari.com)