

Describing Cognitive Decline in Alzheimer's Disease via a Picture Description Writing Task

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Abstract : For the diagnosis of Alzheimer's disease (AD), a large variety of neuropsychological tests are available. In some of these tests, linguistic processing - both oral and written - is an important factor. Language disturbances might serve as a strong indicator for an underlying neurodegenerative disorder like AD. However, the current diagnostic instruments for language assessment mainly focus on product measures, such as text length or number of errors, ignoring the importance of the process that leads to written or spoken language production. In this study, it is our aim to describe and test differences between cognitive and impaired elderly on the basis of a selection of writing process variables (inter- and intrapersonal characteristics). These process variables are mainly related to pause times, because the number, length, and location of pauses have proven to be an important indicator of the cognitive complexity of a process. Method: Participants that were enrolled in our research were chosen on the basis of a number of basic criteria necessary to collect reliable writing process data. Furthermore, we opted to match the thirteen cognitively impaired patients (8 MCI and 5 AD) with thirteen cognitively healthy elderly. At the start of the experiment, participants were each given a number of tests, such as the Mini-Mental State Examination test (MMSE), the Geriatric Depression Scale (GDS), the forward and backward digit span and the Edinburgh Handedness Inventory (EHI). Also, a questionnaire was used to collect socio-demographic information (age, gender, education) of the subjects as well as more details on their level of computer literacy. The tests and questionnaire were followed by two typing tasks and two picture description tasks. For the typing tasks participants had to copy (type) characters, words and sentences from a screen, whereas the picture description tasks each consisted of an image they had to describe in a few sentences. Both the typing and the picture description tasks were logged with Inputlog, a keystroke logging tool that allows us to log and time stamp keystroke activity to reconstruct and describe text production processes. The main rationale behind keystroke logging is that writing fluency and flow reveal traces of the underlying cognitive processes. This explains the analytical focus on pause (length, number, distribution, location, etc.) and revision (number, type, operation, embeddedness, location, etc.) characteristics. As in speech, pause times are seen as indexical of cognitive effort. Results. Preliminary analysis already showed some promising results concerning pause times before, within and after words. For all variables, mixed effects models were used that included participants as a random effect and MMSE scores, GDS scores and word categories (such as determiners and nouns) as a fixed effect. For pause times before and after words cognitively impaired patients paused longer than healthy elderly. These variables did not show an interaction effect between the group participants (cognitively impaired or healthy elderly) belonged to and word categories. However, pause times within words did show an interaction effect, which indicates pause times within certain word categories differ significantly between patients and healthy elderly.

Keywords : Alzheimer's disease, keystroke logging, matching, writing process

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