

Lexical Access of Verbs in Parkinson's Disease: Does Agency Matter?

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Introduction

Parkinson's disease (PD) is a neurodegenerative condition commonly associated with movement-related symptoms, although non-motor symptoms are also prevalent in nearly all patients (99.7% according to Rodriguez-Blazquez et al., 2020). Linguistic deficits in PD have been observed in many domains including naming tasks, where participants are presented with a picture and are asked to quickly and accurately utter the corresponding word. Research shows that PD patients have more difficulties when naming high-motion verbs compared to low-motion verbs (Herrera et al., 2012; Bocanegra et al., 2017) and find verbs describing fast actions more challenging than those encoding slow actions (Speed et al., 2017). Interestingly, abstract verbs, which lack motion-related semantics, are spared (Fernandino et al., 2013). Other findings attribute verb naming difficulties in PD to syntactic (A-structure complexity) rather than semantic reasons, with PD patients performing poorly compared to controls when naming transitive and unergative verbs but not unaccusative ones (Aiello et al., 2022). To summarise, previous literature has found that naming performance for verbs in PD seems to be influenced by semantic factors like motion and speed, although syntactic-related criteria have also been proposed. However, the role of agency in naming verbs has not been investigated so far. Our study aims precisely to address this gap in the literature, comparing PD patients and healthy adults in a lexical access task eliciting different classes of verbs in which the Agency component has been manipulated.

Methods

The research protocol included three groups: individuals with PD ($N = 31$), age-, sex- and education-matched neurotypical healthy subjects ($N = 31$), and younger controls ($N = 31$). Sample size was determined using a G*Power analysis (effect size of $d = 1$, power of 0.95, $\alpha = 0.05$), which recommended 27 subjects per group. All participants underwent neuropsychological evaluations, encompassing the Frontal Assessment Battery (FAB), the Hospital Anxiety and Depression Scale (HADS), the Montreal Cognitive Assessment (MoCA) to perform a cognitive screening and exclude the presence of mild cognitive impairment in the tested subjects, and an eye-tracking-based Trail Making Test A and B (TMT). Additionally, a neurologist assessed PD patients while OFF medication using the Unified Parkinson's Disease Rating Scale (UPDRS).

The lexical access task that we developed and administered to address our research questions involved naming verbs from five categories determined by the linguistic theory:

- (1) unergative verbs with "internal" agentivity (Pinker, 2007), e.g., *to yawn*;
- (2) unergative verbs, e.g., *to walk*;
- (3) transitive verbs of the "achievement" type (Vendler, 1967), e.g., *to discover*;
- (4) transitive verbs of the "accomplishment" type (Vendler, 1967), e.g., *to cook*;
- (5) unaccusative verbs, lacking agentivity and constituting our control items, e.g., *to fall*.

The stimuli were AI-generated using DALL-E (see Picture 1) and presented to participants on the computer screen with the software E-Prime 3. Reaction times and accuracy data were collected during the picture naming task.

Expected Results and Implications

Data collection has been completed, and analysis is currently underway, with results available by the time of the conference. The varying degrees of agentivity in the verbal stimuli will enable us to test the hypothesis that this linguistic feature modulates verb naming abilities in individuals with PD. If individuals with PD are sensitive to the Agency component of verbs, the presence of an agent, common to both transitive and unergative verbs, may make these verbs more challenging. This hypothesis is supported by studies indicating altered "awareness of the authorship of action" in PD, which relates to the perceived sense of agentivity (Saito et al., 2017).

The findings of this study will refine the linguistic theory by linking verb naming deficits in PD to broader cognitive and neuropsychological processes while enriching the clinical understanding of PD by identifying linguistic symptoms that might hold diagnostic significance.



Picture 1: Examples of visual stimuli representing the five verbal categories involved

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