Introduction

- Due to dopaminergic frontal-striatal network dysfunctions, persons with Parkinson’s disease (PD) may show impaired event processing (Godbout & Doyon, 2000; Zacks & Sargent, 2010; Zalla et al., 2000).
- Temporal event knowledge = information about the sub-events in which sub-events occur in an activity.
- Content event knowledge = information about the sub-events of an activity.
- The N400 and late positive component (LPC) are associated with temporal and content violations in event sequences in healthy persons (Drummer et al., 2016).
- Hypothesis: Persons with PD show slower and less accurate performances along with altered ERP patterns (e.g., regarding the N400 and LPC) in response to temporal and content violations.

Methods

- 22 persons with PD: 8 females; mean age = 64.82, SD = 11.03.
- 24 healthy persons: 10 females; mean age = 67.67, SD = 7.59.
- Similar cognitive functions assessed with the Parkinson Neuropsychometric Dementia Assessment (PANDA) (t(44) = 1.06, p = .296).
- Presentation of script header (e.g., going grocery shopping) followed by event triplets in three conditions:
  1. Correct condition: Reflecting on needed purchases – Writing a shopping list – Walking along the supermarket shelves.
  2. Temporal error condition: Getting a shopping cart – Lining up at the checkout counter – Working through the shopping list.
  3. Content error condition: Getting a shopping cart – Opening the water tap – Walking along the supermarket shelves.
- Decision if presented events are correct or incorrect.

Results

- Persons with PD are generally slower (F(2, 44) = 5.60, p = .009, ƞ² = .13) and are more inaccurate (F(2, 44) = 6.42, p = .015, ƞ² = .13) than healthy persons.
- Persons with PD show an early starting positive response (e.g., after 300 ms) (F(2, 36) = 42.92, p ≤ .001, ƞ² = .34) and a broadly distributed (anterior, posterior) LPC (F(3, 63) = 5.74, p = .002, ƞ² = .21).
- For healthy persons, the LPC starts only at 500 ms after stimulus onset and is distributed solely posteriorly (F(3, 63) = 4.81, p = .001, ƞ² = .17).
- Persons with PD do not show a N400 effect but a broadly distributed (anterior, posterior) LPC (F(3, 63) = 5.74, p = .002, ƞ² = .21).
- Healthy persons show a right lateralized N400 effect (anterior, posterior) (F(3, 67) = 3.44, p = .023, ƞ² = .13) and again a solely posteriorly distributed LPC (F(3, 63) = 4.81, p = .001, ƞ² = .17).

Discussion

- Overall lower behavioral performances in persons with PD → the present task has high demands on executive functions (e.g., updating), which are typically impaired in PD (Owen, 2004).
- LPC responses are associated with reanalysis (e.g., updating) processes of sensory input which is inconsistent with prevailing predictions (Brouwer et al., 2012).
- Persons with PD might recruit additional cognitive resources to reanalyze their mental representation (i.e., event model) in working memory upon temporal and content violations in event sequences.
- Increase use of less specialized brain regions to compensate for deficits in event model formation (Faustmann et al., 2007).
- N400 effects are associated with a semantic mismatch with the event model (Drummer et al., 2016).
- Persons with PD seem to have no expectation regarding the upcoming sub-event and may show impaired retrieval of content event information (Delogu et al., 2019).
- Persons with PD show weak event model representation and / or retrieval, resulting in low event prediction and error identification.
- As the processing of events is fundamental in daily routines, alterations may cause behavioral dysfunctions in persons with PD.

Literature