

# A Comparison of the Effect of Parkinson's Disease on Verbal and Signed Modalities

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## Introduction

The effects of PD on other communication modalities besides oral language, is not well known. American Sign Language (ASL) uses a physical means to communicate, requiring a balance of gross and fine motor movements. Similar to the verbal modality of communication, ASL has four distinctive features; place, orientation, movement and handshape, in addition to facial expressions (Rautakoski & Martikainen, 2014). PD has an impact on those using voice as their primary mode of communication and has potentially comparable effects on those who use ASL as their primary mode of communication. In PD, compensatory actions that decrease distinctive features and facial expressions in the presence of PD may contribute to reduced communicative abilities in verbal and signed modalities (Kegl, Cohen & Poizner 1999).

## Parkinson's Disease

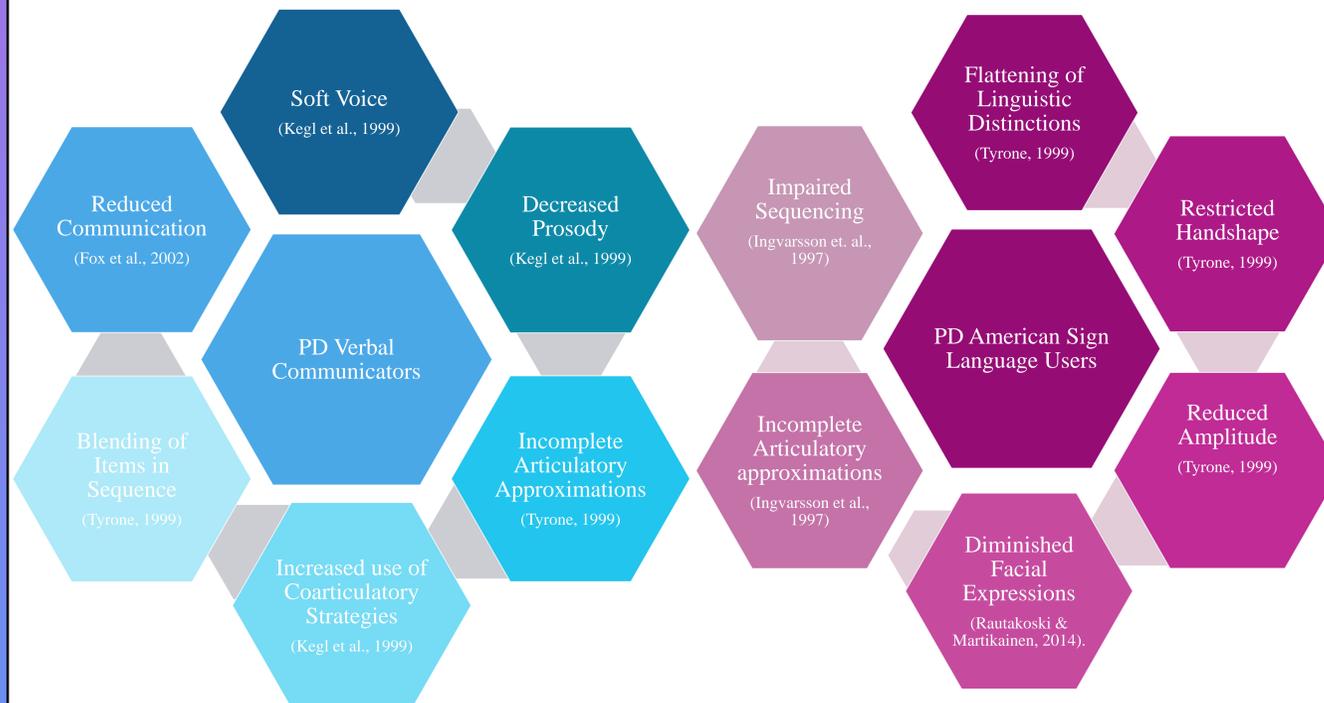
Parkinson's Disease (PD) is a progressive neurodegenerative disorder that is chronic in nature. It is associated with atrophy of dopamine-producing neurons in the substantia nigra (Dauer & Przedborski, 2003). This area is located in the basal ganglia of the brain which is responsible for facilitating and inhibiting physical movement. The loss of neurons in the substantia nigra is the primary catalyst of PD symptoms (Dauer & Przedborski, 2003). Although inherited cases of PD exist, genetics do not encompass all cases for unknown reasons.

Symptoms progressively worsen resulting in abnormal physical characteristics such as tremors at rest, rigidity, involuntary movements termed dyskinesias, postural instability, and moments of motionlessness (Dauer & Przedborski, 2003). Reserved, monotone, breathy, hoarse voice qualities, reduced facial expressions and imprecise articulation are also factors contributing to impaired communication of individuals with PD (Fox, Morrison, Ramig, & Sapir, 2002).

## Method

This scoping review was conducted in accordance with the guidelines prescribed by Arskey and O'Malley (2005). Ten articles were selected through a hand search, then identified and categorized based on relevancy. "Parkinson's Disease" and "Sign language" were two main search terms used as well as a thorough exploration of sources found in article bibliographies. Google Scholar, and Science Direct proved to be key resources in the search.

## Results



## Objective

This review seeks to identify literature pertinent to aspects of communication of two modalities impacted by Parkinson's disease. The purpose of this review is to compare Parkinson's Disease's effect on those who use speech as their primary mode of communication to those who use ASL as their primary mode of communication.

## Literature

- Bavelier, D., Newman, A. J., Mukherjee, M., Hauser, P., Kemeny, S., Braun, A., & Boutla, M. (2008). Encoding, rehearsal, and recall in signers and speakers: Shared network but differential engagement. *Cerebral Cortex*, 18(10), 2263–2274. doi:10.1093/cercor/bhm248
- Benson, F., Darkins, A., & Fromkin, V. (1988) A characterization of the prosodic loss in parkinson's disease. *Brain and Language*, 34(2), 315-327. doi:10.1016/0093-934X(88)90142-3
- Boutla, M., Supalla, T., Newport, E. L., & Bavelier, D. (2004). Short-term memory span: Insights from sign language. *Nature Neuroscience*, 7(9), 997–1002. doi:10.1038/nn1298
- Brentari, D. (1995). Aphasic and parkinsonian signing: Differences in phonological disruption. *Brain and Language*, 48(1), 69–105. Brentari, D., Poizner, H., & Kegl, J. (1995). doi:10.1006/brln.1995.1003
- Brentari, D., & Poizner, H. (1994). A Phonological analysis of a deaf Parkinsonian signer. *Language and Cognitive Processes*, 9(1), 69–99. doi:10.1080/01690969408402110
- Dauer, W., & Przedborski, S. (2003). Parkinson's Disease: mechanisms and models. *Neuron*, 39(6), 889–909. doi:10.1016/S0896-6273(03)00568-3
- Fox, C. M., Morrison, C. E., Ramig, L. O., & Sapir, S. (2002). Current perspectives on the Lee Silverman Voice Treatment (LSVT) for individuals with idiopathic Parkinson Disease. *American Journal of Speech-Language Pathology*, 11(2), 111–123. doi:10.1044/1058-0360(2002)012
- Ingvarsson, P. E., Gordon, A. M., & Forssberg, H. (1997). Coordination of manipulative forces in Parkinson's Disease. *Experimental Neurology*, 145(2), 489–501. doi:10.1006/exnr.1997.6480
- Kegl, J., Cohen, H., & Poizner, H. (1999). Articulatory consequences of Parkinson's Disease: Perspectives from two modalities. *Brain and Cognition*, 40(2), 355–386. doi:10.1006/breg.1998.1086
- Rautakoski, P., & Martikainen, K. K. (2014). Communication problems of Parkinson patients using sign language as their main communication method. *Parkinsonism & Related Disorders*, 20(1), 128–130. doi:10.1016/j.parkreldis.2013.09.011

## Discussion

### Verbal Modalities

- This population have increased difficulties holding their vocal folds in an extended position, and therefore have difficulty producing a higher pitch and varied intonation (Kegl et al., 1999)
- Due to attempts to ease articulation, articulators such as the tongue do not approximate fully, blending items in sequence and manipulating the message.

### Signed Modality

- Complex morphology, encompassing salient morphological and grammatical markers into a single sign regarding agreement with place, movement patterns, and spatial contours (Benson, Darkins & Fromkin, 1988).
- Handshapes are not fully articulated, and movements are not approximated appropriately when sequenced for complex signs, of two movements or more, and sequences.
- Impairments in sequencing movements supports the claim of the basal ganglia's role in motion (Ingvarsson, Gordon, & Forssberg, 1997).

### Both Modalities

- PD is a result of decreased excitation of the cortical motor centers of the basal ganglia, a reduction in movement is observable across all systems (Dauer & Przedborski, 2003)
- Impaired manual dexterity is a symptom present in PD and intensifies with disease progression
- Individuals with PD have impaired expressive abilities and no impairments have been found regarding receptive abilities (Kegl, Cohen, & Poizner, 1999).
- Changes in expression are not recognized by the individuals themselves, communicative intent is lost or misinterpreted by communication partners (Rautakoski & Martikainen,
- Individuals with PD in both modalities are thought of as "whispering" and monotonous (Rautakoski & Martikainen, 2014).

## Future Research

Despite the modality of communication, the effects of PD increase in severity over time, leading to an increase in compensatory strategies and an increase in messages lost. Considering how the brain changes during these compensatory actions may prove beneficial when differentiating between signers and speech users and lead to a better understanding of PDs effect on different modalities