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# The effects of levodopa on word intelligibility in Parkinson's disease

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## Abstract

Dysarthria is a common manifestation in patients with idiopathic Parkinson's disease. This study investigated the effects of levodopa on intelligibility in patients with Parkinson's disease. Ten participants were tested during on- and off-states using the Yorkston and Beukelman intelligibility test (1980). Intelligibility as scored by a panel of speech therapists was significantly improved in the on-condition. No correlation was found, however, between intelligibility and overall severity of the disease or severity of the motor problems.

*Educational outcomes:* As a result of this activity the participant will be able to discuss the effects of levodopa on intelligibility in patients with Parkinson's disease.

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*Keywords:* Parkinson's disease; Hypokinetic dysarthria; Levodopa; Intelligibility

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## 1. Introduction

Changes in speech are a common manifestation of idiopathic Parkinson's disease (PD). It is estimated that some 60–80% of patients with PD develop dysarthria in the course of their illness (Canter, 1963; Darley, Aronson, & Brown, 1969; Solomon & Hixon, 1993). Typically, patients with PD develop a hypokinetic dysarthria,

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characterized by deficient respiratory control (Critchley, 1981), abnormal voice quality and articulatory imprecision (Darley et al., 1969; Solomon & Hixon, 1993), poor control of voice onset and offset (Gallina, Smith, Zeffiro, & Ludlow, 2001), abnormal speech rate (Hammen, 1990), hypophonia (Logeman, Fisher, & Bowler, 1978; Sanabria et al., 2001) and defective prosody (Darley, Aronson, & Brown, 1975). According to Berry (1983), PD accounts for 98% of all cases with hypokinetic dysarthria seen in speech pathology practices.

Although nowadays a number of treatment options are available for patients with PD, pharmacotherapy with levodopa remains the cornerstone of medical treatment. Introduced in the 1960s, levodopa revolutionized the treatment of PD and continues to be the most effective symptomatic therapy (Katzenschlager & Lees, 2002). It alleviates the bradykinesia and rigidity and to a lesser extent also the tremor that are characteristic of PD (Elble, 2002), but it should be recognized that long-term use of levodopa may lead to dystonia, dyskinesia and on–off effects (i.e. unpredictable motor symptom fluctuations).

As far as speech is concerned, the effects of levodopa seem to be far less consistent. While some studies reported positive effects on fundamental frequency (Sanabria et al., 2001) and on articulation, loudness, and persistence of phonation (Critchley, 1981; Wolfe, Garvin, Bacon, & Waldrop, 1975), others did not find significant changes on oral function (Gentil, Tournier, Pollack, & Benabid, 1999) or general speech performance (Poluha, Teulings, & Brookshire, 1998). Even worsening of speech with exacerbation of disfluencies due to levodopa treatment has been described (Louis, 2001).

In the early 1970s, two studies also reported the effects of levodopa on intelligibility. Adelman, Hoel, and Lassman (1970), in an investigation involving 25 patients, mentioned that intelligibility level was rated higher under levodopa than under a no-drug-condition. Details on participants and methodology used are lacking, however, in this brief report. Nakano, Zubick, and Tyler (1973) compared speech intelligibility under levodopa, placebo, and procyclidine hydrochloride in 18 patients with PD, using a multiple choice speech intelligibility test. Ratings by 10 untrained listeners unequivocally showed levodopa to be superior to placebo or procyclidine. To the best of our knowledge, the results of the latter two studies have never been replicated. The purpose of the present study, therefore, was to further investigate the effects of levodopa on intelligibility. Like in the studies of Adelman et al. (1970) and Nakano et al. (1973) intelligibility was compared between on- and off-conditions. In addition, the present investigation included an assessment of the relationship between intelligibility, overall severity, and severity of the motor disorder.

## 2. Patients and methods

### 2.1. Subjects

The participants of this study were 10 patients (five men, five women) aged between 63 and 80 years (mean 68 years) with clinically diagnosed idiopathic PD (Table 1). All diagnoses were made by the second author (P.S.) using the criteria by Gelb, Oliver, and

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