

perceptual evaluations of speech and voice after levodopa treatment for IWPB.

Data Collection

The results of the literature search revealed six articles consistent with the selection criteria. Four studies used a

justified. Additionally, the in-depth statistical analysis was particularly robust. While the perceptual ratings showed good inter-rater reliability (ICC = .826) and moderate intra-rater reliability (ICC = .754), the use of only 3 perceptual raters is a relative weakness of the study. Another weakness of this study was the collection of only a sustained vowel in lieu of more natural, connected speech.

Given the suggestive results of this study, Cushnie-Sparrow et al. (2018) propose a “speech severity responsiveness hypothesis,” wherein the level of levodopa response increases with increasing perceptual voice quality severity. When individuals with more severe voice quality symptoms were grouped separately from those with mild symptoms, greater medication effects became clear. This suggests that early studies did not see this severity-effect because of increased variation in severity across participants.

Discussion

Overall, the results of this review revealed suggestive evidence that levodopa medication does not lead to improvements in mild speech and voice symptoms resulting from Parkinson’s disease. However, the evidence provided in these studies should be approached with caution, given the small sample sizes, the lack of clear demographic data as well as poor statistical reporting in some instances. Some studies also showed poor inter-rater reliability and the use of very few perceptual raters, decreasing the strength of the evidence provided.

When a larger sample size was included (Cushnie-Sparrow et al (2018)), researchers were able to control for severity of dysarthric symptoms, which revealed significant effects. Similarly, De Letter et al. (2005) noted that participants in their study with lower overall intelligibility showed greater differences between the “ON” and “OFF” states. This suggests that as the severity of symptoms increases, so does the perceptual impact of levodopa medication. Had the former investigators included measures of connected speech (mimicking real-world context), their results would have proved compelling.

In addition to the weaknesses found in all studies examined, limitations of this present review also impact the conclusions that can be drawn about the effects of levodopa. Namely, there was considerable variability in the specific speech and voice characteristics evaluated in each report. This limited the strength of corroboration between studies, as direct comparisons could not be made. This was largely due to the small pool of studies that met selection criteria, as only those including

perceptual measures were accepted. A much larger group of studies looking at more similar measures could have been evaluated if acoustic measures were considered. However, despite the considerable subjectivity of this type of measure, this writer maintains that perceptual ratings are the gold standard for drawing conclusions about the real-life implications of results, if good inter and intra-rater reliability is maintained.

Future Research Considerations

The evidence in this review ranged from equivocal to suggestive, based on study designs that limited their real-world confirmation of results. In future studies looking at the impact of levodopa treatment on perceptual measures of speech and voice symptoms in PD, the following recommendations should be considered to strengthen the level of evidence:

- a) Researchers should collaborate with other centres to include much larger sample sizes to increase the validity of results. This will allow studies to control for severity of symptoms, age and time since disease onset.
- b) Samples should include larger numbers of individuals with mild, moderate and severe dysarthric symptoms to compare results.
- c) Speech samples should always include connected speech to mimic real-life context.
- d) Variables such as previous behavioural speech therapy should be controlled for.
- e) Researchers should conduct repeat-trials with patients receiving standard doses of levodopa as well as their physician-prescribed dosages in order to compare effects.
- f) Studies should look at a wider range of perceptual characteristics (ie. voice quality, overall intelligibility, prosodic features, etc). Particular attention should be paid to

