Spatio-temporal variability in speakers with Parkinson's Disease

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This paper reports on the use of the spatio-temporal index (STI) to investigate speech behavior in participants with Parkinson's Disease. Our methodology differs from previous reports in two ways: STI measures were obtained using audio measures and the data were scaled in a non-linear way.

Using an acoustic rather than kinematic measure had the advantage of not requiring specialist equipment and it being a more acceptable data collection technique for disordered clients. In relation to the scaling method, the STI does not allow for discrimination between spatial and temporal components of variability in articulation. In cases where the temporal activity of the articulator alone varies non-linearly over utterances it is therefore not possible to identify whether the source of the variation was in amplitude, timing or both. To account for this, several non-linear phase warping strategies have been proposed that enable separate estimates of amplitude and phase variability (Strik and Boves, 1991, Lucero, 2005, Lucero, Munhall, Gracco and Ramsay, 1997 and Ward and Armfield, 2001). The most popular approach in speech production research is probably that introduced by Lucero *et al.* (1997) based on Functional Data Analysis (Ramsay & Silverman, 1997). Howell, Anderson and Lucero (in press) have recently successfully applied these methods to persons who stutter.

Applications of the above methods (and the problems encountered) are described for participants with Parkinson's Disease. The results are discussed in relation to their contribution to our understanding of speech timing difficulties in these speakers.