

## “When the pen shapes and reshapes music”: Effects of music and musical sonification on Parkinsonian dysgraphia

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**Abstract.** It has been shown that music enhances motor control of patients with Parkinson’s disease (PD). Musical rhythm is perceived as an external auditory cue that helps PD patients to better control their movements. The rationale of such effects is that motor control based on auditory guidance would activate a compensatory brain network (including the parietal cortex and the cerebellum) that would minimize the involvement of basal ganglia (e.g. Nieuwboer et al., 2009). Would associating music to movement improve its perception and control in PD? In fact, musical sonification consists in modifying in real-time the playback of a preselected music according to some movement parameters (to illustrate the method, see the supplemental material in Danna & Velay, 2017). This method was evaluated in handwriting, which is particularly vulnerable in PD patients and defined as a ‘dysgraphia’ encompassing all PD deficits in handwriting (Letanneux et al., 2014). In the present study, nine patients with PD and nine control subjects volunteered for the experiment. A ‘test-training-test’ design was applied three times, with different conditions of training (counterbalanced order): with music; with musical sonification; and in silence. The tests consisted in writing loops, the French word “cellule” (meaning “cell”) four times, and signing. Preliminary results, in both PD patients and controls, revealed that handwriting velocity and trace length were higher after training with musical sonification than after training with music and silence. If confirmed, this finding highlights the clinical interest of musical sonification in motor control and (re)learning.

**Keywords:** Movement sonification; Music; Handwriting; Parkinson’s disease