Investigating embodiment mechanisms in music perception: the case of traditional dance music

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We describe a novel experimental framework to investigate the influence of motor activities on music perception. The underlying intuition is that many yet-unexplained aspects of music - and notably rhythm - perception (syncopation, phrase grouping, "groove", "moods"...) result from an embodied perceptive process in the central nervous system, constrained by physical laws of the neuromuscular system, which mostly is not under voluntary control. The context for the experimentations is a form of French folk dance and music called *hanterdro*. We played computer-generated music (MIDI), where timing and intensity can be controlled to the millisecond, to 3 subjects who were asked to perform a corresponding dance. The dancers' movements were simultaneously recorded with a motion capture system, as a precise trajectory of body points in a 3D space. We prepared 4 different musical stimuli, based on variations on a traditional hanter dro melody (``Jolie coeur de rose"). Each stimuli is composed of a repeated phrase, with continuous variations of some musical parameter (for instance, increasing amounts of syncopation on a given note). Preliminary results on the data – which is still being analysed – show that the timing of simple stepping patterns can be influenced by musical events which occur not on, but rather between, the onsets of the steps (Fig. 1). Such observations – if confirmed by further analysis - are a step toward clarifying the neural mapping (a non-linear differential equation) between rhythmic sound and movement.

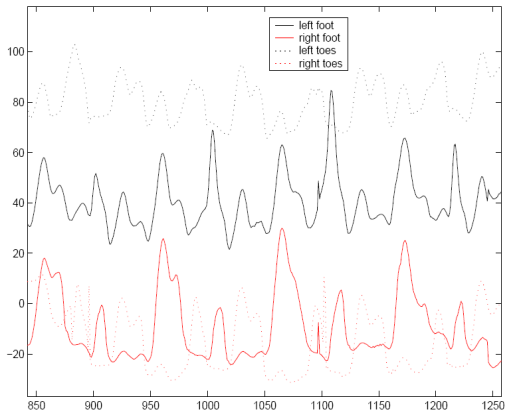

Fig.1 A typical recording of the hanterdro step pattern, with the vertical position of two markers on each foot of a subject. The periodic dance pattern (short-short-long-long) appears clearly, as well as a number of more precise behaviours, such as non monotonic raise of the foot during the suspensions corresponding to the long step. The timing of such micro-gestures seem to be semi-consciously influenced by musical perturbations such as syncopation.

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