Rhythmical structures in music and body motion in Afro-Brazilian samba and Norwegian telespringar

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Afro-Brazilian samba and Norwegian telespringar are both often characterized by their complex rhythmical patterns. More specifically, recent studies have identified the existence of systematic anticipation of the third and fourth sixteenth note in a beat in samba groove, while telespringar, normally notated in ¾, is recognized for a type of *asymmetrical meter* featuring a long – average – short (L – A – S) duration pattern at beat level. Considering the strong relationship between music and dance in both samba and telespringar, the present study proposes that, in addition to sound data, motion data from both musicians and dancers should be incorporated into analyses of these rhythmical structures.

In this study, we investigate whether the microtiming features previously shown in samba and telespringar music are also represented in the body motion of performers who are playing and dancing. We derive our discussion from motion-capture experiments where skilled samba and telespringar performers were recorded using an advanced optical infrared motion-capture system. This system tracked the movements of reflective markers attached to the participants' bodies. The sound and motion data were analyzed using the MIR and MoCap Toolboxes for MatLab, and our statistical analyses were performed using SPSS (IBM, Inc.).

Our study's audio analysis of samba confirms the existence of a systematic anticipation of the third and fourth sixteenth note in a beat. Moreover, it reveals a synchronized systematic microtiming pattern in both the musician's heel-tapping and the dancer's steps. Our study's audio analysis of telespringar also confirms the L – A – S pattern at the beat level, with an average ratio of 38:34:28. A synchronized L – A – S pattern was also found in the foot-stamping of the musician, accompanied by upper-body swaying at bar level. It is therefore clear that the microtiming features found to be characteristic of the sound of samba and telespringar are also present in performers' body movements. These observations support the view that these systematic microtiming features are not a matter of deviation from an underlying perceived pulse with isochronous subdivisions in samba or from an underlying isochronous pulse in telespringar. Instead, they actually constitute an essential feature of the samba and telespringar.