Culture-Driven Plasticity and Imprints of Body-Movement Pace on Musical Rhythm Processing

*Ségolène M. R. Guérin[1,2], Emmanuel Coulon[2], Tomas Lenc[2,3], Rainer Polak[4], Peter Keller[5], Laurie Gallant[2], Antoine Boveroux[2], Sylvie Nozaradan[2]

1. URePSSS, Université du Littoral Côte d'Opale, 2. Institute of Neuroscience (IoNS), Université Catholique de Louvain (UCLouvain), 3. Basque Center on Cognition, Brain, and Language (BCBL), 4. RITMO Centre for Interdisciplinary Studies in Rhythm, Time and Motion, University of Oslo, 5. Center for Music in the Brain, Department of Clinical Medicine, Aarhus University & The Royal Academy of Music Aarhus/Aalborg

Music naturally induces human movement through its rhythmic structure. Conversely, synchronised body movement can shape rhythm perception –a short-term effect that is likely influenced itself by lifelong cultural exposure. Yet, direct experimental evidence for both short- and long-term modulation of rhythm processing through movement remains limited.
To address this, we present a registered report using electroencephalography (EEG) and hand-clapping responses to a highly syncopated, metrically ambiguous rhythm derived from West/Central African musical traditions (N = 80). These neural and behavioural responses were recorded separately in participants from West/Central Africa and Western Europe before and after a body-movement session involving stepping and clapping to a cued beat (either three- or four-beats meter, the latter concurring with original music-cultural conventions).
African participants exhibited a significant short-term effect, clapping more consistently and in closer alignment with the beat as cued in the body-movement session. They also more reliably interpreted the rhythm in line with cultural conventions, both before and after movement. In contrast, European participants showed no significant short-term movement effect. A sibling study was then conducted on an additional Western cohort (N = 40), where the body movement session was replaced by watching audiovisual clips of individuals performing the same body movement as in the first study, while remaining still. In contrast with Study 1, behavioural responses to the cued beat were found to be significantly more consistent after the training session, suggesting that multisensory inputs, possibly activating motor representation without actual movement production, can elicit a short-term effect even when production of actual movement does not.
Finally, inconsistencies between neural and behavioural data in both studies suggest that a brief training session alone may not robustly stabilise a beat interpretation that can be automatically reactivated in neural activity after the movement cessation, particularly in response to a complex, syncopated rhythm. Nonetheless, when participants are compelled to move to such a rhythm, they can draw on learnt beat–rhythm association to guide movement timing.

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