

Music favors synchronized movement more than speech: Is isochrony key?

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Spontaneous and deliberate motor synchronization with music is widespread (e.g., in dance or when tapping our foot or body swaying in sync with musical beats). In contrast, synchronization with spoken utterances is rare. Speech, albeit featuring rich rhythmic organization (Liberman & Prince, 1977; Port, 2003), and serving as an inter-personal communication device (Auer, Couper-Kuhlen, & Müller, 1999), unlike music, is typically not conducive to synchronized movement. This discrepancy between music and speech in favoring sound-movement coupling likely results from greater regularity of musical beats (i.e., isochrony) as compared to speech stresses. Another factor which may be responsible for music superiority over speech in “attracting” movement is meter (i.e., regular pattern of embedded temporal periodicities). These factors were examined in an experiment using a distractor paradigm, successfully adopted in previous studies to show superiority of the auditory modality over the visual modality in attracting movement (Repp & Penel, 2004). Participants were asked to tap their index finger along with isochronously presented sounds (targets), while in separate conditions music and speech distractors (i.e., familiar musical excerpts and fragments of children poetry, respectively) were presented at one of various phase relationships with respect to the target. The distractors were to be ignored; thus, their disrupting effect on synchronization indicated a pervasive tendency of distractors to capture participants’ movement. First, distractors were presented without manipulation (i.e., computer generated music was perfectly isochronous and speech fragments were read by an actor who synchronized speech stresses to the sounds of a metronome; the actor was instructed to maintain constant speech rate). In four other conditions, the distractors or the pacing stimulus were progressively manipulated. The average fundamental frequency of the distractors was equalized, and, in another condition, music beats/ speech stresses were made both isochronous. Moreover, low-level acoustic factors such as the timbre of the pacing stimulus and distractors’ loudness were controlled. We tested five groups of university students (n = 162) without formal musical training. Each group was submitted to one of the five conditions. In all conditions music exhibited superiority over speech in capturing movement. Music distractors had a greater modulating effect on asynchrony and/or its variability between taps and target stimuli, irrespective of beats/stresses in the two distractors being equally isochronous. When potentially confounding factors were controlled music distractors still led to higher variability of asynchrony than speech distractors did. These findings argue against the hypothesis that isochrony is the sole factor responsible for music’s pervasive tendency to attract movement. In this experiment, although speech distractors had a quite regular metrical structure, they weren’t comparable to music distractors. Musical events occurring in between isochronous beats were regularly timed, thus conferring to music a regular metrical structure. In contrast speech distractors were less metrically regular. These differences between music and speech may account for music superiority over speech in attracting movement. Meter may be the key factor fostering strong coupling between sound and movement.

Auer, P., Couper-Kuhlen, E., & Müller, F. (1999). *Language in time. The rhythm and tempo of spoken interaction*. New York: Oxford University Press.

Liberman, M., & Prince, A. (1977). On stress and linguistic rhythm. *Linguistic Inquiry*, 8, 249–336

Port, R.F. (2003). Meter and speech. *Journal of Phonetics*, 31, 599-611.

Repp, B.H., & Penel, A. (2004). Rhythmic movement is attracted more strongly to auditory than to visual rhythms. *Psychological Research*, 68, 252-270.