

Lack of beat isochrony disrupts motor performance in a child drummer prodigy

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Abstract

Several studies have focused on coupling between perception and action (e.g., via finger tapping), and more generally on entrainment, in average musicians and non-musicians. Yet, little is known about the effects of entrainment on timing and movement kinematics in individuals exhibiting outstanding rhythmical abilities. In this study we examined the effect of beat isochrony on the performance of IF, a 7-year-old child drummer prodigy. IF displayed very early (at 3-4 years of age) outstanding musical abilities, and exceptional sensorimotor synchronization. To assess whether temporal regularity of the underlying beat (i.e., isochrony) during music playing affects IF's performance we tested IF and a "control" group (i.e., children from music schools with 1-to-1.5 years of percussion training) in a motion capture study.

Participants imitated a short 6-note isochronous metrical pattern (Strong-weak-weak-Strong-weak-weak) on a percussion pad under four conditions. In the first condition the pattern was imitated repeatedly along with a metronome. In the second condition, the pattern was repeated but with a break in between repetitions, together with a metronome. In the third condition, similar breaks were introduced, but disrupting beat isochrony (i.e., with an irregular, though predictable, metronome). Finally, in the fourth condition break durations were random. IF exhibited higher temporal accuracy than controls with an isochronous metronome. However, his performance was much less accurate with disrupted beat isochrony. This was accompanied by overall differences between IF and controls in movement kinematics in terms of movement amplitude, and anticipation times. Enhanced performance in the presence of an isochronous beat, as opposed to lack of isochrony, suggests that motor entrainment may act as a marker of musical expertise early during development.