

Relations Between Temporal Error Correction Processes and the Quality of Interpersonal Coordination

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ABSTRACT

Background

Interpersonal coordination in joint rhythmic activities, such as ensemble music making, can be temporally precise yet highly variable between individuals. This may be due to individual differences in the operation of temporal error correction mechanisms that enable internal timekeepers in co-performers to remain entrained in the face of intentional and unintentional fluctuations in tempo. ‘Phase correction’ is one such temporal adaptation process that—despite being automatic—may be a source of inter-individual variation in interpersonal coordination.

Aims

The current study investigated the relationship between individual differences in phase correction and interpersonal sensorimotor synchronization.

Method

Phase correction was assessed in 40 participants with wide ranging musical experience by estimating the average proportion of asynchronies that each individual corrected for when synchronizing finger taps with adaptively timed auditory pacing signals. Taps were produced on a MIDI percussion pad. Participants were subsequently paired to form 10 ‘high correcting’ dyads and 10 ‘low correcting’ dyads. Each dyad performed a synchronization-continuation task that required both individuals first to tap together in time with a 2 Hz auditory metronome (for 20 sec) and then to continue tapping together when the metronome ceased (for a further 20 sec). Each individual’s taps were produced on a separate percussion pad and triggered distinctive percussion sounds. Data were collected from 40 synchronization-continuation trials per dyad.

Results

The variability of interpersonal asynchronies was greater for low than high correcting dyads only when the metronome paced the interaction. The lag-1 autocorrelation of interpersonal asynchronies was likewise only relatively high in low correcting dyads during paced tapping.

Conclusions

Individual adaptive timing capabilities predict the quality of interpersonal coordination during dyadic sensorimotor synchronization with a regular pacing signal, but not during self-paced dyadic synchronization. Low correcting dyads may be able to stabilize their performance during self-paced

continuation tapping by increasing the gain of phase correction or by engaging in period correction (i.e., adjusting the tempo of their tapping). These findings imply compensatory mutual adaptive timing strategies that are most likely effortful and may have costs in attentionally demanding contexts such as musical ensemble performance.

Keywords

Interpersonal coordination; sensorimotor synchronization; individual differences.