Interpersonal synchronization: Discrete correction of asynchronies vs complexity matching

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Introduction: Interpersonal synchronization represents a major topic of scientific investigation, for accounting for important coordination phenomena in sport, leisure, music activities, and also for rehabilitation purposes. Several models have been advocated for accounting for these processes. In this communication we contrast two hypotheses on synchronization: a discrete process of mutual correction of asynchronies, which belongs to the cognitivist tradition, and the complexity matching hypothesis (West et al., 2008), which emphasizes the effects of a global, multiscale coordination between systems.

Methods: We analyzed series recorded in various experimental situations (synchronized tapping, synchronized forearm oscillations, synchronized walking, walking in synchrony with an irregular metronome). Series were submitted to the Windowed Detrended Cross-Correlation analysis (Roume et al., 2018), a method that focuses on short-term synchronization process between systems.

Results: Results showed that in most cases, synchronization was dominated by discrete process of mutual correction of asynchronies. The only situation where complexity matching was unambiguously evidenced was side-by-side walking. Interestingly, walking in synchrony with an irregular metronome appeared also dominated by a discrete process of asynchrony correction.

Discussion: These results question the possibility for deriving a universal model of interpersonal synchronization. Asynchrony correction appears dominant in laboratory tasks, involving simple effectors movements (tapping or forearm oscillations). Complexity matching occurs in more natural situation, involving more global activities (walking). Finally complexity matching seems likely to occurs only when two complex, living systems, are in mutual adaptation.

Conclusion: We recently showed that the complexity matching effect could allow restoring complexity in deficient systems (Almurad et al., 2018 ; Ezzina et al., 2021). This result offered interesting perspectives, especially for preventing falls in elderly. The present results suggest strong limitations in the choice of tasks that could be used for such rehabilitation purposes. Further research efforts are necessary for a better understanding of the complexity matching effect in everyday life situations.

References

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