

Complexity matching in side-by-side walking

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The processes that sustain interpersonal synchronization (IS) are still poorly understood, and several theoretical frameworks have been proposed: The information-processing approach suggests that IS is based on representational processes of anticipation [1]; The coordination dynamics perspective considers that IS could be accounted for by models of coupled oscillators [2]; The complexity matching hypothesis suggests that IS could be based on a global exchange of information between systems [3]. We propose three statistical tests for disentangling these hypotheses: correlations between multifractal spectra [4], and cross-correlations between series, which both allow to distinguish the information-processing hypothesis from the two others, and a windowed cross-correlation analysis [5], which allows to distinguish between coordination dynamics and complexity matching.

Methods

26 participants were involved in the experiment. They were paired into 13 dyads and they performed synchronized walking in three conditions: independent, side-by-side, and arm-in-arm walking. Each trial lasted 16 minutes. Stride duration series were collected and submitted to the above-mentioned tests.

Results

The analysis of correlations between multifractal spectra and the cross-correlation analysis clearly rejected the information-processing hypothesis. The windowed cross-correlation analysis showed that the averaged lag 0 cross-correlation was non significant, a result consistent with the complexity matching hypothesis.

Discussion

The results present evidence for the presence of a complexity matching effect in synchronized walking conditions. This result has important implications, especially for rehabilitation purposes. A typical loss of complexity in elderly has been reported [6]. Complexity matching offers some interesting perspectives in this regard. If an elderly person is invited to walk in synchrony with a young and healthy companion, one could expect to observe a restoration of complexity.

References:

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