Fractal properties of relative phase in bimanual tapping and bimanual coordination

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Delignières et al. (this congress) set out two models accounting for the distinguishing statistical features of time interval series in unimanual tapping vs unimanual oscillations. By coupling these unimanual models, following the event-based vs dynamical modalities respectively advocated by Ivry and Richardson (2002) and Haken et al. (1985) we proposed two models of bimanual tapping and oscillations, which are in keeping with two fundamentally different conceptualizations of coordination control. Both models enable straightforwardly distinguishing predictions concerning the serial correlations in relative phase series: whereas the coupled oscillation models predicts Long Range Correlation (LRC), the coupled tapping model predicts white noise. We put these predictions to the test of bimanual tapping and oscillation tasks. In the oscillation condition, ARFIMA modeling confirmed the presence of LRC. For most series, the best fitting models did not include any short range process. Conversely, in the tapping condition there was no evidence for LRC, and most series were best fitted by models associated an auto-regressive and/or a moving average process. These results support the fundamental differences in control of bimanual coordination carried out by the coupled tapping and oscillation models. Nevertheless, the coupled tapping model should be amended in order to provide a theoretical account for the presence of short range correlation.

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Ivry, R.B. & Richardson, T.C. (2002). Temporal control and coordination : Th emultiple timer model. Brain and Cognition, 48, 117-132.