The influence of limb and joint information on action synchronisation

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Ensemble musicians and dancers can synchronise their actions with a high degree of temporal precision. To achieve this, motor actions need to be planned in advance rather than on the basis of incoming sensory input. It has been suggested that actors can perform this anticipatory planning by mapping the motor actions of their co-actors onto their own action system and then generating a prediction of the unfolding action using their own motor dynamics. We tested this hypothesis by asking participants to synchronise a button-press with a rhythmic action that they observed on a computer screen. Participants viewed actions under two conditions. In the full information condition, they viewed an animated mannequin. This provided limb and joint information in the stimulus. In the point information condition, participants only viewed a single moving dot that tracked the movement of the mannequin's hand. We predicted that limb and joint information would facilitate mapping of observed actions onto the observer's action system. Furthermore, we divided participants into two groups depending on whether they had experience performing the observed rhythmic action. We predicted that motor experience would further facilitate this mapping allowing participants to make better use of limb and joint information. We found a main effect of display type ($p = .033$), suggesting a timing accuracy advantage when participants viewed the mannequins. Furthermore, the display type x motor experience interaction approached significance ($p = .050$), suggesting that this advantage may be larger in the motor experience group. We found no main effect of motor experience ($p = .086$). One possible explanation for these results is that the full mannequins were easier to visually track and, therefore, easier to synchronise with. This explanation, however, is unable to explain the display type by motor experience interaction. A more plausible explanation for these results is that limb and joint cues facilitate the mapping of observed actions onto the observer's motor repertoire. This would lead to an increase in synchronisation accuracy by allowing observers to use their own motor dynamics to generate action predictions.