

# Bimanual coordination learning with different feedback modalities and information types

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Coordination dynamics has been adopted as a way to probe the relationship among human brain, mind, and behavior. Previous studies have shown that bimanual coordination learning is more resistant to the removal of feedback when acquired with auditory feedback than with visual feedback. However, it is unclear whether this differential “guidance effect” between feedback modalities is due to better sensorimotor integration via the non-dominant auditory feedback channel or better linkage to kinesthetic information under rhythmic input. The current study aimed to examine how modalities (visual vs. auditory) and information types (visuospatial vs. rhythmic) of concurrent augmented feedback influence bimanual coordination learning. Participants either learned a 90°-out-of-phase pattern for three consecutive days with Lissajous feedback indicating the integrated position of both arms, or with visual or auditory rhythm feedback reflecting the relative timing of the movement. The results showed differential progression of error reduction under these three conditions during acquisition and diverse performance change depending on feedback condition after practice when feedback was removed, implicating that the guidance effect could be jointly determined by modality and information type of feedback. However, similar performance change across groups in dual-task interference, during which participants performed irregular rhythm counting task together with the motor task, suggested that a similar motor representation might be preserved, albeit acquired under different feedback conditions. Furthermore, as auditory rhythm counting seemed to interfere more with the movement compared with visual rhythm counting, the execution of the motor task could involve the retrieval of the rhythmic information in auditory format.