Learning sensorimotor mappings for speech and limb movements in adults who stutter

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Subjects learn to perform accurate movements when the relationship between effectors and sensory feedback is manipulated. This phenomenon provides a foundation for hypothesis-driven studies of deficits in sensorimotor learning. Theoretical work has suggested that stuttering may result from difficulties with learning sensorimotor transformations. Interestingly, stuttering is also associated with nonspeech motor differences. Therefore, we investigated whether stuttering and nonstuttering adults differ in the learning of novel sensorimotor transformations for speech and limb movements.

In Study I, subjects produced words while, in the adaptation phase, formants in the auditory feedback were shifted up or down. Gradual and sudden shifts were included because basal ganglia and cerebellum—previously implicated in stuttering—may differentially affect adaptation to sudden versus gradual distortions. In Study II, subjects made reaching movements in a virtual environment in which start, target, and cursor stimuli appeared in the horizontal plane of the hand but the hand remained invisible. In the adaptation phase, coordinates of the cursor representing finger-tip position were rotated 30^{o} around the start position.

We report data from pre-exposure, adaptation, and after-effects trials, and we integrate findings in the context of a theoretical model of the neural substrates and sensorimotor mechanisms underlying stuttering.

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