Changes in visual-spatial cognition when adults learn American Sign Language and how pre-existing visual-spatial abilities predict success in learning.

Visual space has unique importance in signed languages because, unlike spoken language, signed languages use space to encode multiple linguistic features. For example, space is used for grammar, where spatial locations, and movements between them, are used to mark grammatical features such as subject and object. This implies that visual-spatial cognition is involved in processing signed languages, and indeed native signers have enhanced visual-spatial working memory (Wilson et al., 1997) and mental imagery abilities (Emmorey et al., 1993; Emmorey et al., 1998). Fluent, non-native signers also have enhanced visual-spatial working memory (Keehner and Gathercole, 2007), and hearing children learning sign language show visual-spatial cognitive benefits after one year of experience (Capirci et al., 1998). It is not known, however, how much experience is needed to see this effect in adult learners. Furthermore, beyond improvements in visual cognitive skills with sign language learning, it is not clear if pre-existing individual differences in visual-spatial cognition can predict success in ASL learning.

In the present study, English speakers with no prior sign language experience were recruited from first level ASL courses and performed tasks that assessed their working memory and their visual-spatial cognition before and after one academic term of ASL instruction. To determine whether changes in visual-spatial cognition are specific to learning a visual-manual language, we also recruited adults learning any first level spoken language to serve as controls. Working memory was assessed with the OSPAN tasks. Visual-spatial working memory was assessed by the Movespan task, which evaluated working memory for human actions, and by the Corsi block-tapping task (regular and rotated). Mental imagery ability was assessed by the mental clock imagery task, while mental rotation was assessed with the 3D block and the rotated Corsi block-tapping tasks. Finally, the ability to imagine different spatial perspectives was measured by a modified version of the Perspective Taking/Spatial Orientation Task. The ASL proficiency of the participants was assessed pre and post language training with an ASL Picture Naming test and an ASL Recognition test.

We predicted that ASL learners would show more improvement on the visual-spatial cognitive tasks than the spoken language learner controls. We also expected that, within the ASL group, individuals with better performance on working memory tasks and visual-spatial tasks prior to language training would show better performance on the post-test ASL proficiency tests. Results will be discussed in the context of second language acquisition and used to provide insights on the cognitive benefits of learning a visual-manual second language.

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