Neural predictors of visuomotor adaptation rate and multi-day savings

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Recent studies of sensorimotor adaptation have found that individual differences in task-based functional brain activation are associated with the rate of adaptation and savings at subsequent sessions. However, few studies to date have investigated *offline* neural predictors of adaptation and multi-day savings. In the present study, we explore whether individual differences in the rate of visuomotor adaptation and multi-day savings are associated with differences in resting state functional connectivity and gray matter volume. Thirty-four participants performed a manual adaptation task during two separate test sessions, on average 9 days apart. We found that resting state functional connectivity strength between sensorimotor, anterior cingulate, and temporoparietal areas of the brain was a significant predictor of adaptation rate during the early, cognitive phase of practice. In contrast, default mode network functional connectivity strength was found to predict late adaptation rate and savings on day two, which suggests that these behaviors may rely on overlapping processes. We also found that gray matter volume in temporoparietal and occipital regions was a significant predictor of early learning, whereas gray matter volume in superior posterior regions of the cerebellum was a significant predictor of late adaptation. The results from this study suggest that offline neural predictors of early adaptation facilitate the cognitive mechanisms of sensorimotor adaptation, with support from by the involvement of temporoparietal and cingulate networks. In contrast, the neural predictors of late adaptation and savings, including the default mode network and the cerebellum, likely support the storage and modification of newly acquired sensorimotor representations. These findings provide novel insights into the neural processes associated with individual differences in sensorimotor adaptation.

This work was supported by grants from the National Space Biomedical Research Institute (NASA NCC 9-58, SA03801, MA02701, and PF04101), from the National Aeronautics and Space Administration (NASA; NNX11AR02G) and NASA Flight Analogs Project, and the National Institutes of Health, and National Center for Advancing Translational Sciences, 1UL1RR029876-01