ACQUISITION OF SKILL PROFICIENCY OVER MULTIPLE SESSIONS OF A NOVEL ROVER SIMULATION

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INTRODUCTION: Following long-duration exploration transits, adaptive changes in sensorimotor function may impair the crew's ability to safely perform manual control tasks such as operating pressurized rovers. Postflight performance will also be influenced by the level of preflight skill proficiency they have attained. The purpose of this study was to characterize the acquisition of skills in a motion-based rover simulation over multiple sessions, and to investigate the effects of varying the simulation scenarios. METHODS: Twenty healthy subjects were tested in 5 sessions, with 1-3 days between sessions. Each session consisted of a serial presentation of 8 discrete tasks to be completed as quickly and accurately as possible. Each task consisted of 1) perspective-taking, using a map that defined a docking target, 2) navigation toward the target around a Martian outpost, and 3) docking a side hatch of the rover to a visually guided target. The simulator utilized a Stewart-type motion base (CKAS, Australia), single-seat cabin with triple scene projection covering 150° horizontal by 50° vertical, and joystick controller. Subjects were randomly assigned to a control group (tasks identical in the first 4 sessions) or a varied-practice group. The dependent variables for each task included accuracy toward the target and time to completion. RESULTS: The greatest improvements in time to completion occurred during the docking phase. The varied-practice group showed more improvement in perspective-taking accuracy. Perspective-taking accuracy was also affected by the relative orientation of the rover to the docking target. Skill acquisition was correlated with self-ratings of previous gaming experience. DISCUSSION: Varying task selection and difficulty will optimize the preflight acquisition of skills when performing novel operational tasks. Simulation of operational manual control will provide functionally relevant evidence regarding the impact of sensorimotor adaptation on early surface operations and what countermeasures are needed.

Learning Objective: The use of a motion-based simulation to investigate decrements in the proficiency to operate pressurized rovers during early surface operations of space exploration missions, along with the acquisition of skill proficiency needed during the preflight phase of the mission.

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