Ecological Validity of an Accessible Gaming Interface in an Older Stroke Survivor: A Single-Case Lab-to-Home Study M. J. Lim, P. H. Lee, W. K. Song. *Gerontechnology* 25(s)

Purpose Leisure is recognized by the World Health Organization as a fundamental human right and represents a core element of Participation within the ICF (International Classification of Functioning, Disability and Health) framework [1-2]. For people aging with disability, engagement in leisure activities has been associated with improved physical, cognitive, emotional, and social functioning, as well as enhanced quality of life [3]. Commercial video games therefore hold promise as leisure-based rehabilitation tools for stroke survivors; however, standard controllers remain largely inaccessible, and the effectiveness of adaptive interfaces often diminishes when transferred from supervised laboratory use to independent home settings. This study investigates the ecological validity of a custom ball-shaped controller by examining the critical transition from lab to home use. **Method** A longitudinal single-subject A1 (Lab) – A2 (Lab+ Custom Joystick) – B (Home) design was conducted with a 68-year-old chronic stroke survivor (hemiplegia, male, onset 16 years) across eight sessions. The participant used a custom ball-shaped IMU (Inertial Measurement Unit) joystick integrated with the Xbox Adaptive Controller (XAC) to access commercial driving games (Xbox Forza and DiRT), selected for their continuous steering demands. The IMU joystick controller was a palm-sized spherical device made of soft elastomer, embedding an IMU sensor to capture rotational input. Interaction relied on grasping and wrist rotation, allowing one-handed use with minimal fine motor demand. Phase A1 (Sessions 1–3) established baseline usability with the standard XAC, Phase A2 (Sessions 4–5) introduced the IMU controller, and Phase B (Sessions 6–8) involved independent home use without researcher support. Usability (SUS) and Technology Acceptance Model (TAM) were analyzed. **Results and Discussion:** A “transition dip” in SUS scores occurred upon introducing the new device (Session 4: 45), reflecting initial learning costs, but scores recovered by Session 5 (55). Notably, home deployment (Phase B) triggered a surge in technology acceptance (TAM = 89), despite the loss of researcher support. A PEOU–PU (perceived ease of use - perceived usefulness) asymmetry emerged: while PEOU fluctuated due to setup independence, PU remained high. Crucially, the accessibility of the home environment facilitated high-dosage training. These findings suggest that accessible interfaces bridge the gap between usability and recovery by securing therapeutic dosage. Because this study did not include a comparison with alternative controllers, changes in scores should be interpreted cautiously.

References

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Figure 1. Longitudinal Trajectories of Usability (SUS) and Technology Acceptance (TAM) across Baseline (A1), Intervention (A2), and Home Deployment (B) Phases.