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The Effects of a Driving Simulator on Driving-Related Skills Necessary for ADL and IADL Function

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Background

Returning to driving is often a goal for an individual following a neurological impairment. Critical skills for success in returning to driving include intact cognition, visual, and visual-perceptual skills which are skills that are commonly compromised in individuals who have had a neurological accident. In addition, these skills are necessary for other areas of instrumental activities of daily living (IADLs), as well as activities of daily living (ADL) performance (Crotty & George, 2009). Emerging evidence has shown the use of driving simulator training as an intervention to increase on-road driving performance (Bedard et al., 2008). There is little evidence on the effects of driving simulators on specific skills, such as visual skills, and the generalizability this may have on ADL function and other areas of IADLs. It is prudent to investigate the effects of a driving simulator on skills crucial to everyday function.

1 Ask: Research Question

Does the use of a driving simulator improve visual, cognitive, and visual-perceptual skills that are necessary for ADL and IADL function?

2a Acquire: Search Terms

Databases: Scopus, PubMed, ClinicalKey, Medline
Search Terms: driving reintegration, therapy outcomes, cognition, neurological impairments, visual attention, stroke, community mobility, driving simulator, driving intervention, driving training, traumatic brain injury

2b Acquire: Selected Articles

Akinwuntan et al. (2010): Randomized Controlled Trial. Compared the effects of driving simulation training versus a control group who received cognitive rehabilitation training on driving-related visual attention skills in moderately impaired stroke survivors.

Shimada et al. (2018): Randomized Controlled Trial. Compared the effects of a safe driving skill program composed of 10 1-hr vision training and driving simulator training sessions and 10 1-hr on-road driving training sessions versus a control group who received 1 hour of classroom education about driving safety in older adults with mild cognitive impairments.

3a Appraise: Study Quality

Akinwuntan et al. (2010): Level II. n=48; randomly assigned to group with driving simulation training (n=22) or control group (n=26). Used the Barthel Index and Mini Mental Interview, shown to be reliable and valid assessment tools. The study was done in Pellenberg, Belgium. No true control group or baseline used, unable to rule out practice effect and spontaneous recovery.

Shimada et al. (2018): Level II. n=146; randomly assigned to group with safe driving skill program (n=70) or control group with one hour of classroom education (n=76). Used the National Center for Geriatrics and Gerontology Functional Assessment Tool and the MMSE to measure cognitive function and a Dynamic Vision Analyzer to measure visual acuity/dynamic vision, both reliable and valid tools. Study personnel involved in data collection were blinded to randomization. The study was done in Obu, Japan.

3b Appraise: Study Results

Akinwuntan et al. (2010): Dependent variable measured using the Useful Field of Vision (UFOV) test. No significant difference between groups ($p<.05$). Greater number of participants who received driving simulation training were able to pass a comprehensive pre-driving evaluation including an on-road test at 3-month follow up.

Figure 1. STISIM Drive System. Retrieved from https://stisimdrive.com/research/mcab180/

Shimada et al. (2018): 146 participants completed the 3-month follow-up. Dependent variable was measured by completion of an on-road driving evaluation. Driving performance was rated on a 28-item scale with a total score ranging from 100 (best) to no lower limit (worst). Secondary outcome measures were the number of critical errors of safe disconfirmations and dangerous driving. Results were statistically significant between groups. Dynamic vision showed significant improvement ($p<0.04$) but cognitive performance did not, suggesting that driving skill is independent of cognitive function.

4 Apply: Conclusions for Practice

Evidence demonstrates a positive effect on the use of driving simulation on visual skills, but little evidence to show the effectiveness of a driving simulator on cognitive skills, suggesting safe driving skill is independent of cognitive function. In addition, strong evidence was not found to support the use of a driving simulator over other forms of visual and cognitive training. Further research is needed to determine effectiveness and if this intervention generalizes to other areas of ADL and IADL performance. Future research should focus on on-road driving and its effects on ADL/IADL performance.

References:

Akinwuntan A.E., Devos H., Verheyden G., Baten G., Kiekens C., Feys H., & De Weerdt W. (2010). Retraining Moderately Impaired Stroke Survivors in Driving-Related Visual Attention Skills. *Topics in Stroke Rehabilitation, 17*(5), 328-336.

Bedard M, Porter MM, Marshall S, Isherwood I, Riendeau J, Weaver B, Tuokko H, Molnar F, Miller-Polgar J. (2008). The combination of two training approaches to improve older adults' driving safety. *Traffic Inj Prev;9:*70–76.

Crotty M. & George S. (2009). Retraining visual processing skills to improve driving ability after stroke. *Arch Phys Med Rehabilitation, 90*, 2096-2102.

Figure 1. *STISIM Drive System* [Online Image]. (n.d) Retrieved March 25, 2019 from https://stisimdrive.com/research/mcab180/. Copyright 2017 by Systems Technology, Inc.

Shimada, H., Hotta, R., Makizako, H., Doi, T., Tsutsumimoto, K., Nakakubo, S., Makino, K. (2018). Effects of driving skill training on safe driving in older adults with mild cognitive impairment. *Gerontology, 65,* 90-97. doi: 10.1159/000487759

Evidence supports the use of driving simulation training on visual skills related to ADL/IADL performance.

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