VR & AI-based mobile apps in enhancing independence of daily function in older adults

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Purpose People with early dementia often presented with a diverse set of symptoms, including cognitive, emotional and behavioral domains. These will significantly hinder their safety, increase care demand in daily living and cause high pressure to their care-givers. The mobile application combing both virtual reality (VR) and artificial intelligence (AI) is the way to bring up an effective, low-cost and highly accessible solution to early detection and intervention in terms of cognitive and daily living function (Hung,et al. 2020). **Method** Through the development of a user-friendly and interesting mobile application, this pilot study aimed to promote a self-paced training routine among older adults. Four virtual training scenes (use of public transportation, supermarket shopping, money management and simple cooking) are critical to independent daily living of the older adults (Lai, et al., 2022). With the elements of game-like structure, the training motivation of older adults in using the application can be improved. Through analyzing the utilization pattern and training outcome, AI-system can offer individualized training contents according to the data gathered. Among these elderly users, we have divided them into high- (> 6 weeks) and low- users (≤ 6 weeks) groups and evaluated their change /improvement in the primary outcome measure (pre- and post- test), i.e. built-in outcome measures which is based on Chinese Multiple Errand Test (CMET) content. This serves as initial process of showing effectively of the Apps. Their Apps usage would be 2-3 times/weeks, each time 30mins or more. **Results and Discussion** Using independent *t*-test, it is found that there were statistically significant difference between the two users groups in achieving cumulative good scores, in terms of number of trophy obtained during Apps usage. High use groups received more trophy in three of the four modules as compared with low use group. It may be partly due to longer period of use, thus gaining the benefits of the training and becoming more proficient in the Apps content and coping better the cognitive demand and achieving goals set in each of the four modules. Using 1-way repeated measure ANOVA, we compared two groups (high and low use group) across 2 time points (first using and last using). It is found that means of number of correct ($F(1,97)=48.67$, $p<0.001$), and error shopping ($F(1,97)=39.85$, $p<0.001$) have shown improvement in high use group. It is suggested that the a user-friendly and interesting mobile application can promote self-paced cognitive training among older adults. Initial results seems to support the utilization pattern and training outcome via AI-system and the individualized training contents.

References

S.C.W., Hung, A.Y.,Ho, H.W.L., Lai, C.Z.W. Lee, A. S.K. Pong, & F.H.Y. Lai. (2020). Meta-analysis on the effectiveness of virtual reality cognitive training (VRCT) and computer-based cognitive training (CBCT) for individuals with mild cognitive impairment (MCI). *Electronics,* 9(12),2185. https://doi.org/10.3390/electronics9122185

F.H. Lai, A.Y.Tong, A.W. Fung et al. (2022). Information communication technology as instrumental activities of daily living for aging-in-place in Chinese older adults with and without cognitive impairment: the validation study of advanced iInstrumental activities of daily living scale. *Frontiers in Neurology,* 13, 46640. Published 2022 Mar 9. doi:10.3389/fneur.2022.746640

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