THE RISE OF A NEW HOPE: THE EFFECTIVENESS OF VIRTUAL REALITY TECHNOLOGY FOR ELDERLY CARE

*Andrada-Elena **Stan***

Sociology Department, University of Utrecht, Utrecht, The Netherlands

Corresponding Author: Andrada-Elena Stan, research.psycho.logy13@gmail.com

Abstract. With the new advances in technology, there is plenty of room for renewing the therapeutical approaches made available to the public, and, in the case of this paper, to the geriatric population. Previous studies have shown Virtual Reality (VR) technology to be effective in increasing the levels of physical activity, and in improving one's wellbeing and cognitive functions. This is the case for both healthy participants, and for those with cognitive disorders (such as dementia). One aim of the present commentary is to discuss the available literature on how VR aids cognitive functions and wellbeing in the geriatric population. Another aim is to discuss the effectiveness of this technology as a therapeutic approach for complicated grief, a newly introduced disorder with no established treatment. Last, the commentary will bring forth different issues that the implementation of the VR technology may face, as well as different avenues for future research.
Key words: technology, virtual reality, older adults, grief

Rezumat. Avansarea tehnologiei extinde oportunitățile de înnoire a metodelor terapeutice oferite atât publicului larg, cât și, în cazul acestei lucrări, populației geriatrice. Studiile anterioare au arătat că tehnologia de tip Realitate Virtuală (VR) este eficientă în creșterea nivelului de activitate fizică și în îmbunătățirea stării de bine și a funcțiilor cognitive. Acestea sunt valabile atât pentru participanții sănătoși, cât și pentru cei cu disfuncții cognitive (cum este cazul demenței). Unul dintre scopurile acestui comentariu este de a discuta literatura științifică existentă pe tema modului în care tehnologia VR vine în sprijinul populației geriatrice din perspectiva stării de bine și a funcțiilor cognitive. Un alt scop este de a dezbate eficiența acestei tehnologii ca modalitate terapeutică pentru doliul complicat, o patologie nou introdusă care nu are încă un tratament bine stabilit. În final, comentariul va prezenta atât unele dintre potențialele probleme legate de implementarea tehnologiei VR, cât și diferite direcții pentru cercetările viitoare.
Cuvinte cheie: tehnologie, realitate virtuală, vârstnici, doliu

INTRODUCTION

The technological advances brought by the 21st Century have changed the way researchers look at and think about therapeutic practices for all age ranges, but notably for helping the elderly improve their quality of life. With its increase in affordability, Virtual Reality (VR) has been more and more integrated in studies investigating the prevention of the age-related cognitive decline [1, 2, 3] and the treatment of different pathologies such as post-traumatic stress disorder and complicated grief [2, 4]. However, research in this area is still scarce, replications are missing, while the barriers to potential implementation of VR in healthcare systems need to be considered from a policy standpoint. Thus, the aim of the present commentary is to discuss the existing research on the effectiveness of VR in different health areas, while considering the potential obstacles of introducing this technology to the existing healthcare system.

Cognitive training

A first applicability of VR is its use for cognitive training in order to promote healthy ageing in the attempt to prevent (or at least delay) health issues such as dementia [1]. In their review of the benefits of VR for cognitive training, Bauer and Andringa [1] explained that multisensory integration of information is essential for effective learning, especially if accompanied by movement. VR is offering such a possibility for learning due to its immersiveness (through the head-mounted display), while encouraging movement in a safe environment (tracked by the equipment's sensors).

Eisapour et al. [3] looked at three patients with Mild Cognitive Impairment (MCI) and showed that for the elderly, physical exercise is very important in sustaining their wellbeing and cognitive functions. Precisely, exercise was associated with increased fitness, physical functioning, cognitive functioning and positivity in

behaviour [3]. Specifically looking at the cognitive functions, Bauer and Andringa [1] discussed a series of studies investigating learning through VR. Results showed that VR activities/training did increase the amount of learned material. However, the samples used in these studies consisted of university students. The reported studies that also included an elderly participant sample had more mixed results. This leads to two important conclusions: on one hand, more research needs to be done on the learning effectiveness of VR for the elderly and, on the other hand, this should be done consistently.

VR's benefits for improving this vulnerable group's quality of life

From the existing literature on this topic, D'Cunha et al. [2] report an important idea, which is the potential benefit of using VR for elderly with MCI and with dementia (i.e., people living with dementia, PLWD). Since this demographic tends to be socially isolated [5, 6], and since social isolation is positively related to cognitive decline and negatively associated to one's quality of life (QoL) [2]), the characteristics of VR are promising. VR represents an effective way to combat social isolation, by creating the opportunity to socialise with others (real or not) and by engaging patients in cognitive training and in emotionally calming experiences [2, 7]. These latter experiences are of high importance for PLWD who experience a high degree of stress, anxiety and confusion. Moreover, social isolation can be removed even further by adding a touristic feature to the VR experience (i.e. depicting different parts of the world/ museums). This technology can also be utilised to stimulate memory functions [2], which makes it of particular interest for PLWD since through this training, they can regain some level of control over their lives. With this increased level of independence, the elderly's quality of life is also enhanced.

In their study, Guerrero et al. [8] implemented intelligent assistive systems (IASs) in order to help the elderly with their medication intake. This was done in an Augmented Reality (AR), rather than VR environment and it only had a sample of three. The results show that efforts targeting the implementation of this technology are worthwhile, however the research is in its incipient stage and technical difficulties still pose great obstacles.

There are however, VR projects in place that can help sustain a good quality of life for the elderly which have surpassed these issues (i.e., SENSE-GARDEN) [2, 9]. The benefits of such an equipment is that the patient can communicate, engage in physical activity and in cognitive training, within the comfort of their own homes while supervised by their careers.

VR can also be used as a therapeutic approach in helping people recover from stroke [10, 11], which is possible both by entering patients in a virtual environment, and by asking them to use VR while playing computer games [10]. Living with chronic pain, and even with those types of pain that come with normal ageing is an unpleasant experience, therefore another quality of life benefit from using VR is that it can produce analgesic effects [11]. Therefore, this technology is a tool that can help overcome the burden of different disorders and illnesses, with the possibility to fully recover from them.

A specific example: VR and treating complicated grief

Complicated grief (CG) is a (relatively) newly introduced disorder that exhibits a symptomatology similar to post-traumatic stress and major depressive disorders, without being responsive to the same treatments as these latter ones [12-14]. It occurs when one cannot adapt to the loss of a loved person even after a long period of time has passed since the death event (usually, the time threshold is 6 months after the event, but this limit can change based on the griever's cultural, religious and normative background) [13]. This condition provokes significant impairments to the griever's life on personal, social and work levels, with a significant impact on their physical and mental health [15, 16].

The younger population has been considered at higher risk of developing CG since for them the death event comes more unexpectedly [17]. However, the elderly can also be at high risk of developing it, because they have a higher likelihood of experiencing the deaths of multiple loved ones during their lives [12]. Indeed, this is very much possible: when looking at the

prevalence of CG in adult bereavement, Lundorff et al. [13] have found that the elderly could be placed at higher risk ("could" is being used since their mediation analyses were borderline, therefore not rigorously statistically significant). The authors explain that this could be due to a more precarious health condition on one hand, and due to a loss of social support on the other. Additionally, the Covid-19 pandemic could have also placed the elderly at higher risk of developing CG because of the isolation, health perils imposed on them by the virus, and because of not having a chance of conducting the usual rituals that help them say goodbye [13, 18].

Given the great impact CG is expected to have in these circumstances on the geriatric population, the remaining question is how to effectively treat it. As previous research has shown, CG is not responsive to pharmacological treatment, which would anyway be counter indicated for the geriatric population [13]. Exposure therapy has been shown to be effective in helping patients recover from anxiety and stress related disorders, such as phobias, post-traumatic stress disorder and other trauma related disorders [4, 18]. This is because it helps patients face their fears with an increased intensity in a controlled and monitored environment.

One way of delivering exposure therapy is through VR technology. Pizzoli et al. [18] described a Korean documentary entitled "I Met You", which depicted a mother interacting with the avatar of her lost daughter through VR experience. The mother expressed a sense of relief at the end of the interaction, however the authors warn clinicians about this practice as for some, it can be too sensitive. They recommend the careful development of standardised protocols by trauma experts in using VR exposure therapy of such strength. They also explained that the experience should be of incremental intensity (e.g., by starting with an interaction depicting an environment the deceased had in common with the griever) and should be tailored to each patient's experience, needs and sensitivities.

A first study that did this was conducted by Quero et al. [4]. The researchers screened for patients with adjustment disorders, in which they also included CG symptomatology. They then categorised patients into three groups: waiting list (i.e. control), traditional intervention and VR intervention (i.e., EMMA's World). They also investigated the effects of the intervention at 6 months and 12 months follow-ups. Results showed that both the traditional and VR interventions were beneficial for the patients even at 6 and 12 months after the experiment. Interestingly, at the 12-month follow-up, the VR group showed a higher level of recovery compared to the traditional intervention group. Therefore, a possible conclusion of this study is that both interventions are effective, but in the long-term, the VR one is of superior quality. Moreover, their descriptive statistics showed that more people preferred VR when compared to the traditional intervention.

Although these results are promising, Pizzoli et al.'s [18] worries that not everyone is suitable for or accepting of technological therapies cannot be dissipated just yet [4]. More research is indeed required, and clinicians need to properly design protocols and experiments in the search for an effective therapy. Nevertheless, given that this disorder has a different responsiveness to therapies for comorbid disorders and that it tends to precede more severe ones (like post-traumatic stress) [19], VR exposure therapy is a promising avenue that makes researcher's efforts towards finding a proper treatment worthwhile.

Implementation barriers and subjects for future research

Despite the evident benefits the new technology of VR can bring in the lab, there certainly are some barriers to systematically introducing it in healthcare facilities.

Both the elderly, and the healthcare personnel show signs of digital illiteracy, and it can be challenging to teach them how to use this new tool. New technology can seem scary to use and this could impair one's will to even try to learn. Fortunately, the elderly seem quite intrigued by the equipment and motivated to take part in activities that involve the VR method [1, 7, 20]. However, some patients might find the head-mounted display to be uncomfortable, aspect which should be considered.

Moreover, convincing the healthcare personnel to learn how to use VR can be challenging. They already face a high demanding, stressful job, some of them experiencing burnout [21]; therefore, they might meet the idea of an extra task with resistance. Institutions that would like to adopt this new technology should highlight the benefits of this new method based on the available literature, and explain how this is done in the patients' best interest.

However, a high level of immersiveness and realism is not always good. This is because on one hand, it can cause cybersickness and on the other hand, it can impair the learning of some patients. Cybersickness is represented by the same symptomatology as motion sickness and is evoked by the conflict between the visual input (i.e., seeing on the screen that one is supposed to be moving) and the vestibular input (i.e. the vestibular system telling that one is staying on the spot) [1, 22].

Some patients with dementia might have difficulty learning through a very immersive VR environment, because too much information is being conveyed at the same time [1]. This means that the VR experience needs to be tailored to the needs and characteristics of each individual. It is possible to do this, as the equipment supports the need for personalisation, however this might add weight to the already existing problem of digital illiteracy. Moreover, it makes it more difficult for designing a standardised research protocol required to enable replication across studies.

The need for replication of the existing results showing the effectiveness of VR as a therapeutic approach for the elderly is just one area of interest for future research. Another area is represented by the need to replicate such research that has been done on youth. Bauer and Andringa [1] described studies that found support for VR's alternative in cognitive training, but this research was conducted on university students. In terms of the elderly, the studies they reported in the review showed more mixed results, therefore scientific efforts should be directed at investigating this age segment in more detail.

Furthermore, replication is not the only promising avenue for future studies, as there are also new areas of interest. One example is the focus on emotional salience. The emotional capabilities seem to be somewhat maintained in the later years and also across health groups (e.g., when looking at dementia versus healthy patients) [1, 23]; since this is a common denominator, it can more easily target the age segment in its entirety. At the same time, this salience is important in aiding learning, therefore it can help interventions aimed at cognitive training [1]. One specific emotion that can be enhanced is hope. As Hsieh [24] has shown, VR can be used to increase children's hope and pleasure levels; if this is replicated in an elderly sample, then specific therapies can be developed to help with cognitive training, but also with protection from psychological illnesses as well (such as complicated grief, depression etc.).

CONCLUSIONS

In conclusion, the now cost-effective VR technology brings up new avenues for therapeutic and research endeavours. It has been found to aid cognition through the multimodal sensory stimulation, effect found for both healthy elderly and for elderly with dementia. Moreover, it shows that it is worthwhile to target efforts at providing the elderly with VR equipment to promote and support active ageing. New possibilities arise, guiding research towards the development of effective VR-based treatments for stress related disorders, and for complicated grief. While it is true that the implementation of VR in a systematic way within the healthcare system can and will face barriers, the existing literature shows that efforts in overcoming these are worthwhile. With time, and with more research, the rise of the new hope represented by VR could become a much needed therapeutic practice, improving the wellbeing of those who came before us: our elderly.

Conflicts of interest

The authors declare no conflicts of interest.

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