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VIEWPOINTS

The Impact of Serious Games on Physical Activity, Cognitive Training and Mental Health for the Ageing Population During COVID-19: Implications and Future Trajectories

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COVID-19 has been widely affecting human social interaction due to the public health mitigation practices which have been set out by the government in various countries, such as lockdown and social isolation. As a consequence, the ageing population, one of the vulnerable groups, has been suffering from the discontinuity of regular interventions and disconnect from social life, which may likely cause physical and cognitive decline, and accelerate the development of depressive symptoms. To mitigate the challenges that have been arisen in the ageing population during the global pandemic, Serious Game (SG), one of the non-invasive novel digital technologies, offers a motivational atmosphere with a purposeful training context, as well as a remote training capability for those who lack mobility or are frail. SG is envisioned to improve their quality of life through maintaining their physical activity, cognitive training and mental health. The aim of this paper is to demonstrate the potential use of SG to improve physical activity, cognitive training and mental health among the ageing population during COVID-19.

Introduction

The ageing population has been facing unprecedented challenges during COVID-19. At the early onset of COVID-19, the fatality rates of COVID-19 in nursing homes across various countries increased,[1] i.e. the USA (42%), Belgium (42%), France (44.6%) and Ireland (54%). Furthermore, the majority of deaths were in the older group (age of 65 or above).[2] They may have been utterly disparate when compared to the younger generations due to the variation of infection and fatality rates and presentation of symptoms. Meanwhile, a range of public health mitigation practices has been advocated in communities, including lockdown and social isolation, to control the transmission of the viruses.[3] As a consequence, vulnerable populations are highly affected, especially the elderly, due to the closedown of daycare centres or hospitals, resulting in the discontinuity of on-site conventional healthcare services. Thus, this may widely affect the ageing population physically, cognitively and socially.

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According to an article by Livingston G et al. on dementia prevention, intervention, and care from 2020,[4] social isolation and physical inactivity are two of the modifiable risk factors that can potentially be mitigated to reduce up to 40% of the risk of dementia. It is worth mentioning that the elderly with comorbidities including dementia and cognitive impairment are at a high risk of COVID-19 progression.[1] However, social isolation and lockdown are two of the governmental policies in preventing the spread of COVID-19.[2,5] The disruption of physical activity imposed by the preventive policies and practices, especially isolation, discourages the elderly from sustaining regular physical activity (PA). It is evident that PA effectively maintains the physical functioning of daily life and diminishes the advancement of physical dysfunction and other diseases.[5] In addition to the other problems plaguing the ageing population during the pandemic, such as the reduction in wellbeing, qualities of activity and sleep, the level of cognitive functioning may also be adversely affected and worsened due to the intensification of depression.[2] Elderly with low level of social participation have a higher chance of developing depressive symptoms,[6] thus numerous mental health issues have arisen and been induced during the COVID-19 period. In short, there are complications and interplay between the physical and cognitive functions of the elderly, which may trigger depressive symptoms and worsen their mental health. These shortcomings are interwoven, drastically decreasing their quality of life (QoL) in the short-term and long-term.

On the other hand, face-to-face conventional healthcare services may not be a suitable platform to offer effective physical or cognitive training to the ageing population. The study by Thompson DC et al. points out that the preventive measures in nursing homes are hardly enforced due to the inability of the residents and shortage of medical carers, which lead to high frequent physical contact between the residents and medical staff, and the increased risk of infection.[1] Therefore, preventive measures should be put in place to protect the elderly, who are regarded as one of the vulnerable groups and mitigate the potential of outbreaks in the older population. However, long-term social isolation or being discharged may be devastating to the elderly, especially to those with cognitive impairment who are participating in regular intervention. To address this conundrum, technological advances, such as Serious Games (SGs) which create an engaging and fun atmosphere with therapeutic purposes, including physical and cognitive training, may help the elderly to be physically active and improve their QoL remotely, although the social engagement may still be lacking. The aim of this article is to present the potential of how SG can aid the ageing population in combating COVID-19.

Serious Games

Djaouti D et al. explain that Serious Game (SG) is a game used for a primary purpose which is beyond "pure entertainment".[7] Comprising of motivational gaming elements, SG has been widely acknowledged as part of a multitude of digital advances which can aid PA,[8] cognitive training[9] and mental health[10]

for older adults. With regards to PA, Brauner P et al.[8] investigate the SGs in promoting physical exercise via a Microsoft Kinect motion-tracking sensor. These SGs are used in ambient assisted living (AAL) to promote independent living for the elderly. The body movements are captured through sensors and presented as an avatar in the virtual scene to allow the players to interact with the game objects accordingly. The AAL is structured so that it can be implemented in the elderly's daily routine to promote an engaging environment. In response to the COVID-19 situation, AAL can be installed in the elderly's dwelling houses to motivate them to continue PA within a fun atmosphere. With respect to cognitive training, Lau SY and Agius H[9] introduce a framework and immersive SG for elderly with mild cognitive impairment (MCI) to undergo therapeutic scenarios, including activities of daily living (ADLs), instrumental activities of daily living (IADLs), reminiscence and reality orientation, with the use of a Leap Motion controller, an infrared-based device, to track the designated hand gestures required by the games. With the aid of real-time and tailored gesture-based interaction, the elderly can engage with the game tasks intuitively and motivationally, which may effectively improve cognitive functioning. The tailored training content in conjunction with light supervision by the occupational therapist may reduce the high frequency of physical interactions. To this end, it is beneficial for the elderly to attempt the appropriate training during lockdown or social isolation in the COVID-19 period. Virtual reality (VR) exergames are beneficial for cognitive function and minimize depressive issues among the ageing population. Yen HY and Chiu HL[10] argue that VR exergames can not only create realistic simulation with multisensory stimulation, but also enhance social interactions which can involve using multiplayers as placebos. These studies have shown the promising effects in using SG as a means to maintain the PA, cognitive functioning and mental health in elderly.

SG, one of the non-invasive tools, is envisioned to be one of the digital health technologies to mitigate the adverse impact which COVID-19 has brought to the ageing population. The aforementioned study[9] has demonstrated that a framework (i.e. MCI-Game Therapy Experience) as shown in Figure 1, may be an abridged design to harness useful materials for developing a comprehensive SG for physical, cognitive and mental health enhancement for the ageing population during COVID-19. MCI is the stage beyond the normal ageing process and mostly occurs at age 65+. The authors present a tailored treatment for the elderly with MCI, which entails both physical and cognitive training contents with motivational gaming components to overcome the drawbacks of traditional intervention, such as geographical constraints, time-consuming preparation, mundane style and lack of responsiveness in therapeutic tasks.

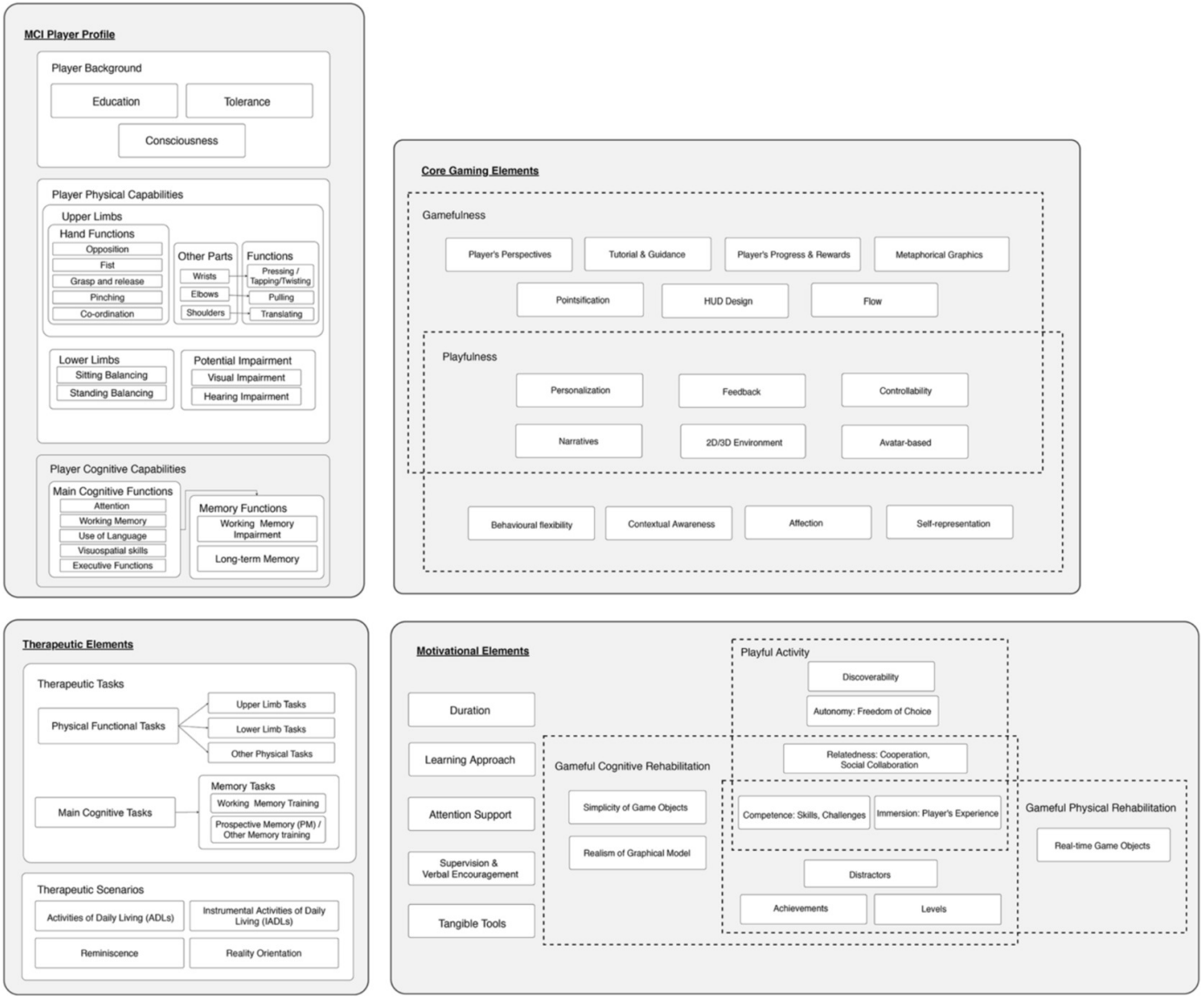

Figure 1. The MCI-Game Therapy Experience (MCI-GaTE) framework that integrates gamified physical interaction with cognitive rehabilitative context for those with MCI.(Source: Lau SY and Agius H (2021)[9])

Implications and Future Trajectories

The impacts and concerns induced by the COVID-19 situation have been summarised. The insights and findings with respect to the characteristics and flexibility of SG prove that SG can become one of the prompt digital health technological solutions to mitigate the risk of physical and cognitive dysfunction and mental issues during the time of COVID-19. Several implications in terms of the role of SG, the relationship between the individual and their family, and the health sector are elaborated below to pave the way for the future development of SG to mitigate the problems that have arisen in the COVID-19 period.

Firstly, SG plays an important role in supporting the elderly to continue physical and cognitive training during isolation. It can be used as telerehabilitation to offer a remote training platform for the elderly who lack mobility or are frail. The tedious repeated therapeutic training content can be alleviated with motivational and responsive gaming components to offer a tailored motivational playing experience depending on the elderly's physical and cognitive conditions, which may improve the adherence to regular PA and cognitive training, leading to independent living to enhance the QoL. Secondly, the disconnect between the elderly and their family is avoidable. As mentioned previously, depressive symptoms are triggered by social isolation. To this end, the involvement of multiplayers in the SG can deepen social interaction amongst family members to facilitate a sufficient degree of communication. Thirdly, it is pertinent to note that SG can ease the burden in the health sector, by maintaining effective consultation between the elderly who live in remote areas and therapists. A little amount of supervision is involved. Finally, as discussed previously, the MCI-GaTE (as shown in Figure 1) covers physical and cognitive training with motivational components to elicit a positive effect on mental health. Although it is not tailored to all elderly with various health conditions, it can be a starting point from which the SG developers and healthcare professionals can assemble interventional strategies to establish a personalised therapy for the elderly based on their medical history and personal background.

In summary, the COVID-19 pandemic highly impacts the PA, cognitive functioning and social well-being in the elderly due to the separation from their social network and the discharge from healthcare services. Therefore, advocating the appropriate assistive technologies, i.e. SG, as an interventional strategy is imperative to promote active ageing and replace on-site conventional treatment by providing remote treatment during the COVID-19 pandemic.

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Conflict of Interest Disclosures

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Ethics

Ethical approval is not needed.

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