The influence of COVID-19 pandemic on elder adults' mental health and possible digital interventions to mitigate that effect

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Worldwide population is rapidly ageing: between 2015 and 2050 the population aged 60+ years is expected to almost double, from 12% up to 22%. In absolute numbers, this means an estimated increase from 0.9 billion up to 2 billion people aged 60 or more.
Elder adults face special physical and mental health challenges which need to be acknowledged and addressed. Mental health and wellbeing are just as important in old age as they are in any other timeframe; however mental and neurological disorders in older adults account for 6.6% of overall disabilities (Disability-Adjusted Life Years - DALY) in this age group. About 15% of adults aged 60+ years face some mental disorder. [1]

Current knowledge – overview of current literature
Mental disorders are widespread within elder adults, some research suggesting that half of adults aged 65 to 84 years have had at least one episode of mental disorder within their lifetime, while one third of them experienced mental disorder within the past year and one quarter is currently having some sort of mental disorder. Anxiety and mood disorders seem to be the most prevalent ones. Moreover, considerable amounts of elders also associate subclinical psychosocial issues, like solitude and stress. Even though the latter do not account as mental disorders per se, they can result in substantial stress, and they were proven to increase the risk for a number of mental disorders. [2]
Additionally, the past almost three years added sudden and drastic changes due to the COVID-19 pandemic, which altered the physical and mental wellbeing of all people. Elder-aged adults were clinically vulnerable and more susceptible to severe detrimental effects, both directly (getting the COVID-19) and indirectly (as social isolation measures went into effect).
Social isolation and solitude have a negative impact on mental health, particularly in elder adults, and may predispose to the onset of cognitive decline. Adults with existing cognitive impairment may, in their turn, be prone to worsening cognitive and mental status due to the pandemic. Available data suggests that the COVID-19 pandemic yields a wide, negative influence on the mental wellbeing of old-age adults, regardless of being (or not) diagnosed with dementia. [3]

There's a currently increased prevalence of older adults facing depression and anxiety. In

response to the increased demand for mental health interventions (which need to be convenient to use and accessible pricewise), there were some recent increases in the number of digital mental health interventions (DMHI) to be developed and incorporated as part of existing mental health therapeutic interventions. Digital interventions seem promising, given their capacity to provide researchers, clinicians and patients with personalized instruments for assessing existing behaviors, examining, treating and properly caring for patients, which may also be used remotely. Reviews and meta-analyses supported the benefits of DMHI-s in treating and preventing depression and other mental disorders, but there is still much need for studies focused on specific benefits and usage of DMHIs in geriatric populations. [4]

Considering the increasing prevalence of ageing and chronic disease, it is of the utmost importance to focus on healthcare innovation to make personal healthcare better, including self-management care herein. Selfcare / self-management implies that people can be trained to manage their health using their own resources and abilities, thus becoming less dependent on extrinsic factors. [5]

Information technology and communications (ITC) provide some substantial potential for supporting adults in self-managing their health, including chronic diseases. There are however mixed feelings about the benefits and efficacies of ITC interventions in case of geriatric populations with chronic diseases. Existing research enabled the identification of multiple challenges related to both patients and medical care providers when integrating ITS interventions in routine care. The main challenges for geriatric patients were poor technological skills, the lack of desire to develop new competencies and reluctance to using new technologies. There were also some challenges in implementing ITC interventions, for instance slow internet connections or the lack of reimbursement from healthcare systems / private health insurers. However, the main benefits of ITC interventions include their non-pharmacological nature, providing tools for health education, encouraging continuous physical activity and observing a healthy diet. [5]

Mobile digital mental health interventions in geriatric care

Throughout the past years there has been an increasing popularity and availability of mobile digital technologies, which in its turn triggered and pushed forward the development of DMHI, including smartphone applications, remote monitoring and tracking gadgets as well as portable devices, like smart watches and virtual/augmented reality headsets. The World Health Organization, the National Health Service in the United Kingdom and the National Institute of Mental Health in the USA have recently assessed smartphone, desktop and tablet applications as effective, cost-effective and valuable methods for providing accessible therapy in case of mental disorders like depression and anxiety. [4]

Recent research has identified that DMHI may be used in the early identification, diagnostic, management and analysis of mental health status in adult patients. However, there are significantly scarce studies focused on older adults, with unique needs and preferences in terms of technology-based health interventions. Managing daily activities for older adults is an extremely complex endeavor, since most geriatric patients also face a plethora of late-onset chronic diseases. Moreover, vulnerable geriatric populations, like those inhabiting rural areas, are prone to receiving inadequate mental health support due

to the lack of mental health care facilities, services and trained professionals in non-urban settings. It is therefore of the utmost importance to acknowledge that the use of DMHI is not limited to being used in primary health care facilities but can also be implemented for usage by people dwelling in remote communities or senior residential care facilities.
As an example, technology may provide senior adults with individual or group access to physical activities using motion sensors or any other "exergaming" technologies, which may alleviate depression and anxiety and may improve the overall wellbeing and quality of life.
Moreover, improving mental health and the quality of life can also be a side effect of using technology-based services addressing individual needs, like for instance various delivery services, access to transportation and the ability to remotely attend conferences, distance learning and remote socialization events.
DMHI research yields the potential to lead to major discoveries in terms of interventional research in various diseases/disorders since it may reach populations which would otherwise lack access to standard mental health interventions, therefore expanding the boundaries of existing available services and overcoming geographical barriers by providing services to remote areas.
Despite all promises held by DMHI, there's also some threat posed by digital inequities: older adults may be unfamiliar with the new technologies and hence may feel excluded; this may aggravate their perception of existing inequities in medical care, thus aggravating their tendencies to avoid getting help and perhaps even triggering self-deprecation feelings.
The main advantage of DMHI is the opportunity they bring in terms of leveling inequities in terms of accessibility of mental health resources. However, there are presently few studies analyzing the effect of DMHI in populations specifically challenged by particular social and physical confinements.
As part of the (already vulnerable) elder adult population, there is an even more vulnerable subpopulation, like those dwelling in abusive homes, the homeless, the poor, racial minorities, refugees, gender/sexual minorities and those afflicted by physical disabilities and chronic diseases.
Schueller et all [7] widely covered how digital interventions may provide opportunities to attenuate mental health disparities within marginalized populations, stating that technology may be adapted to be more culturally sensitive and lower priced and, also, may overcome time, geographical and language barriers. In spite of all this progress, it was understood that each marginalized older adult subpopulation has different strengths and needs in terms of DMHI usage. Intense works are required to transpose into real life the true potential of technologies in terms of responding to the mental health requirements of various old-aged target groups.

Impact of COVID-19 pandemic on elder adults' mental health

The current COVID-19 pandemic implied abrupt, generalized changes into our lives, exceeding the direct effects of the infection per se and its consequences over the physical and mental health of those affected. Equally relevant were also the psychosocial effects of the measures enforced by governments worldwide for the purpose of containing the spread of COVID-19 given the traumatic course of events experienced by all those directly involved in this crisis. The biologically mediated effects of COVID-19 have proven to be multiple. Amongst the numerous clinical effects observed in severe COVID-19 patients

there were also a wide variety of neuropsychiatric signs, even if any other signs and symptoms were absent. Similarly, the psychosocial effects of the pandemic on worldwide general population as well as on first line responders and patients with preexisting psychiatric disorders were largely covered and documented. [3]
Ever since the beginning of the pandemic there were special concerns aimed at protecting the most clinically-vulnerably people in our society, including herein the elder adults.
The research performed based on the clinical data accrued in the first half of 2020 and the prognosis predictive models clearly suggested that elder adults were particularly vulnerable to COVID-19, especially if suffering from comorbidities like Alzheimer's Disease (AD). The psychical wellbeing of people with dementia undergoing social isolation is also of an extremely high risk and the rigorous clinical management of such people is regarded as a top priority, especially for those dwelling in residential homes, since up to 98% of them have neuropsychiatric symptoms.
A significant correlation between social isolation and mental health and the cognitive ability levels was already observed in elder adults and seems to be induced by solitude, meaning by that the subjective perception of social isolation. Moreover, it was discovered that higher levels of solitude were significantly associated with a brain volume decrease in left medial temporal lobe, typically involved with memory and severely damaged in Alzheimer's disease. Consequently, two recent meta-analyses suggested that both poor social involvement / isolation (for instance, living alone, being part of a limited social network, being prone to less frequent social contacts or benefiting of insufficient social support) and being lonely can significantly increase the risk of developing dementia. Therefore, an abruptly and drastically restricted social environment may be particularly detrimental for elder adults and may contribute to the aggravation of neurological ageing and neurodegenerative processes.
Searches performed on PubMed and Web of Science for identifying all relevant papers published before July 7th, 2020. Two independent reviewers have verified and selected the papers adequate for inclusion. There were some additional papers, manually added, which were not identified in performing the search. An overall 15 papers were included: 8 were focused on psychiatric symptoms caused by COVID-19 while the other 7 investigated the impact of social isolation on neuropsychiatric symptoms in elder adults. Four studies included older adults without dementia while 11 included patients with cognitive impairment, mainly due to Alzheimer's. All studied concluded that various neuropsychiatric symptoms occurred and/or were aggravated in all elder adults, regardless of preexisting dementia. Such changes were noted as a result of both COVID-19 and of extended measures imposed, requesting social isolation. Delirium, agitation and apathy were the most frequently detected symptoms, especially in case of preexisting dementia. Accumulated evidence suggests that COVID-19 has a negative, wide impact on mental wellbeing for geriatric patients, with or without preexisting dementia. The viral infection and the social isolation imposed for containing the spread of the virus yield a range of neuropsychiatric consequences. Wider studies are needed, more robustly designed in order to clarify such effects and to assess long-term implications for geriatric patients' mental health and for testing possible mitigating strategies.

Conclusions

"Vicious circle" when using technologies for diminishing the impact of isolation and solitude on mental health

Besides the COVID-19 threat, elder adults generally face the highest rates of social isolation and solitude, typically associated with a plethora of negative consequences on mental health. Physical distancing may also yield a negative influence on older adults dwelling in communities, especially for those relying on support and formal or informal care from family and/or friends, for those using the religious or community centers as social focal points, as well as those dwelling in assisted residential or support homes (where gatherings in common areas like common dining rooms or activity rooms was banned for the purposes of physical distancing). The double burden of lessening the "social bubbles" due to ageing when aggravated by physical distancing restrictions and forceful quarantine/isolation pose significant threats for the mental health of geriatric patients.

In response to the official requests to stay home there has been an important transition to online communication platforms as means to promote and maintain social connections; however older individuals used such technologies with disproportionately lesser rates as compared to younger individuals, both during and after the COVID-19 pandemic. This was mainly due to the "digital inequity" due to the generation gap, with barriers in adopting digital technologies, thus exerting a terribly inhibiting force against digital social connections amongst older individuals, when observing the requirements to stay home. The first tier of digital inequity involves inequities related to adopting and accessing technologies (for example, financial limitations), while the second tier involves actual barriers when using such technologies (for example, functional deficiencies like poor dexterity). Moreover, videoconferencing and/or communication solutions were not developed specifically for older individuals, which resulted in low usage rates before the COVID-19 pandemic and thus in difficulties in accessing and using such platforms during the pandemic.

We are therefore confronted with a vicious circle [8], in which the negative effects exerted on mental health by social isolation and solitude amongst older individuals should be alleviated by using digital solutions, but this would only be possible if the said individual already has the knowledge, the will and the technical access point required for using such technologies. Moreover, while being deprived of face-to-face interaction with older individuals during the COVID-19 pandemic, providing guidance about technology usage was a huge challenge; the challenge was even more difficult due to the physiological, age-related deficits (for instance, diminished visual acuity, reduced manual dexterity or cognitive impairment). Despite its huge potential, the impact of implementing social isolation and solitude mitigation mitigating technologies was quite limited in terms of products and services, within the real world. Unfortunately, most times the individuals that would benefit the most from digital technologies are precisely the most vulnerable and the least-probably prone to access these technologies. Major shifts are therefore required in research culture, from researcher- and technology- driven research to real-life situation focused problems and solutions. Digital inequities include a relatively large lump of problems, especially when considering this pandemic; we should therefore focus on the challenge of developing accordingly the specific technologies disregarding the perspective of older individuals.

We should aim on the short run to promote the adoption by elders of existing technologies, perhaps by having training sessions specifically designed for older individuals, and to address the normally occurring, age related changes which prevent from using the technology (for instance, alterations of memory, vision or mobility); on the longer run, we need to involve older individuals in all developmental stages throughout the lifecycle of

developing new technologies. Promising evidence suggests that participative digital co-design, if defined as a combination of user-centered designing models and community involvement, lead to higher adoption rates for mobile technologies within the mental health disorder population. The COVID-19 pandemic surely outlined the deficiencies of existing technologies and the main challenges in adopting and using them; however, co-designing strategies may be fruitful when addressing these challenges both in terms of adopting existing technologies and in developing new innovative technologies.
In populations excluding mental health disorders, the participative, digital co-design lead to promising developments, yielding promising potential for more relevant research, with better impact, better internal validation and a more rapid translation of research into practice – hence higher engagement; it therefore holds the potential do diminish the digital inequities.
Incorporating such strategies will hopefully address some of the negative side-effects on mental health for older individuals in the context of social distancing, both during and after the COVID-19 pandemic.

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