# Ageing in COVID era – Social isolation risk factors, outcomes and smart solutions

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## Abstract

*__Objective:__ To highlight the importance of social life, with focus on seniors, and to point out modalities to enhance and improve social participation. __Prior work:__ Social interactions influence our daily life rhythms and content, impacts our mood and our physical and cognitive wellbeing, the way we see and appreciate ourselves. Social distancing and physical confinement required to reduce spreading of a pathogen, like during the nowadays COVID-19 pandemic, have a serious impact on the social life of all, changing the dynamic and the flows of the society itself. __Approach:__ A narrative review of risk factors and outcomes of social isolation provides the base for a sample-based exploration of solutions for social isolation during pandemic times. __Results:__ A series of physical health and psychological factors, as well as physical, social cultural and economical environment related factors impact social participation. Retirement, age associated frailty and all disabilities reduce social participation, in a vicious circle. Physical and psychological optimisation lead to efficiency in activities of daily living and provides the resources and the drive for social participation. Inviting physical as well as virtual spaces have been built or adapted to enhance and grow social participation. Hightech - based virtual communities and a series of assistive technologies flourish in post-speed century and are of real help in pandemic times, supporting the continuity of social life and the coherence of the society. __Value and Implications:__*

*Social interaction has several dimensions. It maintains the cohesion and shapes the present and future of the communities and of the entire human society. Smart solutions are available and must be further developed with the contribution of IT-AI developers as well as of rehabilitation experts, geriatricians, psychologists, architects and ecophysiologists, in order to support and grow social participation in sustainable multigenerational communities.*

## 1. Premises

Humans are social beings, designed to live in groups and to behave in collaborative manner. We define ourselves through these interactions with the others and through the value we perceive we have for our society. Social interactions influence our daily life rhythms and content, impacts our mood and our physical and cognitive wellbeing, the way we see and appreciate ourselves and others.

Social distancing and physical confinement required to reduce spreading of a pathogen, like during the nowadays COVID-19 pandemic, have a serious impact on the social life of all of us, changing the dynamic and the flows of the society itself and shaping its functionalities. Seniors are a population at high risk of social isolation even in normal times and this risk is heightened in these pandemic times, with severe consequences at individual as well as at society level. And seniors are no longer a small population, as we are nowadays living longer than ever before. The 65+ population in Europe will increase even more, going from 90.5 million in 2019, up to 129.8 million in 2050, while the general population will have quite the same numbers in 20150 as in 2019 (after a short peak in 2026-2029). The median age in European Community is going to reach 48.2 years in 2050, when Europe will number half a million centenarians [1]. In this situation, with an increasing pressure on the labour force, keeping the ageing people active, healthy and independent in activities of daily living, as long as possible, must go beyond the status of wishfull thinking. Feasible strategies and solutions must be developed and implemented to ensure active ageing goals.

## 2. Objectives

To highlight the importance of social life, with focus on seniors, and to point out modalities to enhance and improve social participation.

## 3. Method

A narrative review of risk factors and outcomes of social isolation provides the base for an exploration of smart solutions for social isolation during pandemic times. The responses of 10 Romanian from different age categories to an unstructured interview highlight their perception of different aspects regarding the specific situation of social isolation during the COVID-19 pandemic.

## 4. Main results

### 4.1. Social isolation or loneliness?

Perceived as loneliness, seclusion, breaking connection with community, alienation, estrangement, abandonment, social isolation is defined as the lack of social interactions, lack of contacts and relations with family and friends. It regards lack of communication and interaction with others, at individual level, as well as lack of interaction with the society at large. Lack of contact with society leads to the disconnection of the individual from the rhythms of the social life, and to the dissolution of his social roles and of his value as a social being, first of all in individual's own eyes [2]. Social isolation relates to an objective condition, regarding reduced social contacts and participation. The subjective feeling of loneliness may be or not related to the objective situation of the individual. Loneliness is the subjective distressed feeling of being alone or separated. It's possible to feel lonely while among other people, and you can be alone but not necessarily feeling lonely [3]. The phenomenon gets new dimensions during special situations like the ones generated by the needs of restraining disease spreading during the pandemic of COVID-19. While social isolation may be self decided and managed, the feeling of loneliness has deep emotional resonance, especially when the isolation is associated with imposed confinement. In this situation, keeping the individual in place, in his usual, welknown and life-history resonating environment has some benefits, even if it is challenging for the ones providing for the senior.

### 4.2. Social isolation risk factors and outcomes

Literature review shows an increasing interest regarding social isolation risk factors and outcomes, especially for the elderly. A series of health related and psychological factors, as well as factors related to the physical, social, cultural and economical environment have impact on the quantity and the quality of social participation. Age is directly related to the level of social participation. A report from the National Academies of Sciences, Engineering, and Medicine (NASEM) points out that more than one-third of adults aged 45 and older feel lonely, and nearly one-fourth of adults aged 65 and older are considered to be socially isolated. Older adults are at increased risk for loneliness and social isolation because they are more likely to face factors such as living alone, the loss of family or friends, chronic illness, and hearing loss [4]. The living environment (rural/urban) also matters [5]. In rural environment, although women reported greater social participation, women reported laso more frequent feelings of loneliness, especially feeling left out, and were less likely to have a spouse or partner [6]. The costs of healthcare are higher for isolated elderly [7].

Most important risk factors for social isolation, as perceived by 10 Romanian respondents from all age categories, seem to be the lack of motivation and of the

sense of coherence, lack of trust in decision makers and in media, lack of trust in fellow citizens, the feeling of being abandoned and overlooked, of hopelessness, cognitive decline, depression and anxiety, lack of emotional connection and lack of resources (financial, informational, support). These associate with disability increase due to progression in frailty as consequence of lack of motivation and activity, hygiene, nutrition and engagement, as well as with poor sight and hearing, poor mobility (lack of physical activity (including chores) and more time spent in bed and in a more and more limited space), poor diet and progressive dysmetabolism, in a vicious circle. Low levels of digital literacy decrease the possibility of the elderly to use electronic means of communication, contributing to social isolation, too.

The most recent comprehensive review on social isolation of elderly was published in 2020 by the National Academies of Sciences, Engineering, and Medicine in the USA. This review [8], in order to support the improvement of healthcare for elderly, summarize their findings in regards of risk and protective factors for social isolation and loneliness in elderly, grouping their main evidence-based risk factors in three main categories:

- *Physical Health Factors*: common chronic diseases and conditions, including heart disease, stroke, cancer (inducing disabilities), the functional status of the individual (difficulties in activities of daily living), sensory impairments (reducing the abilities to communicate);
- *Psychological, Psychiatric, and Cognitive Factors*: the presence of psychiatric disorders, such as major depression, generalized anxiety disorder, and social anxiety disorder, the impairments and restrictions of activity nd participation due to neurocognitive disorders;
- *Social, Cultural, and Environmental Factors*: lack of supportive relations, especially those with family, friends, and caregivers (aspects with cultural specificity), losing a close family member (spouse) is a frequent disruptive event for older adults, particularly for women (loneliness is primary symptom of bereavement), retirement from activity, along with social environmental factors such as driving abilities, housing status, location and accessibility to social life, being an immigrant or belonging to some unclustered minorities.

The review of recently published literature provides us an image also on the impact of social isolation on health and quality of life of the elderly:

- The impact of the social isolation on *health outcomes* includes changes in physiological parameters (high blood pressure [9], changes in heart rate variability [10], changes in glucose levels in Diabetes mellitus [11], even increased levels of inflammation markers [12]), psychological aspects (depression, anxiety, rapid decline in global cognition, processing speed, executive function, visuospatial abilities, immediate and delayed recall, increased risk of dementia [13,14]), reduced muscle strength and mobility, increased frailty, reduced ability to climbing stairs and upper limb tasks, reduced performance of activities of daily living, increased fear and risk of falling, increased risk of outpatient visits, emergency department visits, hospitalisation for stroke and heart, cardiovascular disease [15] and increased susceptibility to cold (symptoms), upper respiratory illness [16].

- The impact of social isolation on ***health related behaviours*** include: poor diet, tobacco use, heavy alcohol use, physical activity – low level, reduced going-out behaviour [17], overweight, reduced sleep quality, frequent insomnia, shorter duration of quality sleep, but longer time spent in bed [18], reduced quality of life and health-related quality of life indicators, hoplesness, reduced wellbeing socres [19], increased risk of abuse (financial, physical, even sexual abuse), outright neglect, more isolation and progressive disabilities [8].

The following factors may act as risk factors or **protective factors from social isolation**, if efforts are made to improve the individual condition, by making changes in regards with the frailty syndrome severity, disabilities, the severity of chronic diseases: stroke, heart disease, cancer and related risk factors – addressing these including through diet, physical activity level, sleep quality and rhitms, compensate sensory impairment: hearing loss, visual, smell loss, treat depression and anxiety, address cognitive decline and risk related factors, improve social communication and human-animal interactions, implement and enhance supportive relations disregarding unsupportive ones, develop efficient strategies of coping with disruptive events, stimulate active ageing in place, postpone retirement and develop strategies to keep individuals socially involved after retirement, deveop and implement solutions in regards with accessibility [8].

### 4.3. Social isolation in old age – the vicious cycle

Social isolation is not easily identified nor quantified, due to the subtlety of the risk factors and isolation outcomes as well as due to the complex interdependence of the above mentioned. Also, the relations between each risk factor and isolation are bidirectional. The ageing individual enters at some point (the moment of retirement or the death of a life partner, or the installation of a certain disability) in a vicious circle, because of stressful environmental conditions, because of an illness or to some physical or psychological disabilities due to chronic health conditions, associated to the reduced energy level and to the frailty syndrome inevitable in oldage. This vicious circle includes firstly: reduced social interaction, reduced motivation, reduced performance of the activities of daily living, decrease in physical and cognitive functioning, decreased quality of life [20].

Social isolation is frequently associated with signs and symptoms as: social withdrawal, lack of interest regarding appearance, house keeping, lack of interest expressed even in simple daily activities like eating, hygiene, sleep [21]. Thus, the consequences of entering the vicious cycle of social isolation impact all physical and psychological aspects of the human being, as well as health, activity level and abilities, practically all the aspects of quality of life and wellbeing of the human being. It is very difficult to exit the cycle or to transform the vicious cycle of ageing and isolation into a virtuous cycle. The barriers are so many. Due to: retirement from work networks, losing friends, family decomposition, physical and psychological based impairments/disabilities making the individual unfit for social participation, losing sense of coherence, motivation, being technically outdated (hardware, software, knowledge), the older loses the string connecting him/her

with the social hive, and it is very difficult to recover, to reconnect to the actual complex society situation if you don't keep up on a daily basis.

### 4.4. Isolation during current pandemics – new challenges

Mental and physical health of older people is negatively affected during the social distancing for COVID-19. A systematic review found that the main mental and physical outcomes reported were anxiety, depression, poor sleep quality and physical inactivity during the isolation period. Experts organizations and WHO have given different recommendations to keep older people mentally and physically healthy. An integrated and multidisciplinary assessment done by geriatricians, psychiatrists and physiotherapists could be needed [22].Restrictions in regards of visiting community meetings, parks, neighbourhoods, places of worship, and day-care centres (the only socialisation channels for most aging adults) associated the decrease in the social network itself (losing more friends and relatives). With lockdown or quarantine, these activities have become impossible [23]. Also, older people are adversely affected by the ageist discourses that imply that elderly are not that important [24]. Older patients were, sometimes, denied appropriate treatment, when the healthcare system was overwhelmed. People were not even allowed to organise funeral ceremonies for relatives that have died isolated in COVID-19 facilities and this dramatic situation has significantly induced fear and lack of trust in authorities and in younger people, among older people all over the world, "as they feel unwelcome in the world they built through all their life" [25].

### 4.5. The perspective of Rehablitation Medicine in regards of active ageing

Older user is not only socially disconnected, but also frail and presenting with disabilities affecting his/her ability to perform the daily living activities and decreasing his/her participation capacity. Physical and psychological optimisation lead to efficiency in activities of daily living and provides the resources and the drive for social participation. The International Classification of Functioning, Disability and Health put activity in the center of the diagram representing the interrelations between the components of the bio-psycho-social model of the human being [26]. Personal factors, disease and environment influence the ability to perform, as well as the real-life performance in the activities of daily living, which, in turn, will influence these aspects. Social participation is in bidirectional relationship with the activity domain, too. In order to improve the social participation level, one must address the barriers hindering activity, in all aspects.

The interventions implemented through technological means should respect both Physical and Rehabilitation Medicine approaches:
- Restorative approach - Regain the function – by training the function and the ones related closely
- Compensative approach - Assist the function – by real-time and quantified assistance (assist as needed)

The World Health Organization (WHO) defined active ageing as "... the process of optimizing opportunities for health, participation, and security in order to enhance quality of life as people age" [27]. The concept of active ageing is based on optimising three main domains: participation, health, and security. The model proposed by WHO contains six groups of determinants, each covering important aspects: health and social services, behavioural, personal (biology, genetics and psychological factors); physical environment; social; economic aspects.

The key aspects of active ageing are autonomy (decision making, coping abilities, being in control, in accord with one's rules and wishes), independence in regards with the activities of daily living, quality of life in one's terms of values, standards, aims and concerns, healthy life expectancy. Quality of life in seniors is mainly determined by their perceived ability to live independently and to live as long as possible without developing severe disabilities [28].

There are objective and subjective variables of active ageing, the psychological aspects being essential to this construct, as well as the cultural specificity.


## 5. How can we improve social participation?

We have to be able to empower and support the older individual by providing him/her with accessible and sustainable means to improve activity level and participation. We can improve social participation addressing all modifyable aspects related to it:

- By improving access to and engagement in social activities provided in:
- Old ways:
- Physical Agora, recalibrated to social distancing and air hygiene requirements;
- Meeting-spaces designed for different activities;
- Real time accurate information regarding access, due times and organisational aspect;
- New ways:
- Enhance access to electronic non-interactive media and interactive social media – on reliable trustful platforms providing meaningful and useful info and activities, service and savvy support;
- Empower users to use the new technologies;
- Mediate communication, filter the right information.
- By improving fitness for social participation. In order to make the older person able to be socially active, we need to:
- Improve physical (including sensory) and psychological (including motivation and drive) functions;
- Improve ADL efficiency and reduce ADLs costs in terms of time and energy;
- Improve adaptability and reserve, as well as drive;
- Improve time management;
- Improve stress management;
- Improve communication and digital skills.

## 5.1. ICT based technology impacts on social isolation in elderly

ICT solutions are already in use, enhancing social participation, no matter the age of the users. According to the latest Digital Economy Outlook Report from the Organization for Economic Cooperation and Development (OECD), 62.8% of 55–74-year-olds are connected to the internet nowadays [29]. According to Ofcom's Adults' Media Use and Attitudes report 2018, 28% of people over the age of 75 now use tablets in UK. The same report states that 32% of people aged over 75 have a social media account [30].

A systematic review published in 2016 concludes that ICT could be an effective tool to tackle social isolation among the elderly. However, it is not suitable for every senior alike. ICT was found to alleviate the elderly's social isolation through four mechanisms: connecting to the outside world, gaining social support, engaging in activities of interests, and boosting self-confidence [31].

An even more recent systematic review (2021) showed no evidence supporting the effectiveness of digital technology interventions (DTIs) designed to tackle loneliness, in reducing loneliness (the subjective aspect) in older adults [32].

Digital technology is implemented in all domains nowadays and can be of real help for the healthcare sector in regards with older people, by improving access of heathcare provider to important data related to the progress of chronic diseases and disabilities, by providing means for continuous intervention programs to improve mental health, physical and cognitive functions, and to improve social participation, but older people seems not ready yet for this approach [33].

Telehealth platforms are used by the elderly to get medical counsel and telerehabilitation intervention, but are not adapted to the requirments of this specific group age [34]. GPS can be used to track their level of activity [35] and even to locate seniors in space, if they get lost [36]. Remote fall detection is used largely [37]. Internet use is associated with reduced likelihood of depression in older people, and social networking sites are used by older adults to maintain close interactions and to keep informed regarding family and friends. Elderly groups on social media channels and of Alzheimer's disease forums on the microblogging system are increasing, social networking systems being intensively used to stay informed by sharing the latest health-related information, as well as for discussion on general and important themes by ones, and as a source for reminiscence triggers by others [38].

In Romania, 40% of 55-74 years old people stated in a survey they never used the internet. The older Romanian are using the internet to get general information, to read about medication, to get the necessary information to reach a destination, to pay bills, to make online shopping and to keep close with friends and family members [39]. Scheduling visits to healthcare providers by using the internet and the possibility to remotely communicate with their GP or with organisations of public interest is of great help for elderly in Romania. The need and interest for improving digital literacy in elderly can be notice as In July 2019 Transilvania IT Team implemented digital literacy courses for elderly, in Cluj, Romania, ECDL launched also, in April 2021 a similar program in Bucharest, and there are non-governmental organisations supporting elderly in learning how to use smartphones,

tablets and PCs. A small number of elderly use Smart technologies for home assistance, reminders, errorless learning procedures fro activities of daily living and wearables for digital health interventions [40,41]. The COVID pandemic emphasized the need to improve the digital literacy of all, including older people, aspect mainly overlooked [42].

### 5.2. Designing technology to reduce social isolation for elderly

When developing a new assistive technology for daily living, we need to keep into account the basic needs of a human being, along with user weak points, but also user strong points, the ones we need to use to empower user to get in control, in order to improve his/her own quality of life.

Inviting physical as well as virtual spaces have been built or adapted to enhance and grow social participation. Hightech - based virtual communities and a series of assistive technologies flourish in post-speed century and are of real help in pandemic times, supporting the continuity of social life and the coherence of the society.

In order to design optimal solutions, one must focus on finding dolutions for the real needs of the future users.

**Senior users (primary users)** needs in regards with technology can be summarized as:

- Need for monitoring vital and safety parameters and to provide real time interventions to improve health condition;
- Need for hazard and disability prevention;
- Improve senior lifestyle behaviours with personalized recommendations using different user interfaces and types of interaction methods in view of improving their independent living and active ageing in place;
- Consider retirement as a big risk factor - persons become especially vulnerable for emotional isolation rather than social isolation. The absence or loss of a spouse or intimate partner interacts in several ways with social isolation and loneliness;
- Give access to public information regarding access to public utilities and events, like public transportation means and other relevant information for public issues and everyday living;
- Support Secondary and Tertiary end users (hospitals, caregivers) to communicate and collaborate with each other.

**Secondary users** – the carers needs emerge from all the above along with the constraints of the secondary user's own life. The need of emotional meaningful interaction with their beloved or their patients, the need of closely monitoring the activities of daily living and specific physiologic parameters are not met due to physical distance, lack of appropriate locally based or remote technology, financial resources to acquire these, lack of knowledge of even the existence of such assistive technologies, lack of professional healthcare and technical support. Healthcare services are even more impacted by the isolation in pandemics, elderly avoiding even visiting their GPs, which put at severe risk their frail health condition even

more. The need for accessible, safe and well-designed communication channels for medical communication is increasing, as well as the need for communication between healthcare providers and family caregivers.

***Tertiary users*** **–** healthcare system and healthcare service organisations have the following challenges to face: the "need for speed" in getting positive therapy outcomes, to avoid overburden, the need for data management, the need for experts in new healthcare, the need for internal communication and teamwork, the need to implement the new trend for community-based healthcare, the need to fully implement and support the new trend for telecare.

***Gerontechnology*** is defined as the inter- and multidisciplinary academic and professional field combining gerontology and technology. When designing gerontotechnology, we must take into account the following aspects:

- Challenge: Older users means a diverse group, age range from 60 to 120 people with different experience and life vision. Many have physiological limitations and disabilities, different from those experienced by younger populations.
- Possibilities: Gerontechnology can be at once both assistive and training technology for older persons – decreasing real life challenges, improving safety in using technology for ADLs and postponing cognitive decline, at the same time.
- Attention: "...designers often become an expert with the device they are designing. Users are often experts at the task they are trying to perform with the device" [43].
- Must do: "nothing about us without us" [44]. Users' involvement is mandatory in order to develop a technology with real utility for our target population, namely cognitively challenged older persons. We need to design and assess different aspects of a system's usability, and then, redesign and reassess.
- Support: Emphasize the importance of usability and that of co-creation in User (person) Centred Design approach in research and development [45].

Research and development in this domain is mandatory to actively and consistently involve real end-users, in order to ensure the usability of the product and of the intervention designed. The user's own perspective regarding his own needs and his requirements are the ones defining the user behavior in regards with the technology, no matter how smart and benevolent are the developers.

***Solutions***, as experts and our own respondents envisioned them, must address:

- First place: increase quality and meaningful social interactivity to prevent and decrease social isolation;
- Second place: ensure safety and fitness of the users (physical, cognitive, emotional and volitional aspects);
- Third place: improvement of the ability to and the performance in activities of daily living.

A big challenge in designing the interactivity between primary user and technology will be given by the fact that primary user's declared goal may be defined

as: "I, primary user, retired elderly, want to be happier, to feel good, to have a better life, a more vibrant one, a worthy life". They may not be aware of the fact that social isolation is the cause of their lower quality of life/well-being, and a consequence of these, as well. Or, even worse, the primary user may have no more goals, no more motivation. Primary user's real problem may be defined as: Losing connection with the hive of social life (rhythms, reality orientation, complexity of social networking, stratification, roles). Therefore, a special approach must be used to reconnect the primary user. We must empower him to regain control of his/her own life. His emotional reserve and restant interests and hobbies must be accessed and stimulated. Therefore, functional and nonfunctional requirements must be designed in order to build trust, to negotiate step by step behavioral changes, to safely persuade the primary user on the path of social reconnection in a safe and controlled social and media environment.

In order to ***prevent and decrease social isolation***, smart solutions should be able to:

- Create and stimulate networking in a safe environment;
- Empower participation in formal and informal educational activities (university of old age;
- Create, inform and ease access to events;
- Engage users in social charity activities, community decisions and in contests;
- Provide telemedicine tools for consultations, individual or group cognitive stimulation, training and rehabilitation intervention programs, emotional support, counselling and psychotherapy;
- Offer age friendly and pandemic friendly workshops regarding healthy house and lifestyle adaptations;
- Provide reminders and ensure easy access to events (personal, family, peers, social, cultural, city hall, policy events, including information regarding weather, transportation means, other accessibility details);
- Implement persuasive techniques of coaching which should be applied (to Improve adherence, compliance to recommendations), motivational quotes to improve mood. Use the adequate metaphors, interface design for disabled people should be provided, as well as incentives;
- Provide users with real time feedback;
- Increase trust in the assistive technology and in its providers seriosity and real time reaction and interventions when needed;
- Improve social participation and quality of life of the primary users which will bring gains for all communities (family as well as enlarged community);

***Safety and Fitness along with Activities of Daily Living*** interventions should address:

- Frailty syndrome:
- Sarcopenia (loss of muscle mass and strength);
- Fatigue;

- Poor physical - health prevention and treatment of incipient frailty syndrome, by alerting the user / caregiver if the elderly person forgets or doesn't want to
- Maintain his/her an optimum physical activity (number of steps/day or week, walking distance/day or week);
- Less time in bed, improved sleep schedule.
- Risk of falls: using sensors to alert the user/caregiver/family if the senior develops risk factors that could increase the risk of falls and sensors that could measure them such as muscle strength, gait and balance impairments, visual and hearing disorders, excessive use of assistive devices/hours/day).

In order to develop appropriate interfaces and to construct efficient interactions between user and technology, context of use and usability subjective and objective aspects must be addressed. Personalization of the intervention supported by the new technologies is beneficial.

*5.3. To use or not to use?* The user behaviour will be determined by a large palette of factors [46]. To improve the acceptance and usability of future technologies, efforts must be done to:

- Improve digital skills of older people;
- Improve intergenerational communication;
- Replace concurrence and judging others with constructive collaborative thinking;
- Increase awareness;
- Sensitise stake holders, including policy makers;
- Train the trainers and facilitators;
- Implement the solutions in the local services and networks.

### 6. Conclusion

Social interaction has several dimensions. It maintains the cohesion and shapes the present and future of the communities and of the entire human society. Smart solutions were adapted or specially designed to support improvement of social participation of older people during the current pandemic. Progress in this domain, in terms of developing and implementing optimal solutions will be possible only through interdisciplinary team work of software and hardware developers with the users themselves, along with rehabilitation experts, geriatricians, psychologists, architects and ecophysiologists and with the direct support of all stakeholders, in the common effort to support and grow social participation for all in sustainable multigenerational communities.

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