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An innovative large-scale public health intervention to foster healthy ageing in place: the SoBeezy program

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Abstract

Introduction: With the accelerating pace of ageing, healthy ageing has become a major challenge for all societies worldwide. Based on that Healthy Ageing concept proposed by the WHO, the SoBeezy intervention has been designed through an older-person-centered and integrated approach. The program creates the environments that maximize functional ability to enable people to be and do what they value and to stay at home in best possible conditions.

Methods and analysis: Five levers are targeted: tackling loneliness, restoring feeling of usefulness, finding solutions to face material daily life difficulties, promoting social participation and combating digital divide. Concretely, the SoBeezy program relies on: 1) A digital intelligent platform available on smartphone, tablet and computer, but also on a voice assistant specifically developed for people with digital divide; 2) A large solidarity network which potentially relies on everyone's engagement through an intergenerational approach, where the older persons themselves are not only service receivers but also potential contributors; 3) A proactive and meaningful engagement of all the local partners and stakeholders (citizens, associations, artisans and professionals). Organized as a hub, the system connects all the resources of a territory and provides to the older person the best solution to meet his demand. The research program will assess the impact and effectiveness on healthy ageing, the technical usage, the mechanisms of the intervention and conditions of transferability and scalability.

Ethics and dissemination. The Ethics Committees (CEEI et CESREES) approved this research and collected data will be deposited with a suitable data archive.

Article Summary

Strengths and limitations of this study

- An innovative public health intervention to foster healthy aging relying on a digital intelligent platform, a large solidarity network and a proactive and meaningful engagement of local stakeholders and partners.

- To give universal access to technologies and to the internet, the SoBeezy system provides easy-to use technological devices to reduce the technological barriers that still exclude a substantial part of the older population from existing innovative solutions.

- Five targets: loneliness, feeling of unusefulness, activity limitation, participation restriction and digital divide.

- A research program paired to the experimentation in general population to assess the impact and effectiveness on healthy aging, technical usage of the voice assistant by the older population, the mechanisms of intervention and the conditions of transferability and scalability.

- Major potential barrier identified: the recruitment of the targeted population - older person, isolated, frail, with psycho-socio-economic precariousness and potentially with digital divide – sub-population with the greatest needs.

Introduction

The accelerating pace of ageing raises concerns about health, quality of life, living conditions, organisation of the welfare and health systems and associated costs. In that context, healthy ageing, successful ageing, active ageing, ageing well, wellbeing in late life…- whatever the name of the concept – has progressively become a major challenge for all societies worldwide. With significant improvements over the last decades,[1 2 3] a 75-year-old woman in 2019 is not comparable to a 75-year-old one 20 years ago, at least in high-income countries; even though recent trends would suggest less favorable evolutions.[4 5] Consequently people are rethinking the way they see ageing, older persons and the expectations of how to invest these extra years.[6] According to the Healthy Ageing concept proposed by the World Health Organisation (WHO), health in older age should not be defined henceforth by the absence of disease. Indeed, many older people suffer one or more health conditions, which, if well controlled, may have little impact on their wellbeing.[6] The WHO defines healthy ageing as *"the process of developing and maintaining the functional ability that enables wellbeing in older age"*, i.e. that enables to continue to perform things that are important to them.[6,7] Functional ability is made up of the **intrinsic capacity** of the older individual, **environmental** characteristics and the **interaction** between them. Intrinsic capacity is defined as the composite of all the physical and mental capacities that a person can draw on to function in life.[6] The environment characteristics represent all the resources or barriers that will determine whether a person can engage in activities or not.[6] As represented in figure 1 (adapted from the Healthy Ageing concept), the WHO distinguishes five categories of abilities that enable people to be and do what they have reason to value: to meet basic needs, to learn, grow and make decisions, to be mobile, to build and maintain relationships and to contribute to society.[8] This redefinition of the concept places older person and its environments at the heart of the approach; opening huge perspectives in terms of prevention and levers of action, but also entailing major evolutions of the current systems.

Figure 1. Representation of the responses provided by the SoBeezy program to the challenge of Healthy Ageing in Place, adapted from the WHO Healthy Ageing concept

Programs aiming at promoting and fostering healthy ageing have to be global, multi-domain and inter-disciplinary and to target intrinsic capacity as well as the environments to maximize functional ability of all.[9 6] This comprehensive approach gives larger opportunities of areas for action; each factor representing potential levers of intervention to favor healthy ageing: i) **social and psycho-social** factors (loneliness, self-esteem, social network, social support…), ii) **environmental** factors (living conditions, assistive technologies, access to transports, services and facilities, home adaptations to the limitations…), iii) **organizational** (health care organization and social welfare system) and iv) **societal** factors (representations of older persons perceived either as a burden or as a resource for our societies, ageism stereotypes, age-friendly communities…). To do so, Information and Communication Technologies (ICT) are opening new perspectives in the issues of prevention, detection, surveillance, home care wellbeing and eHealth for the elderly population. ICT represent promising lever of action on psychosocial, environmental and even organizational factors, albeit not so-easily implementable in the current elderly population, still far from ICT tools. These latter could have a crucial role to play in healthy ageing programs. In the last 20 years, the number of

technological innovations, devices, robots and platforms for the older population have dramatically exploded. Yet, the large majority of them failed to prove their effectiveness due to a lack of high-quality studies or worse, to an absence of evaluation.[10] Therefore, paradoxically, the impact of ICT on healthy ageing has been rarely formally demonstrated whereas the perspectives offered by these technologies are huge, if appropriate and relevant.[11 12]

Finally, to meet the challenges of ageing, individual and collective priority is clearly ageing in place. Ageing in place is defined by the Centers for Disease Control and Prevention as *"the ability to live in one's own home and community safely, independently, and comfortably, regardless of age, income, or ability level".* It is clearly the aspiration and desire of most of older people but has also become the priority goal of all ageing policies.

In the challenging demographic, social, economic and societal current context, the SoBeezy program, a population-based public health intervention, has been designed to maximize functional ability to enables wellbeing in older age. Through a comprehensive bio-psycho-social and multi-dimensional approach, this program ultimately aims at supporting healthy ageing in place in the best possible social, material and security conditions.

Methods/Design

The SoBeezy program: General presentation

The SoBeezy program aims at facilitating and improving the lives of older persons. The system proposes solutions to cope with the main social and material difficulties encountered in activities of daily living (ADL) and fosters social participation by promoting community-based cooperation and the sharing of activities and experiences. The SoBeezy system relies on: i) A **digital intelligent platform** available on smartphone, tablet and computer, but also on a voice assistant (**BeeVA)** specifically developed for people with digital divide; ii) **A large solidarity network** which potentially relies on everyone's engagement through an intergenerational approach where the older persons themselves and those living with disabilities are not only service receivers but also potential contributors (as represented Figure 2); iii) **A proactive and meaningful engagement of all the local partners and stakeholders** (citizens, associations, artisans and professionals). Organized as a hub, the system connects all the resources of a territory and provides the best solution to meet a need or a demand.

Figure 2. Representation of the SoBeezy system functioning with three networks of contributors and a privileged partnership with local actors and stakeholders

The SoBeezy web platform and the BeeVA voice assistant

The SoBeezy system relies on a web platform, which matches offers and requests of services to provide the appropriate answer/solution to the material, leisure or social issues submitted by the users to the system.

For a universal access to the web platform, including people with digital divide who are currently excluded from all existing digital platforms and devices, the BeeVA voice assistant has been specifically developed. This device facilitates the expression of a need or a demand and allows easy interactions with the SoBeezy system by talking (e.g. “I am looking for someone to… take me to the doctor“ or “to share a walk” or “to play cards”…). BeeVA uses voice recognition, natural language processing and speech synthesis to record and send the request to the web platform, which, thanks to an algorithmic treatment, matches offers and requests of services to provide, vocally, the appropriate answer/solution to the users (as presented Figure 3).

Figure 3. Description of the data treatment by the voice assistant (BeeVA) and the web Platform

The platform has been developed with the French Symfony framework and iOS / Android applications using the cross-platform iOnics framework. BeeVA uses the Google Automatic Speech Recognition (ASR), which catches the text pronounced by a person (Figure3- step 1). The lexical and semantic analysis is performed by a homemade tool to extract key words and relevant information (steps 2 and 3). After an algorithmic treatment of the data to find the appropriate resource to meet the need expressed by the person (step 5), SoBeezy builds a text response (step 6) and BeeVA restitutes vocally the message using a Text To Speech (TTS) API (step 7). For security reasons, the platform and all voices processing run on the servers of the University Hospital of Bordeaux (CHU).

The SoBeezy system proposes to the users two main components: assistance in daily life and activity sharing (social, cultural, leisure, sports activities). For the first axis, nine services are proposed: transportation, shopping, housework, digital and administrative support, animals, visits, care and well-being (hairdresser, beauty care, relaxation…). In addition, BeeVA also proposes several options to facilitate daily life such as an easy-to use digital calendar (with appointment reminders), video call, weather forecast, radio, emergency numbers, serious games, family pictures and news and City news. BeeVA has been designed to reduce apprehension and fears about technology usage and consequently digital divide in the elderly population. Two pilot studies, conducted on sub-samples of elderly users showed good acceptability and ease of use. The first one conducted on 53 elders (60 – 83 years) in experimental situation, aimed at testing the SoBeezy voice assistant in two specific tasks: answering questions and vocal expression of demand by elders. The second, closer to the real life utilization of the device (with BeeVA installed at home of 18 elderly persons living at home (11 women, 7 men), aged on average 76 years old and followed-up 5 weeks with three qualitative and quantitative evaluations. At the end of the experimentation, three profiles of users have been identified: 1) Curious and dynamic individuals rapidly autonomous in the utilization of the voice assistant (7 persons), 2) Persons with initial apprehension to use the device (mainly due to a lack of self-confidence) who required stronger technical support at the beginning, but managed to use the device after one week of utilization (7 persons); 3) Three individuals with mild cognitive impairment and one with illiteracy have needed substantial support to manage to use the device.

The five levers targeted by the SoBeezy program to favour healthy ageing in place

1. *Loneliness and social isolation*

Loneliness and social isolation are now recognized as a real scourge of modern life, which grows at an impressive pace in modern societies. Now identified as major social cohesion and public health concerns, policymakers start to take up this issue. In 2018, the United Kingdom has appointed a minister for loneliness and constituted a cross-governmental group to create policies to address the growing problem, which affects 9 million Britons, i.e. 14% of the population.[13] The other industrialized societies are not spared. In France, we estimated that more than 5.5 million French people are affected. Among the most vulnerable, the elderly and those living with disabilities, the prevalence is much higher. Among those aged 75 and older, 1.5 million of French people would suffer from loneliness and 300 000 would be in a situation of social death (i.e. without any family, friendship, or neighborhood contact).[14 15] Besides the problems of poorer quality of life, having no one to talk to or share thoughts and experiences with, can be as damaging to health as well known risk factors such as smoking, sedentary lifestyle or obesity.[16] Indeed, people suffering from loneliness are more likely to present behavioral and lifestyle risk factors (sedentary lifestyle, poor eating, smoking and alcohol consumption, withdrawal...),[17 18] increased risk of chronic diseases (depression, anxiety, cardiovascular, Alzheimer's disease ...),[19 20 21 22 23] activity limitation in daily living [24] and premature death.[23,25-27] A recent review of the literature showed that a poor social network was associated with an increased risk of 29% of coronary heart disease (95% CI = 1.04-1.59) and of 32% of stroke (IC95% = 1.04- 1.68),[20] while JAMA published in 2017 an article entitled *"Loneliness might be a killer, but what is the best way to protect against it?"*.[25] To tackle loneliness, SoBeezy proposes to target as a priority, older people living alone and/or suffering from loneliness. This screening is achievable thanks to the involvement of the frontline actors in the management of the elderly population: social services of the Municipality, general practitioners, pharmacists, nurses, physiotherapists, dentists, home care services and all relevant local partners, such as associations. To tackle loneliness, SoBeezy provides specific services such as visits at home by citizens or trained volunteers from associations. Another less direct and probably less stigmatizing way to combat loneliness is the experiences and activities sharing component of the SoBeezy program. Finally, being personally involved for other people into the system and belonging to the SoBeezy community should also contribute to prevent and lower loneliness and isolation.

2. *Feeling of worthlessness, self-empowerment and self-esteem*

With advancing age, social roles change considerably and the retirement transition is an obvious illustration. For some people, the reduction in social function can be massive, generating feelings of worthlessness and loss of self-esteem, themselves identified as important risk factors for adverse outcomes, such as depression, cognitive disorders, chronic diseases, isolation and loneliness, dependency and premature mortality.[28-32] In the MacArthur Study of Successful Ageing study, feeling of worthlessness was associated with greater risk of all studied outcomes: mobility restriction (OR = 3.08 CI = 1.35-7.07), limitation in basic activities of daily living (ADL) (OR = 2.65, CI = 1.05-6.68) and death (OR = 3.13, CI = 1.43-6.84), independently of many confounders.[28] In addition, people suffering from worthlessness are also more likely to have unhealthy behaviors (sedentary, tobacco and alcohol consumption, withdrawal and reduced social participation).[33,34] Several studies suggest that giving to everyone the opportunity to feel useful, even modestly, could have substantial benefits in terms of

quality of life, autonomy and to remain at home longer.[33,34] The SoBeezy program provides opportunities to everyone to get involved for other people, even though simple contribution such as an empathetic ear or occasionally giving a hand to solve a material problem. We assume that whatever the age, gender, socio-professional category, abilities or health condition, everyone can contribute to the platform and thus have meaningful social role.

3. *Difficulties in activities of daily living*

All along the dependency process, different types of limitations are gradually affected, starting with difficulties in using transportation and doing the shopping (the entry point into the process), and ending by total losses for basic activities such as eating or transferring. [35,36] Limitations in basic ADL are one of the major factors that jeopardize the chance of staying at home, especially for people living alone. Each technological or human solution found to help people to cope with the difficulties in daily living could contribute to achieve the objective of living in place in good conditions. Relying on the SoBeezy Hub, the platform will be able to identify the optimal answer to meet the needs of assistance in the daily living tasks. The services proposed by the system cover the main needs of the elderly people identified in previous studies:[35,36] transportations, shopping, housekeeping and gardening, digital training, assistance for administrative tasks (now mainly digitalized) and pet sitting and care. The SoBeezy system intervenes both at the preventive level by having an effect on determinants of dependency (loneliness, feeling of worthlessness, digital divide, participation restriction) and both at the assistive level. Finally transportations and doing the shopping representing the entry door into the dependency process,[35,36] a special effort will be carried out to provide solutions for these specific tasks to prevent from further deteriorations. Some services will be provided either by citizens and volunteers (free), or by professionals (paid) when specific skills are required or when no free solutions are identified by the platform.

4. *Social participation*

In the last years of life, most of us are concerned by diseases and disabilities. Yet, as recommended by the WHO, all people should maintain engagement in the things that matter to them. Preservation or restoration of social participation despite age, diseases and disabilities appears to be a promising direction for healthy ageing programs. Indeed, beyond obvious positive impact on quality of live, being engaged in leisure, cultural, sports, religious, ecological and volunteer activities has been identified as beneficial in terms of mood,[37 38] activity limitation and dependency,[39 40] cognition[41 42] and mortality.[43 42] For instance, in the Paquid population-based cohort study, the risk of incident dementia over the 10 following years (258 incident dementia cases) was significantly lower for subjects remaining or becoming active (cumulative risk of dementia: 30%) compared to those remaining or becoming inactive (52% and 42%, respectively) ($p<0.0001$).[41] In the same vein, another cohort conducted in Taiwan on 1,388 older subjects, regularly followed-up over 18 years, showed that continuously participating or initiating participation in social activities later life was significantly associated with fewer depressive symptoms.[38] Promoting and facilitating social activities among older persons is one of the five component of the SoBeezy program, which relies on all the local actors and partners of the territory (municipalities and associations), as well as on all the individual initiatives proposed by the SoBeezy-users and community. The SoBeezy platform provides appropriate answers to specific demands of leisure, cultural, and sports activities, but also suggest other “offers” on the territory proposed by the municipality (conferences, festivities, manifestations…), by the associations (digital workshops, dancing activity, board games…) and by the

citizens themselves (finding partners to visit an exhibition, to go to the cinema, to play cards, to have a cycle ride…).

5. Digital divide

Despite a massive progression of the appropriation of ICT usage by the older population, a substantial part of the current generation of elderly people is still digitally excluded. In France, 31% of the 60 years and older were still digitally excluded in 2017, with a major impact of older age (20% of the 60-74 never use the Internet, and up to 68% of the 85 and over).[44] In addition to older age, lower income, lower education, living alone, and living in rural areas are associated with lower ICT use.[44 45] In our technology-oriented world, where all administrative tasks are becoming digitalized at a steady pace, being digitally excluded results in a major social disadvantage. *Yet, innovative technology solutions represent promising perspectives in enriching the quality-of-life, health, and independence of older persons.*[46] Technical complexity (technical factor) and Internet anxiety (personal factors) are the two main reasons that hinder elderly people's ICT use.[47] To remove these barriers, the SoBeezy system provides easy-to use technological devices to give universal access to technologies and to the internet. In addition, human support being identified as a key condition to alleviate the negative effects of technical complexity and Internet anxiety and to enhance the positive effect of ICT,[47] the SoBeezy system also provides human accompanying of all users who need it. This team is composed of employees of the SoBeezy system, local volunteers involved in the SoBeezy organization and finally of members of the SoBeezy community registered on the platform for digital training. Therefore, the easy-to-use BeeVA represents a real strength of the system compared to the other social support platforms that failed to reach the most vulnerable ones of our society, mainly digitally excluded.

The SoBeezy experimentation 2020-2021

The SoBeezy program will be experimented in three French pilot cities of Nouvelle-Aquitaine (Pessac, St-Jean-de-Luz and St-Yrieix-la-Perche) over 12 months in 2020-2021. The three sites were selected for their diversity in terms of size of the population (from 6,700 to 62,000 inhabitants), territory size (from 19 to 100 km²), population density (from 670 to 1,600 inhabitants/km²), rural/urban areas, medical and paramedical demography, access to services and digital coverage. In total, 66,800 inhabitants of these three cities are aged 18 years and older and represent potential users of the platform (beneficiaries and/or contributors). With an acceptation rate depending on age category (5% in the 18-59 and 10% in the 60 and over), we estimate that globally 7% of the adult population will use the system, i.e. 4,700 subjects. Among them, around 2,200 will be aged 60 years and older (i.e. 47% of the users), among whom one third lives with digital divide (i.e. non-user of a smartphone, digital tablet or computer) according to the recent data for France.[44] These older persons will be equipped with the BeeVA, i.e. around 750 elderly subjects. All BeeVA users will be also equipped with an internet connection (when necessary), with enhanced human support and training. The users will be approached through large public communication campaigns and focused campaigns on specific targets (older persons, isolated individuals, frail…), as well as with the support of social services, medical and care services and local associations. The SoBeezy intervention mainly targets psycho-

socio-economic precariousness (PSEP) which is characterized by an accumulation of "weakening" factors, such as loneliness, financial insecurity, lack of social support, digital divide… that is associated to a higher risk of deleterious outcomes, such as mortality [48,49] or cognitive decline.[50,51] However, in addition to this group at higher risk, we also hypothesize that this intervention will benefit to the non-precarious elderly, according to other levers of action, such as feeling of utility, self-esteem, the meaning given to one's actions, social support perceived when necessary or even participation in the City's life.

The SoBeezy-R research program

A prospective pragmatic quasi-experimental study will be conducted on a sub-sample of 1,000 SoBeezy users aged 60+, volunteers to participate to the research. Through a mix quantitative and qualitative approach will be studied: 1) The impact and effectiveness of the SoBeezy program on healthy ageing in place; 2) The technical usage (feasibility, accessibility, acceptability, usability, user experience…); and 3) The mechanisms of the intervention and conditions of transferability and scalability. The participants will be interviewed through standardized procedures at baseline and after 6 and 12 months of usage of the platform by a psychologist at home, by phone call, but also using ICTs (voice assistant, smartphone, tablet or computer according to the usages). This latter procedure is very useful to collect data in the ecological context of home and in a more continuous manner than through interviews conducted at punctual time-visits. Qualitative studies will also be performed on sub-samples with interviews conducted by sociologists (to assess the mechanisms of the intervention) and cognitics interviewers (to study technical usage). Finally, national health insurance data will also be exploited to analyze both, health care consumption (compared to a control group) and outcomes at longer-term than 12 months (in terms of mortality, hospitalization, institutionalization, dependency, psychotropic drugs use, care costs…). A before-after analysis of the entire cohort (N = 1000) will allow to study the one-year evolution of the main parameters: quality of life, loneliness, participation, sense of usefulness, self-esteem, frailty and activity limitation. Moreover, a comparative analysis of the health insurance data will assess the impact of SoBeezy on health and care trajectories, including medico-economic analyzes. In addition, a focus on psycho-socio-economic precariousness will be performed with a comparative analysis with control group carried out on the sub-sample of precarious SoBeezy users (N = 350). The control group will include 350 precarious elderly subjects living in comparable territories not covered by SoBeezy.

Conclusion

SoBeezy is a comprehensive public health action, specifically designed to meet the public health and social cohesion challenges of ageing through an older-person-centered and integrated approach. The main target of the system is a combination of two priority goals of all ageing policies: healthy ageing and ageing in place. The system relies on both, a specific ICT (the BeeVA voice assistant) to remove the technological barriers that still limit ICT usage in the older population, and on all the resources of a territory that span citizens, local authorities and multiple local partners and stakeholders. To meet

the global needs of the older population and to foster *Healthy Ageing* in place, five levers are targeted through a comprehensive approach: tackling loneliness, restoring feeling of usefulness, finding solutions to face material daily life difficulties, promoting social participation and combating digital divide. The SoBeezy program thus aims at fostering "*Healthy Ageing in Place"*, by creating the environments and opportunities that maximizes functional ability in order to enable people to be and do what they value throughout their lives and to stay at home in best possible conditions.

Data statement

Collected data will be deposited with a suitable data archive or repository as soon as we will be able. In future papers, dataset will be correctly cited and dataset identifiers will be given. In addition, DOI (including DOI for dataset), technical appendix and statistical code will also be provided.

Ethics and dissemination

The Inserm Ethics Committee and the Comité Éthique et Scientifique pour les Recherches, les Études et les Évaluations dans le domaine de la Santé (CESREES – No 1583867) approved this research. Data collected by the platform will be hosted on the secured server of the University Bordeaux Hospital.

Author Contributions

KP contributed to the conception and design of the work and drafted the manuscript
AZR was a major contributor in writing the manuscript
JFD made substantial contributions to the conception of the work and substantively revised the manuscript
HA made substantial contributions to the design of the work and substantively revised the manuscript
SL made substantial contributions to the conception and design of the work, to the creation of the voice assistant used in the work and substantively revised the manuscript.
All authors read and approved the final manuscript and have agreed both to be personally accountable for the author's own contributions and to ensure that questions related to the accuracy or integrity of any part of the work, even ones in which the author was not personally involved, are appropriately investigated, resolved, and the resolution documented in the literature.

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Competing interests: The authors declare that they have no competing interests

Patient and Public Involvement

1. When and how were patients/public first involved in the research? The older subjects, all living in the community, will be invited to participate to the experimentation through large public communication campaigns and focused campaigns on specific targets (older persons, isolated individuals, frail…). Identification, recruitment and support of potential beneficiaries of the program will also be conducted by local partners such as well as local social, medical and care services and local associations. The experimentation will start in July 2020 for a period of one year.

The participants will be invited to participate to the research part of the project, which will be conducted on a sub-sample of 1,000 SoBeezy older users (60+), followed-up over the 12 months of the experimentation.

2. How were the research question(s) developed and informed by their priorities, experience, and preferences? The research questions explored in this study have been based on
   - the challenging current context of ageing for all societies worldwide and the necessity to foster healthy ageing
   - the fact that loneliness and social isolation are now recognized as a real scourge of modern life, which grows at an impressive pace in modern societies, with significant impact on well-being and ageing
   - the Healthy aging concept proposed by the WHO which focuses on functional ability, intrinsic capacities and environments
   - the development of a concrete interventional public health program (SoBeezy) to promote healthy ageing
   - the 30-year experience in epidemiological cohorts on ageing of our research team

3. How were patients/public involved in. A subsample of older persons (representative of the elderly population through their involvement or participation in local associations or via their relationship with local council) has been associated at the very beginning of the SoBeezy program. For instance, these elders have been associated to the technological choices, particularly in the selection of the device: voice assistant or tablet, importance of a screen to remind the information and data…). They also participated to the testing phase of the prototypes. In addition, they also participated to the organizational choices of the platform (selection of the main needs of the elderly population in daily life, type of the services proposed by the platform, formulation of the services on the digital platform …). However, they have not been associated to the choice of outcome measures of the experimentation. However, these choices have been related to the expression of the elderly population needs, since they have been largely oriented by the data collected on more than 14,000 elderly people living in the community and followed-up in cohort studies on ageing; cohorts conducted by our research team for more than 30 years. We thus used these data collected to identify the major needs of the older population living at home. Regarding recruitment to the study, two main approaches will be conducted: public communication campaigns (with also targeted campaign on specific populations) and with the involvement of our local partners including associations of older persons.

4. How were (or will) patients/ public be involved in choosing the methods and agreeing plans for dissemination of the study results to participants and linked communities? The partnership with Municipality (elderly population department) and with some representatives of the elderly population will be used to work on the methods and plans for dissemination of the results. Results will be disseminated through scientific communications (articles and congress), public conference, media, and also specific communication to the participants to the program.

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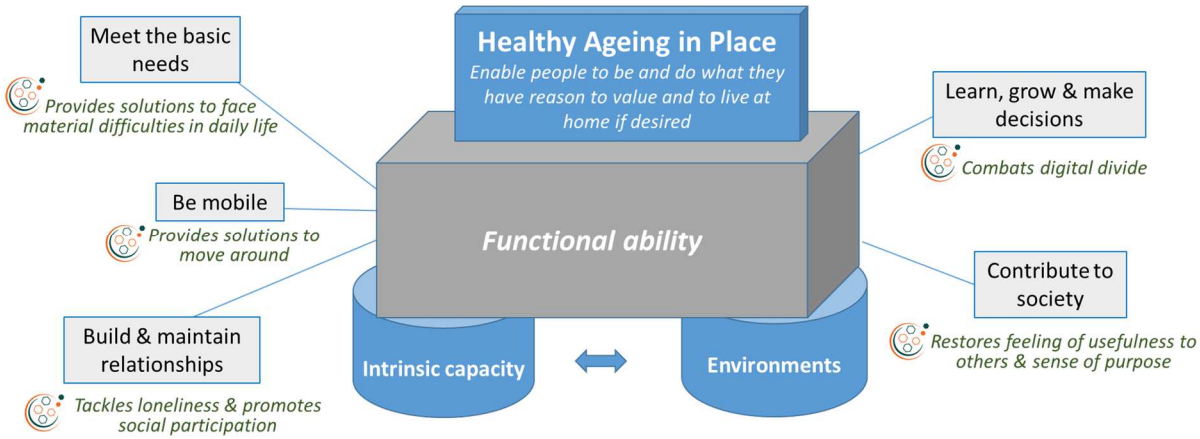

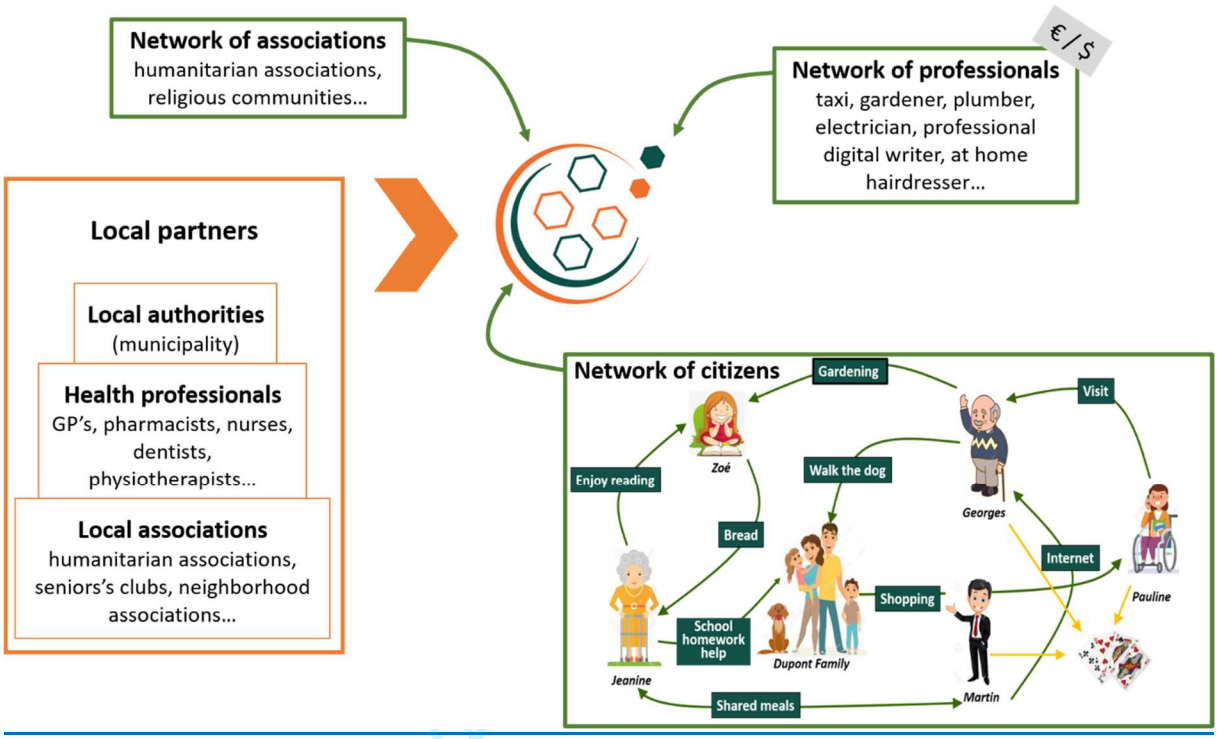

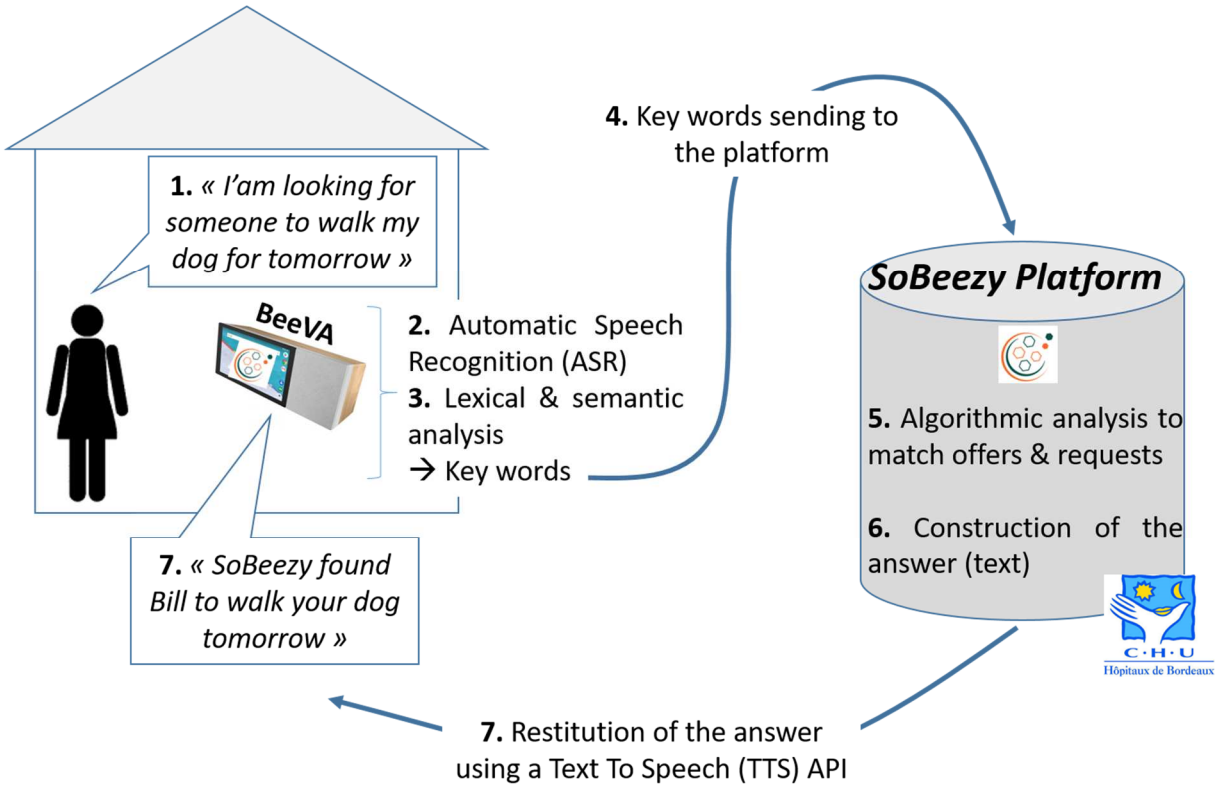

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A prospective pragmatic quasi-experimental study to assess the impact and effectiveness of an innovative large-scale public health intervention to foster healthy ageing in place: the SoBeezy program protocol

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Abstract

Introduction: With the accelerating pace of ageing, healthy ageing has become a major challenge for all societies worldwide. Based on that Healthy Ageing concept proposed by the WHO, the SoBeezy intervention has been designed through an older-person-centered and integrated approach. The program creates the environments that maximize functional ability to enable people to be and do what they value and to stay at home in best possible conditions.

Methods and analysis: Five levers are targeted: tackling loneliness, restoring feeling of usefulness, finding solutions to face material daily life difficulties, promoting social participation and combating digital divide. Concretely, the SoBeezy program relies on: 1) A digital intelligent platform available on smartphone, tablet and computer, but also on a voice assistant specifically developed for people with digital divide; 2) A large solidarity network which potentially relies on everyone's engagement through a participatory intergenerational approach, where the older persons themselves are not only service receivers but also potential contributors; 3) An engagement of local partners and stakeholders (citizens, associations, artisans and professionals). Organized as a hub, the system connects all the resources of a territory and provides to the older person the best solution to meet his demand. Through a mixed, qualitative and quantitative (before/after analyses and compared to controls) approach, the research program will assess the impact and effectiveness on healthy ageing, the technical usage, the mechanisms of the intervention and conditions of transferability and scalability.

Ethics and dissemination. Inserm Ethics Committee and the Comité Éthique et Scientifique pour les Recherches, les Études et les Évaluations dans le domaine de la Santé approved this research and collected data will be deposited with a suitable data archive.

Article Summary

Strengths and limitations of this study

- An innovative public health intervention to foster healthy aging, based on the WHO Healthy Aging concept.

- Five levers of action targeted: loneliness, feeling of unusefulness, activity limitation, participation restriction and digital divide.

- A multidisciplinary research program paired to the experimentation in general population to assess the impact and effectiveness on healthy aging in place through a mixed quantitative and qualitative approach.

- Given the important vulnerability of the targeted population and the absence of the citizen network at the time of the pilot studies, the user-centered design approach was difficult to apply in the pilots prior to this experimentation.

- Despite the greatest needs of this population, its vulnerability may also have an impact on the acceptability of the program.

Introduction

The accelerating pace of ageing raises concerns about health, quality of life, living conditions, organisation of the welfare and health systems and associated costs. In that context, healthy ageing has progressively become a major challenge for all societies worldwide. As largely previously shown, the health of the older population has massively improved leading to a delayed aging among older people over the last decades.[1 2 3] Consequently, a 75-year-old woman in 2020 is not comparable to a 75-year-old female, 40, 30 and even 20 years ago; even though recent trends would suggest less favorable evolutions.[4 5 6] Consequently people are rethinking the way they see ageing, older persons and the expectations of how to invest these extra years.[7] According to the Healthy Ageing concept proposed by the World Health Organisation (WHO), health in older age should not be defined henceforth by the absence of disease. Indeed, many older people suffer one or more health conditions, which, if well controlled, may have little impact on their wellbeing.[7] The WHO defines healthy ageing as *"the process of developing and maintaining the functional ability that enables wellbeing in older age"*, i.e. that enables to continue to perform things that are important to them.[7,8] Functional ability is made up of the **intrinsic capacity** of the older individual, **environmental** characteristics and the **interaction** between them. Intrinsic capacity is defined as the composite of all the physical and mental capacities that a person can draw on to function in life.[7] The environment characteristics represent all the resources or barriers that will determine whether a person can engage in activities or not.[7] As represented in figure 1 (adapted from the Healthy Ageing concept), the WHO distinguishes five categories of abilities that enable people to be and do what they have reason to value: to meet basic needs, to learn, grow and make decisions, to be mobile, to build and maintain relationships and to contribute to society.[9] This redefinition of the concept places older person and its environments at the heart of the approach; opening huge perspectives in terms of prevention and levers of action, but also entailing major evolutions of the current systems.

Figure 1. Representation of the responses provided by the SoBeezy program to the challenge of Healthy Ageing in Place, adapted from the WHO Healthy Ageing concept

Programs aiming at promoting and fostering healthy ageing have to be global, multi-domain and inter-disciplinary and to target intrinsic capacity as well as the environments to maximize functional ability of all.[10 7] This comprehensive approach gives larger opportunities of areas for action; each factor representing potential levers of intervention to favor healthy ageing: i) **social and psycho-social** factors (loneliness, self-esteem, social network, social support…), ii) **environmental** factors (living conditions, assistive technologies, access to transports, services and facilities, home adaptations to the limitations…), iii) **organizational** (health care organization and social welfare system) and iv) **societal** factors (representations of older persons perceived either as a burden or as a resource for our societies, ageism stereotypes, age-friendly communities…). To do so, Information and Communication Technologies (ICT) are opening new perspectives in the issues of prevention (exercise training program, cognitive stimulation activities, improved adherence to treatment…), detection (falls, pain, cognitive decline…), surveillance (personal emergency response systems, monitoring of patients with depression, chronic illnesses, dementia, cancer…), home care wellbeing (assistive technologies to maintain older peoples' independence, communication tools such as assistive robots for socialization

to reduce isolation and to increase social participation) and eHealth (tracking in real-time the health condition of the person and provide feedback and support from distant facilities) for the elderly population.[11 12,13 14]

ICT represent promising lever of action on psychosocial, environmental and even organizational factors, albeit not so-easily implementable in the current elderly population, still far from ICT tools. These latter could have a crucial role to play in healthy ageing programs. In the last 20 years, the number of technological innovations, devices, robots and platforms for the older population have dramatically increased. Yet, the large majority of them failed to prove their effectiveness due to a lack of high-quality studies or worse, to an absence of evaluation.[15] Therefore, paradoxically, the impact of ICT on healthy ageing has been rarely formally demonstrated whereas the perspectives offered by these technologies are huge, if appropriate and relevant.[16 17]

Finally, to meet the challenges of ageing, individual and collective priority is clearly ageing in place. Ageing in place is defined by the Centers for Disease Control and Prevention as *"the ability to live in one's own home and community safely, independently, and comfortably, regardless of age, income, or ability level".*[18] It is clearly the aspiration and desire of most of older people but has also become the priority goal of all ageing policies.

In the challenging demographic, social, economic and societal current context, the SoBeezy program, a population-based public health intervention, has been designed to maximize functional ability to enables wellbeing in older age. Through a comprehensive bio-psycho-social and multi-dimensional approach, this program ultimately aims at supporting healthy ageing in place in the best possible social, material and security conditions.

The SoBeezy program: General presentation

The SoBeezy program aims at facilitating and improving the lives of older persons. The system proposes solutions to cope with the main social and material difficulties encountered in activities of daily living (ADL) and fosters social participation by promoting community-based cooperation and the sharing of activities and experiences. The SoBeezy system relies on: i) A **digital intelligent platform** available on smartphone, tablet and computer, but also on a voice assistant (**BeeVA)** specifically developed for people with digital divide; ii) **A large solidarity network** which potentially relies on everyone's engagement through an intergenerational approach[19 20] where the older persons themselves and those living with disabilities are not only service receivers but also potential contributors (as represented Figure 2); iii) A**ll the local partners and stakeholders available to cooperate** (citizens, associations, artisans and professionals). Organized as a hub, the system connects all the resources of a territory and provides the best solution to meet a need or a demand.

Figure 2. Representation of the SoBeezy system functioning with three networks of contributors and a privileged partnership with local actors and stakeholders

The SoBeezy web platform and the BeeVA voice assistant

The SoBeezy system relies on a web platform, which matches offers and requests of services to provide the appropriate answer/solution to the material, leisure or social issues submitted by the users to the system.

For a universal access to the web platform, including people with digital divide who are currently excluded from all existing digital platforms and devices, the BeeVA voice assistant has been specifically developed, with older users being involved throughout the design process (choice of a voice assistant rather than a tablet, importance of a screen to remind the information and data, tests of the developments…). This device facilitates the expression of a need or a demand and allows easy interactions with the SoBeezy system by talking (e.g. "I am looking for someone to… take me to the doctor" or "to share a walk" or "to play cards"…). BeeVA uses voice recognition, natural language processing and speech synthesis to record and send the request to the web platform, which, thanks to an algorithmic treatment, matches offers and requests of services to provide, vocally, the appropriate answer/solution to the users (as presented Figure 3).

Figure 3. Description of the data treatment by the voice assistant (BeeVA) and the web Platform

The platform has been developed with the French Symfony framework and iOS / Android applications using the cross-platform iOnics framework. BeeVA uses the Google Automatic Speech Recognition (ASR), which catches the text pronounced by a person (Figure3- step 1). The lexical and semantic analysis is performed by a homemade tool to extract key words and relevant information (steps 2 and 3). After an algorithmic treatment of the data to find the appropriate resource to meet the need expressed by the person (step 5), SoBeezy builds a text response (step 6) and BeeVA restitutes vocally the message using a Text To Speech (TTS) Application Programming Interface (API) (step 7). For the safety of use of the platform, the platform and all voices processing run on the secured servers of the University Hospital of Bordeaux (CHU).

The SoBeezy system proposes to the users two main components: assistance in daily life and activity sharing (social, cultural, leisure, sports activities). For the first axis, nine services are proposed: transportation, shopping, housework, digital and administrative support, animals, visits, care and well-being (hairdresser, beauty care, relaxation…). In addition, BeeVA also proposes several options to facilitate daily life such as an easy-to use digital calendar (with appointment reminders), video call, weather forecast, radio, emergency numbers, serious games, family pictures and news and City news. BeeVA has been designed to reduce apprehension and fears about technology usage and consequently digital divide in the elderly population. Two pilot studies, conducted on sub-samples of elderly users aimed at working on both, the choice of the future services that will be provided by the platform according to the needs reported by the elders interviewed and on the choice of the device and its evolutions. The first one conducted on 53 elders (60 – 83 years) in experimental situation, aimed at testing the SoBeezy voice assistant in two specific tasks: answering questions and vocal expression of demand by elders. The second, closer to the real life utilization of the device (with BeeVA installed at home of 18 elderly persons living at home (11 women, 7 men), aged on average 76 years old and followed-up 5 weeks with three qualitative and quantitative evaluations. These studies showed good acceptability and ease of use and three profiles of users have been identified: 1) Curious and dynamic individuals rapidly autonomous in the utilization of the voice assistant (7 persons), 2) Persons with initial apprehension to use the device (mainly due to a lack of self-confidence) who required stronger

technical support at the beginning, but managed to use the device after one week of utilization (7 persons); 3) Three individuals with mild cognitive impairment and one with illiteracy have needed substantial support to manage to use the device.

The five levers targeted by the SoBeezy program to favour healthy ageing in place

1. Loneliness and social isolation

Loneliness and social isolation are now recognized as a real scourge of modern life, which grows at an impressive pace in modern societies. Now identified as major social cohesion and public health concerns, policymakers start to take up this issue. In 2018, the United Kingdom has appointed a minister for loneliness and constituted a cross-governmental group to create policies to address the growing problem, which affects 9 million Britons, i.e. 14% of the population.[21] The other industrialized societies are not spared. In France, we estimated that more than 5.5 million French people are affected. Among the most vulnerable, the elderly and those living with disabilities, the prevalence is much higher. With aging, the likelihood of losing close family and friends increases, whereas the chance of meeting new people decreases. In addition, mobility restrictions limit the ability to get out of the house, to participate and to be engaged in activities. Among those aged 75 and older, 1.5 million of French people would suffer from loneliness and 300 000 would be in a situation of social death (i.e. without any family, friendship, or neighborhood contact).[22 23] Besides the problems of poorer quality of life, having no one to talk to or share thoughts and experiences with, can be as damaging to health as well known risk factors such as smoking, sedentary lifestyle or obesity.[24] Indeed, people suffering from loneliness are more likely to present behavioral and lifestyle risk factors (sedentary lifestyle, poor eating, smoking and alcohol consumption, withdrawal...),[25 26] increased risk of chronic diseases (depression, anxiety, cardiovascular, Alzheimer's disease ...),[27 28 29 30 31] activity limitation in daily living [32] and premature death.[31,33-35] A recent review of the literature showed that a poor social network was associated with an increased risk of 29% of coronary heart disease (95% CI = 1.04-1.59) and of 32% of stroke (IC95% = 1.04- 1.68),[28] while JAMA published in 2017 an article entitled *"Loneliness might be a killer, but what is the best way to protect against it?"*.[33] To tackle loneliness, SoBeezy proposes to target as a priority, older people living alone and/or suffering from loneliness. This screening is achievable thanks to the involvement of the frontline actors in the management of the elderly population: social services of the Municipality, general practitioners, pharmacists, nurses, physiotherapists, dentists, home care services and all relevant local partners, such as associations. To tackle loneliness, SoBeezy provides specific services such as visits at home by citizens or trained volunteers from associations. Another less direct and probably less stigmatizing way to combat loneliness is the experiences and activities sharing component of the SoBeezy program. Finally, being personally involved for other people into the system and belonging to the SoBeezy community should also contribute to prevent and lower loneliness and isolation.

2. Feeling of worthlessness, self-empowerment and self-esteem

With advancing age, social roles change considerably and the retirement transition is an obvious illustration. For some people, the reduction in social function can be massive, generating feelings of worthlessness and loss of self-esteem, themselves identified as important risk factors for adverse outcomes, such as depression, cognitive disorders, chronic diseases, isolation and loneliness,

dependency and premature mortality.[36-40] In the MacArthur Study of Successful Ageing study, feeling of worthlessness was associated with greater risk of all studied outcomes: mobility restriction (OR = 3.08 CI = 1.35-7.07), limitation in basic activities of daily living (ADL) (OR = 2.65, CI = 1.05-6.68) and death (OR = 3.13, CI = 1.43-6.84), independently of many confounders.[36] In addition, people suffering from worthlessness are also more likely to have unhealthy behaviors (sedentary, tobacco and alcohol consumption, withdrawal and reduced social participation).[41,42] Several studies suggest that giving to everyone the opportunity to feel useful, even modestly, could have substantial benefits in terms of quality of life, autonomy and to remain at home longer.[41,42] The SoBeezy program provides opportunities to everyone to get involved for other people, even though simple contribution such as an empathetic ear or occasionally giving a hand to solve a material problem. We assume that whatever the age, gender, socio-professional category, abilities or health condition, everyone can contribute to the platform and thus have meaningful social role.

3. Difficulties in activities of daily living

All along the dependency process, different types of limitations are gradually affected, starting with difficulties in using transportation and doing the shopping (the entry point into the process), and ending by total losses for basic activities such as eating or transferring. [43,44] Limitations in basic ADL are one of the major factors that jeopardize the chance of staying at home, especially for people living alone. Each technological or human solution found to help people to cope with the difficulties in daily living could contribute to achieve the objective of living in place in good conditions. Relying on the SoBeezy Hub, the platform will be able to identify the optimal answer to meet the needs of assistance in the daily living tasks. The services proposed by the system cover the main needs of the elderly people identified in previous studies:[43,44] transportations, shopping, housekeeping and gardening, digital training, assistance for administrative tasks (now mainly digitalized) and pet sitting and care. The SoBeezy system intervenes both at the preventive level by having an effect on determinants of dependency (loneliness, feeling of worthlessness, digital divide, participation restriction) and both at the assistive level. Finally transportations and doing the shopping representing the entry door into the dependency process,[43,44] a special effort will be carried out to provide solutions for these specific tasks to prevent from further deteriorations. Some services will be provided either by citizens and volunteers (free), or by professionals (paid) when specific skills are required or when no free solutions are identified by the platform.

4. Social participation

In the last years of life, most of us are concerned by diseases and disabilities. Yet, as recommended by the WHO, all people should maintain engagement in the things that matter to them. Preservation or restoration of social participation despite age, diseases and disabilities appears to be a promising direction for healthy ageing programs. Indeed, beyond obvious positive impact on quality of live, being engaged in leisure, cultural, sports, religious, ecological and volunteer activities has been identified as beneficial in terms of mood,[45 46] activity limitation and dependency,[47 48] cognition[49 50] and mortality.[51 50] For instance, in the Paquid population-based cohort study, the risk of incident dementia over the 10 following years (258 incident dementia cases) was significantly lower for subjects remaining or becoming active (cumulative risk of dementia: 30%) compared to those remaining or becoming inactive (52% and 42%, respectively) ($p<0.0001$).[49] In the same vein, another cohort conducted in Taiwan on 1,388 older subjects, regularly followed-up over 18 years, showed that continuously participating or initiating participation in social activities later life was significantly associated with

fewer depressive symptoms.[46] Promoting and facilitating social activities among older persons is one of the five component of the SoBeezy program, which relies on all the local actors and partners of the territory (municipalities and associations), as well as on all the individual initiatives proposed by the SoBeezy-users and community. The SoBeezy platform provides appropriate answers to specific demands of leisure, cultural, and sports activities, but also suggest other "offers" on the territory proposed by the municipality (conferences, festivities, manifestations…), by the associations (digital workshops, dancing activity, board games…) and by the citizens themselves (finding partners to visit an exhibition, to go to the cinema, to play cards, to have a cycle ride…).

5. Digital divide

Despite a massive progression of the appropriation of ICT usage by the older population, a substantial part of the current generation of elderly people is still digitally excluded. In France, 31% of the 60 years and older were still digitally excluded in 2017, with a major impact of older age (20% of the 60-74 never use the Internet, and up to 68% of the 85 and over).[52] In addition to older age, lower income, lower education, living alone, and living in rural areas are associated with lower ICT use.[52] [53] In our technology-oriented world, where all administrative tasks are becoming digitalized at a steady pace, being digitally excluded results in a major social disadvantage. *Yet, innovative technology solutions represent promising perspectives in enriching the quality-of-life, health, and independence of older persons.*[54] Technical complexity (technical factor) and Internet anxiety (personal factors) are the two main reasons that hinder elderly people's ICT use.[55] To remove these barriers, the SoBeezy system provides easy-to use technological devices to give universal access to technologies and to the internet. In addition, human support being identified as a key condition to alleviate the negative effects of technical complexity and Internet anxiety and to enhance the positive effect of ICT,[55] the SoBeezy system also provides human accompanying of all users who need it. This team is composed of employees of the SoBeezy system, local volunteers involved in the SoBeezy organization and finally of members of the SoBeezy community registered on the platform for digital training. Therefore, the easy-to-use BeeVA represents a real strength of the system compared to the other social support platforms that failed to reach the most vulnerable ones of our society, mainly digitally excluded.

The aim of this experimentation is to evaluate the impact and effectiveness of the SoBeezy program on healthy ageing in place through a global, multi-domain and multidisciplinary approach.

Methods and analysis

The SoBeezy experimentation 2021-2022

The SoBeezy program will be experimented in three French pilot cities of Nouvelle-Aquitaine (Pessac, St-Jean-de-Luz and St-Yrieix-la-Perche) over 12 months in 2020-2021. The three sites were selected for their diversity in terms of size of the population (from 6,700 to 62,000 inhabitants), territory size (from 19 to 100 km²), population density (from 670 to 1,600 inhabitants/km²), rural/urban areas, medical and paramedical demography, access to services and digital coverage. In total, 66,800 inhabitants of these three cities are aged 18 years and older and represent potential users of the platform (beneficiaries and/or contributors). With an acceptation rate depending on age category (5% in the 18-59 and 10% in the 60 and over), we estimate that globally 7% of the adult population will use the

system, i.e. 4,700 subjects. Among them, around 2,200 will be aged 60 years and older (i.e. 47% of the users), among whom one third lives with digital divide (i.e. non-user of a smartphone, digital tablet or computer) according to the recent data for France.[52] These older persons will be equipped with the BeeVA, i.e. around 750 elderly subjects. All BeeVA users will be also equipped with an internet connection (when necessary), with enhanced human support and training. The users will be approached through large public communication campaigns and focused campaigns on specific targets (older persons, isolated individuals, frail…), as well as with the support of social services, medical and care services and local associations. The SoBeezy intervention mainly targets psycho-socio-economic precariousness (PSEP) which is characterized by an accumulation of "weakening" factors, such as loneliness, financial insecurity, lack of social support, digital divide… that is associated to a higher risk of deleterious outcomes, such as mortality [56,57] or cognitive decline.[58,59] However, in addition to this group at higher risk, we also hypothesize that this intervention will benefit to the non-precarious elderly, according to other levers of action, such as feeling of utility, self-esteem, the meaning given to one's actions, social support perceived when necessary or even participation in the City's life.

The SoBeezy-R research program

A prospective pragmatic quasi-experimental study will be conducted on a sub-sample of 1,000 SoBeezy users aged 60+, volunteers to participate to the research and followed-up over the 12 months of experimentation. Through a mixed quantitative and qualitative approach will be studied: 1) The impact and effectiveness of the SoBeezy program on healthy ageing in place; 2) The technical usage (feasibility, accessibility, acceptability, usability, user experience…); and 3) The mechanisms of the intervention and conditions of transferability and scalability.

The participants will be interviewed through standardized procedures at baseline and after 6 and 12 months of usage of the platform by a psychologist at home, by phone call, but also using ICTs (voice assistant, smartphone, tablet or computer according to the usages). This latter procedure is very useful to collect data in the ecological context of home and in a more continuous manner than through interviews conducted at punctual time-visits. Qualitative studies will also be performed on sub-samples with interviews conducted by sociologists (to assess the mechanisms of the intervention) and cognitics interviewers (qualitative assessments on a sub-sample of users and quantitative evaluation on the whole sample to study technical usage: computer proficiency,[60] usability,[61] user experience questionnaire[62]). Moreover, national health insurance data will also be exploited to analyze both, health care consumption (compared to a control group) and outcomes at longer-term than 12 months (in terms of mortality, hospitalization, institutionalization, dependency, psychotropic drugs use, care costs…). A before-after analysis of the entire cohort (N = 1000) will allow to study the one-year evolution of the main parameters: perceived social support,[63] quality of life, [64] loneliness,[65] participation,[66] sense of usefulness,[36] self-esteem,[67] frailty[68,69] and activity limitation.[70-72] Moreover, a comparative analysis of the health insurance data will assess the impact of SoBeezy on health and care trajectories, including medico-economic analyzes. In addition, a focus on psycho-socio-economic precariousness will be performed with a comparative analysis with control group carried out on the sub-sample of precarious SoBeezy users (N = 350). The control group will include 350 precarious elderly subjects living in comparable territories not covered by SoBeezy.

Patient and Public Involvement

1. **When and how was public first involved in the research?** The older subjects, all living in the community, will be invited to participate to the experimentation through large public communication campaigns and focused campaigns on specific targets (older persons, isolated individuals, frail subjects…). Identification, recruitment and support of potential beneficiaries of the program will also be conducted by local partners such as well as local social, medical and care services and local associations. The experimentation will start as soon as the sanitary Covid-19 situation will allow it, for a period of one year. As details below, a sample of older individuals has been involved all along the design process of the program.
2. **How were the research question(s) developed and informed by their priorities, experience, and preferences?** The research questions explored in this study have been based on
   - the challenging current context of ageing for all societies worldwide and the necessity to foster healthy ageing
   - the fact that loneliness and social isolation are now recognized as a real scourge of modern life, which grows at an impressive pace in modern societies, with significant impact on well-being and ageing
   - the Healthy aging concept proposed by the WHO which focuses on functional ability, intrinsic capacities and environments
   - the development of a concrete interventional public health program (SoBeezy) to promote healthy ageing
   - the 30-year experience in epidemiological cohorts on ageing of our research team

3. **How was public involved in**? A subsample of older persons has been associated at the very beginning of the SoBeezy program. These elders have been associated to the technological choices, particularly in the selection of the device (voice assistant with a screen) and also participated to the testing phase of the prototypes. In addition, they also participated to the structural choices of the platform (identification of the main needs of the elderly population in daily life, selection of the services proposed by the platform, formulation of the services on the digital platform…). However, they have not been associated to the choice of the outcome measures of the experimentation; these choices being based on the data collected on more than 14,000 elderly people living in the community, participants in population-based cohort studies on ageing conducted by our research team for more than 30 years. Regarding recruitment to the study, two main approaches will be conducted: public communication campaigns (with also targeted campaign on specific populations) and the involvement of our local partners including Municipality (elderly population Department) and associations of older persons. These partnerships will also be used to work on the methods and plans for dissemination of the results. Results will be disseminated through scientific communications (articles and congress), public conference, media and also specific communication to the participants to the program (specific articles, conferences…).

Ethics and dissemination

The Inserm Ethics Committee and the Comité Éthique et Scientifique pour les Recherches, les Études et les Évaluations dans le domaine de la Santé (CESREES – No 1583867) approved this research. Data collected by the platform will be hosted on the secured server of the University Bordeaux Hospital.

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Author Contributions

KP contributed to the conception and design of the work and drafted the manuscript
AZR was a major contributor in writing the manuscript
JFD made substantial contributions to the conception of the work and substantively revised the manuscript
HA made substantial contributions to the design of the work and substantively revised the manuscript
SL made substantial contributions to the conception and design of the work, to the creation of the voice assistant used in the work and substantively revised the manuscript.
All authors read and approved the final manuscript and have agreed both to be personally accountable for the author's own contributions and to ensure that questions related to the accuracy or integrity of any part of the work, even ones in which the author was not personally involved, are appropriately investigated, resolved, and the resolution documented in the literature.

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