14 Gerontechnologies and Successful Aging

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Introduction

According to the 2012 Ageing Report from the Economic Policy Committee (EPC), the proportion of the population in the EU aged 65 and over will become a much larger share (rising from 18 percent to 30 percent of the population), and those aged 80 and over (rising from 5 percent to 12 percent) will almost become as numerous as the young population in 2060. The number of older people (aged 80 years and above) is projected to increase by even more, almost tripling – from 23.7 million in 2010 to 62.4 million in 2060. The increase in the total age-dependency ratio (people aged 14 and below and people aged 65 and above over the population aged 15–64) is projected to be even larger, rising from 49.3 million in 2010 to 77.9 million in 2060.

Aging is a natural process, which can be classified into 3 periods at the end of life: (1) entrance into retirement: the aged but active, without disabled disease, often grandparents, with potential social difficulties because of the loss of professional relations; (2) frailty with health diseases, acute and chronic: causing loss of activity and the need for help to continue autonomous living; and (3) disability with cognitive and physical impairment: needing specific healthcare interventions. Aging could be associated with a series of daily problems like loss of autonomy, frailty, illness, and social isolation. Current solutions, particularly in disability, such as placement in specialized hosting institution, show their limit because of the lack of availability and individual and social cost

The increase in life expectancy, number of chronic patients, and healthcare costs, and the shortage of medical and paramedical staff are among the most important challenges in the next few years. In reply to these mutations, the healthcare system evolves gradually, passing from a traditional, paternalistic approach, controlled by the professionals of health, to a patient-centered approach.

Most economists have a very pessimistic vision of the aging of the population. It is indeed the first time in the history of humanity that we are entering a post-transition demographic phase with a significant increase amongst old people. It is a reality and also a challenge.

In this context of change, we can see a rapid and significant development of technologies for old people, and some of these technological innovations could help overcome the potential barriers in aging well.

Indeed, a wide variety of technological devices have emerged in order to help old people to better manage their own health and to compensate for possible difficulties. These technologies, called gerontechnologies, are therefore aimed at promoting successful aging.

In the domain of aging, the concepts of successful aging versus frailty become known in response to the need to build prevention and treatment strategies in the elderly. In summary, it can be considered that frailty represents the intermediate states between aging with complete functional autonomy and irreversible dependency (disability) being the result of pathological aging.

Successful Aging

The first appearance of the concept of successful aging comes from Robert Havighurst in 1961 (Havighurst, 1961). In 1987, Rowe and Kahn (Rowe and Kahn, 1987, 1998) developed, within the MacArthur Research Network on an Aging Society, a model to characterize those very robust and independent older persons according to three domains: (1) disease risk, (2) physical or cognitive capacity, and (3) engagement with life. Successful aging is in the first part of aging and should be protected as long as possible. A lot of definition has been developed involving a multidimensional approach. The most validated and usual model is the MacArthur model (Figure 14.1).

In 30 years, the model remains applicable but obviously has been widely discussed. In their 2015 paper (Rowe and Kahn, 2015), these same authors criticize the model and have a look at its evolution. The authors note that "a thousand of articles have been written on the concept and its components, and more than 100 variations of the original model have been proposed." By its multidisciplinary character, the model of successful aging presents five main domains of approach already mentioned by Seeman et al. in 1995 (Seeman et al., 1995):

- Physical performance;
- Behavioural factors;
- Social network characteristics;

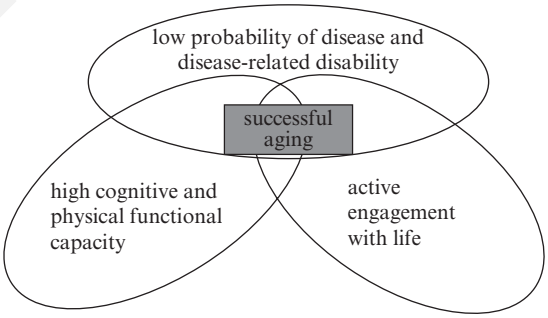

Figure 14.1. *The model of successful aging*
Source: From Rowe and Kahn (1998)

- Psychological characteristics;
- Sociodemographic characteristics.

The underlying characteristic of this kind of multi-factorial model is that the resultant, i.e., successful aging, is more important than the sum of its components, there is thus, an effect of potentiation.

In a very interesting literature review, Kusumastuti et al. (2016) performed a quantitative analysis of citation networks, exploring the literature on successful aging found in the Web of Science Core Collection Database using the CitNetExplorer software. At that time, the citation network consisted of 3871 publications, with 10804 citation links, within the time window from 1902 through 2015. By applying a cluster analysis to this database, the authors isolated two main clusters: the Havighurst-cluster and the Katz-cluster. In the Havighurst-cluster we meet publications concerning successful aging, but from the point-of-view of old persons. Thus, it is a more subjective vision. On the other hand, the Katz-cluster publications are more objective and more quantitative publications, in a perspective of clinical research.

One of the most recent literature reviews in the first cluster is the paper of Deep and Jeste (2006). The authors insist there is a lack of consensus on the definition of the concept. Thus, out of 28 published papers, they count 29 different definitions. Despite the variability between the definitions, about one-third of seniors were classified as successful aging. The majority of these definitions were based on the absence of disability, with less inclusion of psychosocial variables.

The founding publication of the Katz-cluster is the famous paper of Sidney Katz et al., written in 1963 (Katz et al., 1963), with the introduction of the activities of daily living (ADL) and the concept of autonomy.

But the wellness of the person is probably one aspect of healthy aging. In a brief communication in 2011, Thompson et al. (2011) cited Halbert Dunn, who originally defined wellness as "an integrated method for functioning, which is oriented toward maximizing the potential of which the individual is capable. It requires that the individual maintain a continuum of balance and purposeful direction within the environment where he/she is functioning: (1) physical well-being/ fitness, (2) mental and cognitive health, (3) social well-being, and (4) spiritual well-being."

Gerontechnologies

The Numeric Revolution

The principle steps of the numerical revolution can be considered:

- 1980–90: first dematerialization with the first personal computers (PC) and the appearance of Internet
- 2000: amplifications and appearance of the first smartphones
- 2010 onward: explosion of application, Internet, ~~and~~ connected devices
- Future: the "quantified self" is the first sign of the next major transformation

Concerning healthcare and the medico social system, it is needed to correlate the route of life into this revolution, putting the person at the center of the transformation process. The individual is the owner of his/her health data, with the ability to choose the best healthcare and concerning technology, giving order according to what is needed and useful in a given situation, and also for the prevention of future incidents (La Révolution du Bien Vieillir, 2015).

The Birth of Gerontechnologies

Gerontechnology is a discipline dedicated to the use of new technologies in the field of aging. It is based on a cross-disciplinary and multidisciplinary approach between gerontology, which studies aging in its various aspects, and the different techniques (physical, chemical, civil, mechanical, electrical, industrial, information, and communication technologies (ICT)) applied to the production of products and services that meet the needs of daily life.

Gerontechnologies brings together new technologies (domotics, robotics, telemedicine, e-health, m-health) that may have an interest in gerontology. The term "gerontechnology" mad one of its first appearances in the Proceedings of the First International Conference on Technology and Aging, held in Eindhoven in August 1991. It was finally adopted in October 1996 at the Second International Conference on Gerontechnology in Helsinki, Finland.

This field originated in 1980 at the Eindhoven University of Technology in the Netherlands. Gerontechnology is applied in five major areas of design: prevention, compensation, enhancement, research, and aid to caregivers. Prevention is the most powerful and novel of these applications, since it proposes that aging may be altered by redesign of the environment, products, and services. The Herman Bouma Fund for Gerontechnology Foundation was established in honor of the professor emeritus status of Dr. Herman Bouma, on March 26, 1999. Gerontechnology is defined as an interdisciplinary field of scientific research in which technology is directed toward the aspirations and opportunities of older persons. Gerontechnology aims at good health, full social participation, and independent living up to a high age. Research and Development (R&D), the design of devices and proposed services, must aim to increase the quality of life.

Next, we note the publication of founding articles (Bouma, 1998; Graafmans and Taipale, 1998; Pinto et al., 2000a, b). In their 2003 book, Wahl and Mollenkopf (Wahl and Mollenkopf, 2003) argue that, at the general level, all these approaches conceptualize technology and human development (aging) as an interactional relationship: "placing the person and his environment (including, technological devices) in a dynamic and reciprocal exchange system."

In 1997, the International Society for Gerontechnology was founded and *Gerontechnology* (ISSN/EISSN 1569-1101 1569-111X its quarterly official journal, first appeared in January 2001. Bouma et al. (2007) recalled the evolution of gerontechnologies since 1990.

Domains of Application

As pointed out by Wu et al. (2015), very simply, there are two categories of technology among older adults technology: technology that targets the overall population and assisting technology with special needs.

For Fozard (2001), applications of gerontechnology are based on five ways of using technology:

- To prevent or delay age-related declines in functioning;
- To compensate for existing age related limitations in functioning;
- To enhance enjoyment and participation in activities that for many older persons may result from changes in work and family responsibilities;
- To support the caregiver of disabled elderly persons with technology;
- To improve applied and basic research on aging using technology that addresses the major scientific problems of gerontology.

Early in the development of the concept of gerontechnologies, five main application domains of daily life are distinguished:

(1) Health and self-esteem;
(2) Housing and daily living;
(3) Mobility and transport;
(4) Communication and governance;
(5) Work and leisure.

These domains are then crossed with the expected technological impacts:

- Enhancement and Satisfaction;
- Prevention and Engagement;
- Compensation and Assistance;
- Care Support and Organization.

A lot of applications can be considered, and technological development is so rapid that it makes it very challenging. The problem is also to make a distinction between useful and needed tools and "gadget" devices. That is one reason why typology and classifications are so important.

Typology

As early as 2002, attempts to develop taxonomy of gerontechnologies appeared (JEMH et al., 2002). Given the complexity of representing such a large subject, a conceptual schema is used, based on a cross table between the fields of application, in columns, and the technological impacts, in rows.

This representation is taken up by Bouma et al., in a 2009 study where the authors filled cells with the products and services available in the gerontechnology market (Bouma et al., 2009). However, the typology of gerontechnology is not yet well defined. In a systematic review, not previously published, our group demonstrates how gerontechnology can be classified according to their

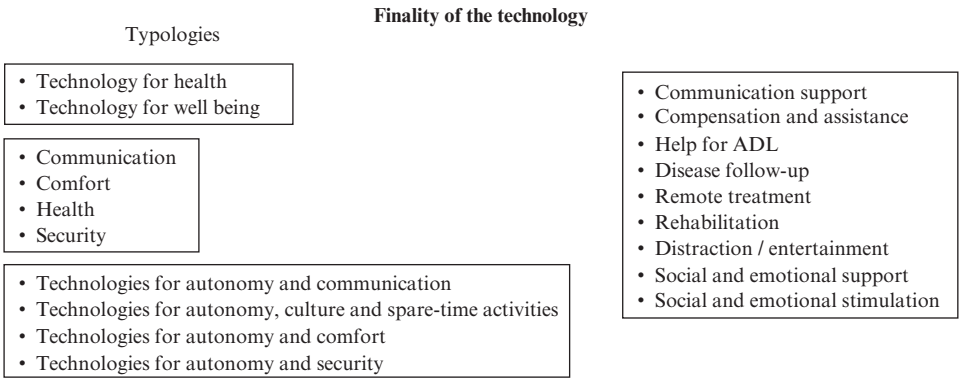

Figure 14.2. *Typologies of gerontechnologies*
Source: Boulanger et al. (unpublished)

finality (Figure 14.2) and how it is actually difficult to find consensual and clear typologies.

However, we propose a classification in two system types: assisting persons and supervising them with possibilities to have alert. In both groups, subclassifications can be proposed according their objectives in health security, social link, and comfort (Figure 14.3). We realize that this type of model is important, but not at all ultimate. Yet, it is a way to try to be able to make sense when the devices are introduced to older persons.

As can be seen in Table 14.1, our group is in the process of developing an updated gerontechnologies application matrix.

Adoption and Acceptance

In a more health and assistance finality, we have tried to classify the technologies with information and supervision of potential health problems. This can be included in e-health and is one part of the topic. So in healthy aging, these devices could be helpful in the prevention of incident, and diseases, but have yet to prove their effectiveness.

In a study of Thompson et al. (2011) on 27 subjects, with a mean age of 88 years, all residing in an independent retirement community, and who generally rated their baseline overall health as excellent or very good, were followed for 8 weeks. The participants were involved in a wellness platform, integrating a tele-health kiosk that assessed physiological parameters, WebQ (allowing for the administration of questionnaires on functional, social, and spiritual well-being), and Cognifit software, which assessed cognitive parameters. The subjects reported a high level of social support and expressed positive attitudes towards the e-health tools and the holistic assessment of wellness. Several participants commented on the value of receiving feedback and having the ability to monitor their own progress. They explain the desire to understand their own wellness information. Parameters were highly correlated across multiple domains

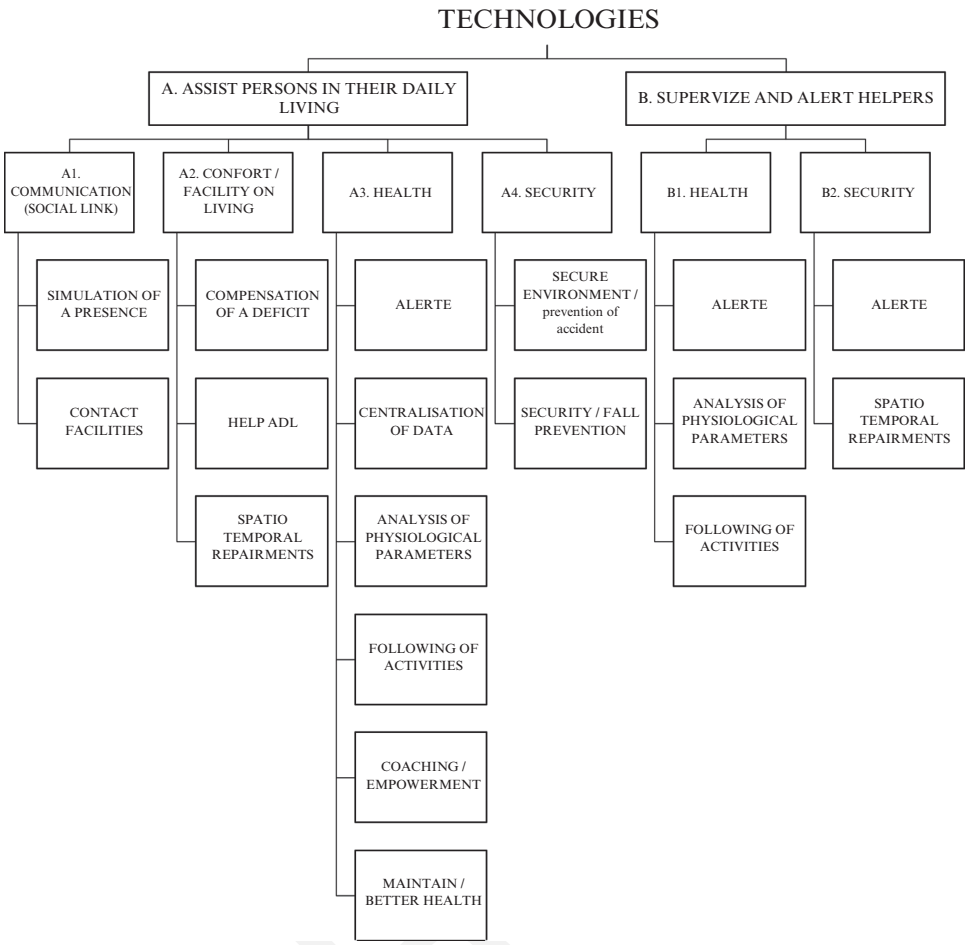

Figure 14.3. *Categorization of gerontechnologies*
Source: Boulanger et al. (unpublished)

of wellness. Important clusters were formed across cognitive and physiological domains, giving further evidence of the need for an integrated approach to the assessment of wellness.

In Hanson (2010), a web-based research protocol was proposed to a user group of young people (age 30 or younger) and an older user group (age 60 or older). Behavioral analysis of participants was based on eye tracking technique. The observed differences are more about performance and speed, than on understanding. For the author, "older adults represent one such group in danger of exclusion. In some cases, older adults have been disinterested in new technologies. In other cases, however, the technologies fail to take into consideration the strengths and weaknesses of older users that would promote this usability."

A recent report by Aaron Smith (2014) shows that older people are often isolated from digital life, although the use of technology is increasing. Many

Table 14.1 *Applications matrix of gerontechnologies (Boulanger et al., in progress)*

	Prevention	Compensation	Alarm/intervention
Classification of technologies	Prevention's technologies: Detect precursor's signs of trouble	Compensation's technologies: The senior is able to keep autonomy	Alarm's technologies: Quick intervention by the formal occurs. Automatic alarms or activated by the senior himself
Cognitive functions: Dementia, cognitive disorders (memory, disorientation in space and/or in time)	Ex: Follow activity or stimulate memory	Ex: Compensation such as memory prostheses (recall tasks, medications, etc.) geolocations	Ex: Alarm when a medication has not been, when person is out of a predetermined perimeters or is lot. When a change has been noted in the activity
Moving functions: Motor disorders	Ex: Stimulation of physical activity	Ex: Compensation of a motor trouble to help seniors to keep their autonomy in the moving (by light path, specific devices, etc.)	Ex: Falls alarms
Vital functions: Cardiac, pulmonary problems, etc.	Ex: Follow health parameters, nutritional coaching, recall to take medications, etc.	Ex: Personalization of recommendation about health, using personal parameters	Ex: Alarm if cardiac, pulmonary, or other problems
Sensorial functions: Hearing, sight troubles, etc.		Ex: Adapted interfaces, adapted devices	
Social link: Social isolation/ depression	Ex: Facilitation to social link, Internet, and use messaging, etc. Follow activities	Ex: Compensation of social isolation contacts with family, friends, etc.	Ex: Alarm when a change is noted concerning social contacts

older persons face physical challenges to using new digital devices and need assistance; while others lack interest in technology. These non-interest users of the Internet think they are not missing out on much.

Still, the biggest challenge is to accommodate the need for a holistic integrated service, which means providing personalized services and adapting technology and content to the individual needs of the different stakeholders. Further, cross-disciplinary research that relates informatics and technology to

different stages of the aging process and that evaluates the effects of proposed technical solutions is needed (Koch, 2010).

For Ziefle and Schaar (2014), the dilemma between older patient empowerment and their stigmatization requires rethinking traditional concepts according to their potential users. It assumes:

- Rethinking of Information and Communication Technology in the medical context;
- Rethinking of age and aging in greying societies;
- Rethinking technology design: user-centered, hedonic, and affective design.

The authors conclude that, "positive aspects of age and aging – life experience, domain knowledge, skills and expertise, wisdom, lifelong learning, and keeper of values and culture – should be deeply anchored in the public's mind. This seems to be not only a timely duty in nowadays societies; it also secures social and societal traditions, and medical technology development is part of it. If future medical technology adheres to an open-minded age perception, empowerment of the seniors is enabled."

While literature on technology adoption does not include ageism (a discrimination by one age group toward another), this literature is consonant with the hypothesis that ageism may contribute to digital divide. In a recent article (McDonough, 2016), Carol McDonough considers that an additional reason for the digital divide among older people is that some of them have internalized the negative and often wrong messages of ageism, which may lead to a reduction in self-efficacy, and specifically, older adult's inability to use internet technology. Wandke et al. (2012) confirms this idea by discuss six common myths in the field of "human-computer interaction and older people" (i.e., older people are not interested in using computers, older people consider computers as useless and unnecessary, older people simply cannot understand interactive computing technology, etc.). They therefore consider that such myths are problematic because they can lead older people to avoid the use of technologies. Consequently, old people could be fearful and anxious about technology and their ability to use the Internet. If older people do not possess the optimism and innovativeness that are the positive attitude in the technology readiness model, then they are likely to only have the negative message of the model, discomfort and insecurity. A consequence is that these older adults devalue the benefit and usefulness of the Internet, and consequently do not adopt it. The attitude toward technology is a significant determinant of adoption. It can be expected that over time this effect will decrease, because future old generations, having grown up using the Internet and technology will not possess a negative view.

In a systematic review, providing an overview of adults' perception of fall technologies, Hawley-Hague et al. (2014) demonstrated that the technology needs to be clearly described in research and older peoples' attitude towards different sorts of techniques must be clarified, to make specific recommendations. Indeed the positive message about the benefit of falls technology is critical, if it is not simple, and especially when tailored to individual need. In this exploratory

study, where a lot of devices (e.g., portable computers, robotics, games consoles) were used, the results demonstrated that one of the barriers of successful use is the lack of adoption and adherence. These two factors are very much linked to the understanding, potential benefits such as independence, increased safety, convenience, and increased social opportunities and confidence. Therefore the adoption and acceptance of a device should be considered at the beginning of the concept. It is important that it is influenced not only by its usefulness, but also by the position of the patient and by the perception by the patient of its "plus value" for their wellness in the successful aging, and not largely influenced by the stereotype of aging.

In a recent review, Dasgupta et al. (2016) has demonstrated a positive impact of tablets on different components of successful aging such as management of chronic conditions, medications, maintenance of physical and cognitive health, and social impact. However, the definition of successful aging of the author includes the management of chronic conditions along with the maintenance of physical, mental, and socio-emotional health. The studies were performed in different settings and with different sample sizes. The impact of the fast evolution of tablets is difficult to measure. With regard to the maintaining of physical health, the studies had small sample sizes, did not take into account gender, age, mood, weather, and chronic conditions, and were not randomized. In cognitive health, the impact of the tablets applications on complex behavior and their transfer effects to other domains of successful aging has not been studied. User interface design seems to change from one cognitive domain to the next. No information has been obtained on the effectiveness of casual games and autonomous training. When defining social support, the studies are limited because of a lack of specificity; the authors consider that comparative evaluations of different ICT tools are needed to demonstrate their effectiveness in improving socio-emotional health of the persons and their privacy implications. Caution must be taken in maintaining privacy and confidentially, but the limited number of long-term studies is also mentioned. Furthermore, the integration with the care provider must also be better developed, which is particularly important in the survey of chronic diseases.

In that matter, the concept of literacy in e-health must be developed further. E-Health literacy names a set of skills and knowledge that are essential for productive interactions with technology-based health tools. Van der Vaart (van der Vaart and Drossaert, 2017) has developed a digital health literacy instrument (DHLI) to make self-report measures using multiple subscales. The DHLI is acceptable, and is now considered as a new measurement tool to assess digital health literacy, measuring six diverse skills. Its self-report scale shows proper reliability and validity. The included performance-based items should be studied and adapted further, to determine their value and their discriminant validity. Future research should examine the acceptability of this instrument in other languages and among different (risk) populations and should explore ways to measure mobile health literacy skills as well. The Digital Health Literacy Instrument, in both Dutch and English, is available and may be used on request via the corresponding author. The

researchers show that "acceptance in this stage is influenced by 27 factors, divided into six themes: concerns regarding technology (e.g., high cost, privacy implications and usability factors); expected benefits of technology (e.g., increased safety and perceived usefulness); need for technology (e.g., perceived need and subjective health status); alternatives to technology (e.g., help by family or spouse), social influence (e.g., influence of family, friends and professional caregivers); and characteristics of older adults (e.g., desire to age in place)."

In a very complete systematic review in 2014 (Peek et al., 2014), Peek et al. have reviewed 2841 articles and selected 16 relevant articles that investigated the acceptance of technology that enhances safety or provides social interaction. They also concluded that we have to differentiate between factors in the pre-implementation stage and factors in the post-implementation stage and that more research is needed to capture the complexity and timeline of the acceptance process of different types of electronic technology for aging in place by community-dwelling older adults. This complexity must be analyzed by models of technology acceptance research, which are dominated by the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT). To understand the use of these models, reference is made to the article by Kiwanuka in 2015 (Kiwanuka, 2015). The unified model of Venkatesh et al. (2007), known under the abbreviation of UTAUT, represents a simplified version compared to TAM, in the sense of not taking into account the construct "attitude towards new technology," as indeed most models were inspired by TAM. It uses three determinants of intent to use, which are: expected performance, expected effort, and social influences.

It is obvious that the assessment of the acceptability or, in other words, the compliance of gerontechnologies proposed to people is an essential step to avoid the development of inapplicable devices. By way of example, numerous studies on evaluation models used in various gerontechnologies can be found (Barnard et al., 2013; Chen and Chan, 2013, 2014; Cimperman et al., 2013, 2016; Arenas-Gaitán et al., 2015; Magsamen-Conrad, 2015; Axelsson and Wikman, 2016; Ma et al., 2016).

This way of information should help the conceptors of devices, but probably more, the acceptance by older persons, in their knowledge and understanding of the device.

Ethical Issues

Ethical values are another important field. In gerontechnology, we start from the assumption that the effects of our professional actions should be beneficial to aging persons directly or indirectly. But what are ethics is saying to us? Technology must improve the quality of life of the person with a substantial benefit they can see and better feel. The device must give the assurance of liberty to the user and not give the feeling of being followed by "big brother."

If technology is connected to the way older people live, then they will participate; but if technology negatively alters people's way of life, then that will not be the case (Bowen, 2009). On another hand, in order to give consent, it is generally

understood that a person should have the information required to make a decision and to understand the implications of that decision (van Berlo, 2005). As mentioned by Bouma (2010), ethics deals with intended and foreseeable effects of human actions onto others. Direct effects upon one or more persons can be traced one-to-one to earlier actions of one or more actors. More often, indirect effects may be traced back to a number of earlier actions and situations. Then we may speak of foreseeable changes in the likelihood of certain effects. The basic issue is to consider what effects and side-effects (risks, misuse) might result from our actions and in what circumstances.

Obviously, "good" and "bad" are not constants, as an all-encompassing term for present law, religion, and custom, but depending on cultural acceptance, behavior and comprehension of the purpose are constants. The wishes of the persons and acceptance are also necessary, but the advice of experts about the real improvement that a machine can bring should be highly valued.

But the question is not so easy in chronic diseases and frail persons, especially with cognitive disorders. And quite often, it seems to the caregivers that it is this population who could better benefit from the progress of technologies to let them live at home in a secure environment. In these situations, the principle of beneficence (doing good for others) needs to be considered together with the principle of justice, in terms of progress, security, and dignity (Cornet, 2012).

Perspectives and Danger

Geriatricians must face the challenges of their education, culture, skills, and clinical practice. However, they need to sustain daily functioning and enhance the quality of care and quality of life of their aged patients. Gerontechnology can help them to face future challenges. Smart objects will be very often used to maintain health and functional capacity. Information from the environment interacts rapidly with the user. Relevant health information such as diet, physical activity, brain functioning, but also physiological parameters, can have access in real time. But the rare studies on efficiency published, have not been convincing and the participants found the concept unfamiliar and not very interesting (Michel and Franco, 2014). In the prevention and management of disease health, connected platforms can include vital signs and other parameters. Different adherence systems have been created, particularly to optimize medication, and their validity has been proven. However, no gold standard has emerged (Stegemann et al., 2012).

The incorporation of new technologies into the fields of health and social care is already a worldwide phenomenon. But there is a lack of evidence to support this practice. Older people who are not aware of the technologies could be disproportionately affected by the numeric revolution, and geriatricians and caregivers must keep in mind the wide-ranging implications for their patients and also their own practice (Stowe and Harding, 2010).

Therefore, we can consider that it is very important to verify the efficiency in terms of survey help, but also in terms of quality of life. ~~Regrettably,~~ not enough studies have been conducted to confirm effectiveness, and t often the devices used precede the need or try to impose some new use.

Conclusions

Successful aging is a multidisciplinary and complex concept. How to distinguish it from similar terms as healthy aging, active aging, well aging, and aging in place? Foster and Walker (2015) and Tesch-Römer and Wahl (2017) suggest lines of thought. While a robust individual obviously benefits with successful aging, the frail show signs of failed aging. For Susan Friedman et al. (2015), "it seems appropriate not only to target prevention efforts toward older adults with chronic medical conditions and the near frail, but also to take a more-active role in promoting and educating successful aging to middle-aged and older individuals with preserved function and few or no comorbidities." The development of a preventive, organized, multidisciplinary, early, and evaluated policy to prevent loss ~~of autonomy is~~ essential. It could enable the whole population to successfully age, to contain the incidence of loss of autonomy, and limit the extent of disability, thus offering a significant financial impact. Unfortunately, the statistics available on the OECD website show that the share devoted to prevention in overall health expenditure is desperately low (see Figure 14.4).

The goal of gerontechnology used in everyday life is to maintain the physical fitness, cognitive health, social links, and emotional balance of the users. Furthermore, assistive technologies, by replacing or compensating for diminished functionality, can restore some autonomy while relieving caregivers. If old people could retain their capabilities, the need for assistive technologies would be postponed. Therefore, the alternative perspective is more preventive and proactive.

However, radical changes in society will deeply influence the practice of medicine. Tomorrow wireless, from home to hospitals and institutions, will be used to circulate information. All recorded health information will be transferred to personal cellphones from capture on the skin (i.e., miniature epidermal captures

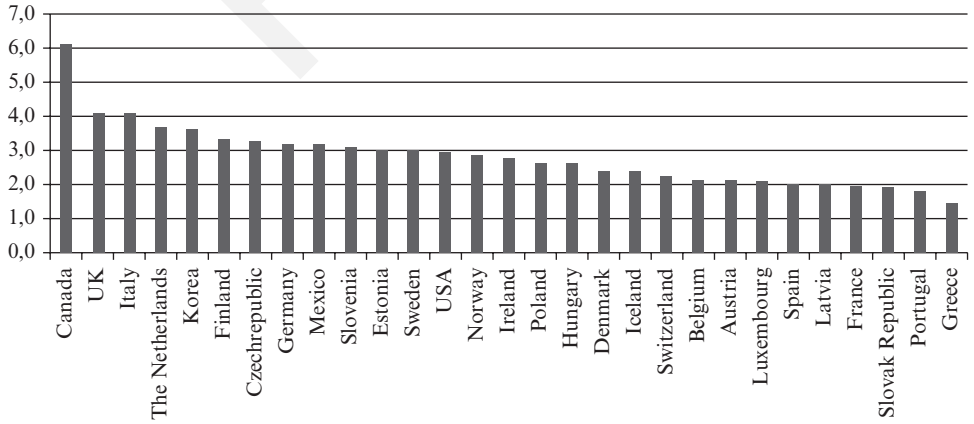

Figure 14.4. *Preventive care in share of current expenditure on health*
OECD, 2014, http://stats.oecd.org/Index.aspx?DatasetCode=HEALTH_STAT

or "electronic skin") and users will be constantly updated of their medical situation from the cloud computer. This "informal network of care" will be increasingly important. Even if the applications come quickly to daily life, it seems impossible to imagine the individual aging process without considering the affective surroundings of the person. Nevertheless, in the care system, "companion" robots will not replace humans soon (Michel, 2012).

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