

Elderly People at Home: Technological Help in Everyday Activities*

M.V. Giuliani

*Institute of Cognitive Sciences and
Technologies (ISTC)
Italian National Research Council
(CNR)
Rome, Italy, 00161
vittoria.giuliani@istc.cnr.it*

M. Scopelliti

*Institute of Cognitive Sciences and
Technologies (ISTC)
Italian National Research Council
(CNR)
Rome, Italy, 00161
massimiliano.scopelliti@istc.cnr.it*

F. Fornara

*Department of Psychology
University of Cagliari
Cagliari, Italy, 09123
ffornara@unica.it*

Abstract - The aim of this paper is to understand to what extent elderly people are likely to accept a technological aid in performing everyday activities. In this perspective, the present research focused on elderly people's strategies in performing everyday activities at home, in order to understand in what domains technology can be considered an acceptable help. We administered a questionnaire focusing on preferred strategies in carrying out common domestic tasks, and on attitudes towards new technologies and home modification to a sample of 123 elderly people living in Rome. Results show that the adoption of a strategy, including the introduction of technological devices, is highly problem-specific, while personal factors are relevant only in particular situations. With increasing age, people are more inclined to give up, and higher educational levels correspond to more frequent technological solutions.

Index Terms – *Coping strategies; elderly people; assimilation; accommodation; technology; home.*

I. INTRODUCTION

A previous study, carried out as a part of the Robocare project [1] with the aim of assessing people's attitudes and preferences towards a domestic robot, showed that the elderly have a conflicting view of such a device [2]. Older people seem to recognize its potential usefulness in the home, but they are somewhat scared of possible damages caused by the robot and are afraid of intrusions into their privacy. As regards physical shape and behavior of the robot, they clearly express a preference towards a serious looking small robot, with a single cover color and slow movements. Moreover, most of them would like it not to be free to wander inside the house and would expect it to be programmed in a fixed way to execute specific tasks. However, when asked about the specific tasks the robot could perform in their home, people's answers are somewhat vague or unrealistic. In fact, robots are still too far away from everyday life to be easily distinguished from other technological aids, and the attitude towards them mirrors the general attitude towards new technologies.

The key point to be emphasized is that the elderly do not show an *a priori* opposition to technological innovations, but

they are more likely to accept them only when the practical benefits are evident.

The assessment of benefits is not only related to the actual capability of a machine to perform a task, but also to the value people attribute to that task, and to the alternatives which are available. Hence, an important aim is to understand what the deeper needs of elderly users are and what the solutions are that are usually implemented to satisfy these needs. Ignoring these aspects would pose serious difficulties for the adoption of potentially useful devices.

A central feature to be emphasized is the relationship between adopted strategies, successful aging [3] and life satisfaction. In life-span developmental psychology, the Piagetian terms *assimilation* and *accommodation* are used to designate two complementary strategies for reducing discrepancies between desired and factual situations [4]: the first involving active modification of the environment in order to reach personal goals; the second comprising mechanisms and processes by which goals are adjusted to external constraints and losses in personal resources. Some studies [5, 6] showed that people tend to shift from assimilative to accommodative strategies as age increases, both strategies however being positively related to life satisfaction.

Reference [6] explored the relevance of different factors - including personal competence, social network, and adaptability of the house - in influencing the attitude towards more assimilative or more accommodative strategies within an elderly group. Five adaptive strategies were considered: physical modification of the environment, formal help, informal help, change of behavior, and accommodation. Strategies of adaptation of the physical environment are considered the most assimilative; strategies of personal adaptation (particularly the "give-up" reaction) are categorized as the most accommodative ones. Results show that the type of problem is the major determinant of the adaptive strategy people choose, while other factors play a relatively modest role.

Following this conceptual framework, the present study addresses the issue of technological modification of the home as

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a specific strategy. Particularly, the use of technological aids is added as an additional assimilative choice for adapting the physical environment to personal needs. Technological devices are considered along a continuum, where a domestic robot would be situated at the extreme pole of innovation. Here, the focus is on strategies *currently* adopted by people, and an intermediate level of technological complexity is considered. Furthermore, the investigation of the effect of increasing age on attitudes and behavioral intentions towards technology is one of the objectives of this study.

II. THE STUDY

A. Objectives

This study aimed at finding answers to the following questions.

1) What are the main dimensions of elderly people's attitude towards new technologies?

2) Which personal (i.e., age, gender, educational level, income), psychological (i.e., perceived health, competence, openness to home changes), environmental (i.e., home safety and comfort) and situational (i.e., type of problems) factors are related to the choice of adaptation strategies in different situations?

3) Which personal, psychological and environmental factors are associated with attitudes and behavioral intentions towards changes in the domestic setting, including both layout and furniture changes and the introduction of technological devices?

B. Tools

Two different versions of a questionnaire were developed for male and female respondents, in order to facilitate respondent's capability to project him/herself in the situation. The questionnaire comprised four sections.

Section 1 included a set of 8 scenarios, each of them describing an old person (a man in the male version, a woman in the female version) experiencing problems in his/her everyday environment. The eight situations were the following:

1. *Playing cards*. Feeling unsafe to go to a friend's house to play cards;
2. *Telephone call*. Having hearing difficulties in using the telephone;
3. *Medicine*. Forgetting when to take daily medicines;
4. *Newspaper*. Visual difficulties in reading;
5. *Cleaning*. Housekeeping;
6. *Bathtub*. Getting in and out of the bathtub;
7. *Intruder*. Fear of burglars getting into home;
8. *Home accident*. Being anxious about accidents at home.

Respondents were asked to suggest one solution for overcoming the problem to the scenario's actor, by choosing among different options including: 1) giving up behavior (i.e. abandoning either the activity or the control of it, for instance choosing to relocate to a children's home); 2) use of social resources, either 2a) "formal help" from volunteers, health-care associations, paid assistant, etc., or 2b) "informal help" from relatives, friends, neighbors, etc.; 3) modification of the

spatio-physical setting; 4) use of technological assistive devices. The solutions varied on a continuum from purely accommodative to purely assimilative, and followed a random order in each scenario response-set.

Section 2 included a set of 8 instrumental everyday activities, usually performed by both males and females. Four of these activities require a cognitive effort (remembering to take a medicine, remembering to switch off the gas, managing money, keeping oneself well-informed about what's happening in the world); the remaining four require a motion effort (house keeping or home maintenance, cutting toe nails, climbing or going down the stairs, kneeling or bending). Respondents were asked to assess their degree of autonomy, ease of performance and overall satisfaction towards each target activity. In addition, overall satisfaction towards health was measured on a 5-step Likert-type response scale.

Section 3 focused on the home environment. It included two measures of perceived safeness and perceived comfort of home spaces, and a few items measuring attitudes and intentions towards possible home modifications, both in general and with reference to the introduction of technological devices.

Section 4 included a 5-step agree/disagree Likert-type Attitude Scale towards New Technologies, borrowed from a previous study [2] and questions about socio-demographics (gender, age, education, income, housemates, etc.).

C. Sample and procedure

We contacted a sample of 123 elderly subjects ($M=74.7$, range = 62-94 years). Participants were recruited from an urban area via both personal acquaintances and social services, well balanced with respect to gender ($M=61$; $F=62$), age groups ("young old"= up to 74 years, $N=63$; "old"= 75 years and over, $N=60$), social and educational level. Most of them were living with the partner (61%), about one quarter (24%) were alone, and the remaining part were living with different relatives.

The questionnaire was administered in a face-to-face interview in participants' home.

D. Results

A Factor Analysis performed on the Attitude Scale towards New Technologies yielded two independent dimensions, explaining 47.8% of the total variance. A Positive Attitude, summarizing the advantages provided by technologies (you don't get tired, you don't waste time, you can perform a lot of activities, you are not dependent on others, etc.), is opposed to a Negative Attitude, referring to a general uneasiness and a slight mistrust of technology (devices break down too often, instructions are difficult to understand, I don't trust it, etc.). The two dimensions showed a good internal consistency (Positive Attitude: Cronbach's $\alpha = 0.80$; Negative Attitude: Cronbach's $\alpha = 0.69$) and proved to be coexistent aspects in elderly people's representation, thus providing a somewhat ambivalent image of new technologies. Age, gender, income, and educational level did not show a significant effect on either positive or negative dimensions of attitude towards new technologies.

A general positive attitude towards home modifications, also including technological devices, was found. This tendency is anchored in practical considerations, which already emerged as a basic component of elderly people's perspective [2]. The variables gender, educational level, income, perceived health, home comfort, home safety did not show a significant association with this attitude. Conversely, a significant effect was found with respect to age, with the old elderly being much more reluctant to accept any kind of environmental change than the young elderly ($F_{(1, 95)} = 15.85$, $p < 0.001$).

How does this general attitude apply to everyday situations? A two-fold analysis of the proposed scenarios was performed, in order to outline consistent cross-scenario strategies and to understand what the variables influencing the choice of specific strategies in each situation are.

On the whole, relying on technological interventions emerged as a widely chosen strategy (24%), second only to more familiar physical changes of the setting (Fig. 1).

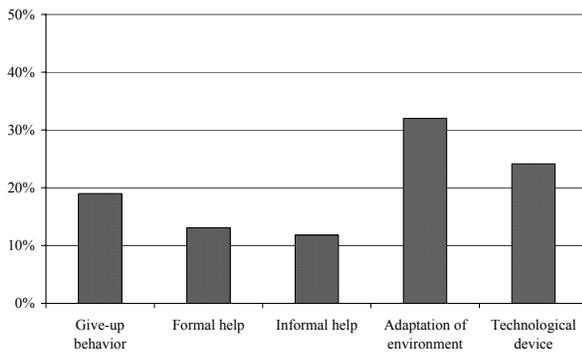


Fig. 1. Distribution of strategies (percentage)

Except from the cleaning scenario, where formal help was preferred, the choices were evenly distributed between formal and informal help. A paid housekeeper in fact represents a solution already adopted by 32% of the respondents. Therefore, in subsequent analyses the two modalities were summed up in a "social help" strategy.

In order to examine the relationships between individual variables and cross-scenarios strategies, an index representing how many times each respondent express a preference for each type of strategy was created and one-way ANOVA's were used to test the effect of independent variables.

The analyses showed that, as regards personal variables, the only significant association is related to the opposition between the give-up behavior and the technological choice. The "old" group tended to adopt a give-up behavior significantly more often than the "young old" group ($F_{(1, 121)} = 7.03$, $p < 0.01$) and conversely the "young old" group was more likely to rely on technological aids ($F_{(1, 121)} = 10.79$, $p < 0.001$) (Fig. 2).

A similar result emerged as regards educational (Fig. 3) and socio-economic level (Fig. 4). The more highly educated ($F_{(2, 114)} = 6.07$, $p < 0.01$) and the high-income respon-

denents ($F_{(1, 113)} = 3.98$, $p < 0.05$) rely on technology significantly more than less educated ($F_{(2, 114)} = 5.22$, $p < 0.01$) and low-income respondents ($F_{(1, 113)} = 6.03$, $p < 0.05$), who are more likely to adopt a give-up behavior.

Gender did not show any significant association with coping strategies.

Interestingly, as regards environmental variables, a significant opposition was found between give-up strategy and environmental strategy. In fact, people living in a comfortable house were more likely to modify the physical setting ($F_{(1, 115)} = 4.99$, $p < 0.05$), while people living in an uncomfortable house more often adopted an accommodative strategy ($F_{(1, 115)} = 5.92$, $p < 0.05$).

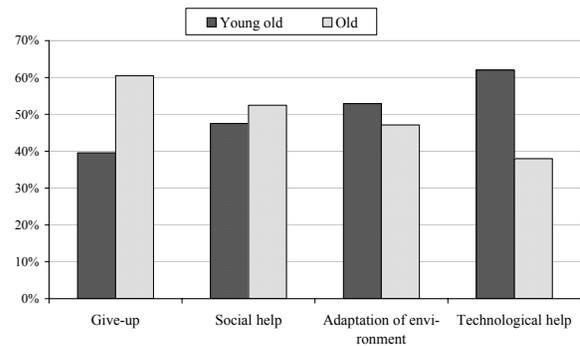


Fig. 2. Strategies by age group (percentage)

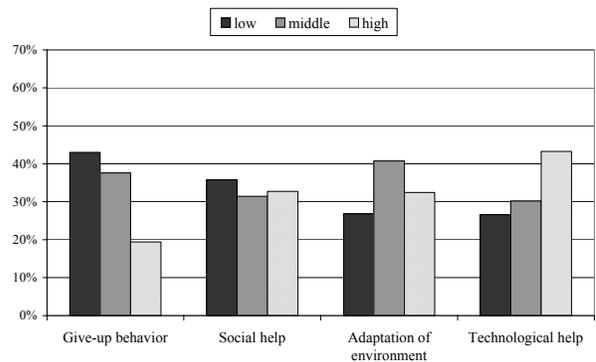


Fig. 3. Strategies by educational level (percentage)

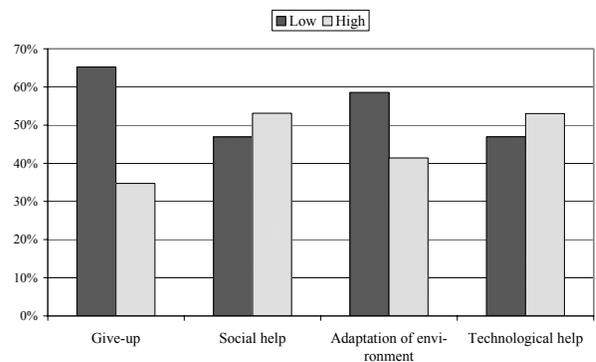


Fig. 4. Strategies by income (percentage)

Perceived safety of the domestic environment yielded similar results, with low safety associated to give-up strategies ($F_{(1, 113)} = 11.79, p < 0.001$) and high safety associated to environmental changes ($F_{(1, 113)} = 5.01, p < 0.05$).

As regards psychological variables, the assessment of performance in instrumental activities was discarded because of the uneven distribution of the population on the positive pole. We used a median-split on health condition responses in order to divide the sample into two groups, respectively with bad and good perception of the overall health conditions. There were no significant differences between the two groups as regarded the adopted strategies. However, it must be considered that the variability in the perceived health was very low.

The relationship between strategies and scenarios was highly significant ($\chi^2 = 353.62, df = 21, p < 0.001$), showing that the choice of a strategy is dependent on the situation (Table 1). The give-up reaction was adopted significantly often in the Playing Cards and Newspaper scenarios, but rarely in the Bathtub, Cleaning and Intruder scenarios. Social help was preferred in the Playing Cards and in the Cleaning scenarios, but dispreferred in the Bathtub, Telephone, Medicine, and Home accident scenarios. Change of the environment represented the more relevant strategy in the Telephone and Intruder scenarios, but was selected significantly less than other strategies in the Bathtub, Cleaning and Accident scenarios. Lastly, the technological strategy dominated in the Bathtub, Accident and Medicine scenarios, emerging instead as ineffective in the Playing Cards, Newspaper and Cleaning scenarios.

The influence of personal variables on individual scenarios showed a highly variable pattern of coping strategies.

Age group was found to influence coping strategies in the Playing cards ($\chi^2 = 14.48, df = 3, p < 0.01$), Telephone ($\chi^2 = 10.09, df = 3, p < 0.05$), and Medicine ($\chi^2 = 7.90, df = 3, p < 0.05$) scenarios. A coherent picture emerges, showing that the old elderly tend to more accommodative solutions (i.e. social help or give-up) and the young elderly tend to more assimilative strategies (i.e. technological devices or changes in the environment).

TABLE 1.
FREQUENCIES OF STRATEGIES BY SCENARIOS
(IRRELEVANT RESPONSES WERE CONSIDERED AS MISSING)

Scenario	Strategy				Total
	Give-up reaction	Social help	Adaptation of environment	Technological help	
Playing cards	33	42	45	2	122
Telephone call	20	13	67	21	121
Medicine	17	17	47	39	120
Newspaper	45	24	42	5	116
Bathtub	14	15	19	75	123
Cleaning	19	72	18	10	119
Intruder	11	37	53	21	122
Home accident	23	20	21	56	120
Total	182	240	312	229	963

Income was found to influence the adopted strategy again in the Playing cards scenario ($\chi^2 = 9.24, df = 3, p < 0.05$), with low income respondents oriented towards a give-up solution, and in the Accident scenario ($\chi^2 = 21.98, df = 3, p < 0.001$), with high income respondents favoring the technological solution. The Cleaning scenario ($\chi^2 = 10.10, df = 3, p < 0.05$) presents a completely different pattern, with low-income people actively looking for environmental or technological solutions, and high income respondents suggesting the strategy they already practice of a paid housekeeper.

Similar results were found in regard to the *educational level*, which influenced the Playing cards ($\chi^2 = 14.21, df = 6, p < 0.05$), Telephone ($\chi^2 = 12.99, df = 6, p < 0.05$), Medicine ($\chi^2 = 15.15, df = 6, p < 0.05$), and Accident ($\chi^2 = 19.67, df = 6, p < 0.01$) scenarios. The opposition between a give-up reaction and the choice of a technological strategy, respectively adopted by higher educated and lower educated respondents, was particularly strong in the Playing cards and Accident scenarios, while in the Medicine scenario the lower educated respondents relied mainly on social help.

On the whole, *perceived health* was found not to be an influential variable, with the exception of the Accident scenario ($\chi^2 = 8.44, df = 3, p < 0.05$). Here, a worse perception of one's health is associated with accommodative strategies such as relocation to one of their children's home, while a better perception of health favored the technological and environmental strategies.

Not surprisingly, the *attitude towards a technological change* in the home setting emerged as a rather important variable in influencing the preferred strategy. In the Playing cards ($\chi^2 = 8.88, df = 3, p < 0.05$), Telephone ($\chi^2 = 12.67, df = 3, p < 0.01$), and Bathtub ($\chi^2 = 8.61, df = 3, p < 0.05$) scenarios, the pattern, as already seen in other cases, is that of a strong tendency of people with a negative attitude towards technological changes at home, to show a give-up reaction while people with a positive attitude tend to adopt environmental or technological solutions. In the Medicine scenario ($\chi^2 = 10.38, df = 3, p < 0.05$) respondents against technological changes present a more wide range of solutions, nevertheless remaining largely below the other group in technological choices.

As already mentioned, environmental variables (i.e. perceived comfort and safety) significantly influence the choice of a strategy in a few scenarios.

With respect to *comfort*, both in the Playing Card ($\chi^2 = 13.34, df = 3, p < 0.01$) and in the Telephone call ($\chi^2 = 8.11, df = 3, p < 0.05$) scenarios the more respondents perceive their house as being uncomfortable, the more they are likely to adopt a give-up strategy, while in the opposite case the tendency is toward environmental changes.

A higher perception of *safety* is associated with a preference for the technological strategy in the Medicine scenario ($\chi^2 = 8.47, df = 3, p < 0.05$) and for environmental changes in the Playing cards scenario ($\chi^2 = 18.10, df = 3, p < 0.001$). In the Newspaper scenario ($\chi^2 = 7.97, df = 3, p < 0.05$) the choices are distributed among different options. In the three scenarios, the perception of potential risks favors the give-up behavior, and

the opposition between the two groups is particularly higher in the Playing cards scenario.

III. DISCUSSION AND CONCLUSION

In accordance with previous findings [2], the general attitude towards new technologies was found to be rather positive, with a homogeneous distribution of both positive and negative evaluations across age, gender, and educational level groups. Conversely, significant differences between different age groups had emerged when comparing young people, adults and elderly people [2]. It is possible to argue that, for people over 65 years, age is no longer an important factor in shaping people's attitudes towards innovative technologies.

The more relevant finding in identifying acceptability requirements of domestic technology is that elderly people do not act in an idiosyncratic way when dealing with everyday problems at home. Instead, they choose the best solution depending on the specific problem they have to cope with, confirming previous research on this topic [7].

Some consistencies emerged as regards the scenario categories. In fact, difficulties experienced in discretionary leisure activities, such as Playing cards and Newspaper reading, are most likely to generate accommodation, while in situations related to safety (such as the Intruder and Home accident scenarios) or health and personal care (Medicine and Bathtub scenarios) people usually strive to find an alternative solution, mainly based on changing the environment. These findings clearly show that elderly people have a well-structured hierarchy of needs and concerns, and when there are not enough resources to fulfill all of them, they show a tendency to select the ones which are of greatest importance.

On the whole, assimilative strategies were found to be a frequently chosen solution to cope with increasing difficulties in performing everyday tasks at home, at least by the young old. A tendency to exhibit a give-up reaction was found instead among the old elderly, showing that difficulties are often perceived as a normal condition they have to live with and accept. The widespread stereotype that elderly people would be hostile to changes, both in general and even more with the introduction of technological devices, turned out no longer to be true. Technological devices clearly go unused only when they appear to be unrealistic or in conflict with the main goal of the action. For example, in the Playing cards scenario, the social goal implied in this activity could hardly be substituted by the solution we offered of playing with the computer, and asking for help from friends and relatives emerged as a viable solution. In the Newspaper scenario, the technological strategy consisting in a special device displaying the verbal communication on a monitor seems to be a little too futuristic in respondents' eyes. Technology is widely accepted in the Telephone call scenario, because it involves hearing devices which probably are already familiar to the elderly. In the Bathtub and Intruder scenarios environmental modifications (a special tub and an armored door) are preferred to technological solutions, probably because they are easier to install in the home.

Social relationships can be a useful resource only for specific activities, like cleaning and playing cards. In the Cleaning scenario they ask for help from a formal and paid assistant, and this choice is in line with a common practice; in the Playing cards scenario, they ask for informal help, showing the intrinsically social value of this activity.

Home adaptations to personal needs emerged as a frequent strategy for overcoming problems, despite some differences among situations. The apparently contradictory result according to which people who are somewhat concerned about their home safety tend to adopt more accommodative strategies, could be explained by the hypothesis that people who consider their house to be safer have actually adopted some technological device inside their own domestic space, and they are aware of the benefits it can provide. So also in the proposed scenario they think that this can be the best option.

An interesting result that needs to be accounted for is the contrast between the global attitude towards technology and responses to the scenarios as regards the influence of personal variables. Why age, educational level, and income are associated to different solutions to the scenarios problems, in particular to the opposition between give-up behavior and technological aids, while they have no impact on neither positive nor negative attitude towards technology? The answer to this question probably lies in the different degree of involvement of the respondents. When they have to suggest the best coping behavior, they have to take into account not only the adequateness of the means to the solution of the problem, but also the person's competence needed to use that means. The scenarios situation favors the identification of the respondent with the actor in the story, hence the respondent evaluates the worthiness of the different solutions in relation to his/her personal resources. Increasing age (hence, age-associated decline in resources) and low education accentuate the difficulty in learning how to use new devices, low income prevents from expensive modifications of the environment, but also from setting up devices whose maintenance could be costly, etc. When resources are too scarce, people adapt to loss either renouncing to their autonomy and asking for help, or abandoning the activity. Further evidence of the interpretation of respondents' behavior as an adaptive mastery of the congruence between resources and environmental demands, comes from the association between environmental resources (e.g. comfort and safety of the house) and choice of environmental modifications. Here too, respondents seem to choose the solution providing the best balance between desired outcome and costs (i.e. required effort and allocation of resources). In fact, when environmental resources are sufficiently high, people tend to avoid the technological solution in favor of a more traditional environmental solution, that does not imply cognitive effort.

A global picture to our data can help to develop a general model of adaptive strategies put in practice by elderly people in coping with everyday problems. In this model, when people can rely on strong personal resources and competences, an assimilative strategy, based on environmental or even techno-

logical modifications is more likely to occur; when personal resources and competences are weak, accommodation is the most probable reaction. Within this general pattern, a key role is played by the relative importance attributed to the specific activity to be performed. The higher the importance, the stronger the tendency to focus even weak resources on that goal, in order to keep control of that activity. This result is frequently pursued by paying a price, which has to do with the management of other everyday activities, in which a give-up reaction is more likely to occur. An extreme situation arises when elderly people have scarce resources even to manage those domains which are of central importance in their life. In this situation, accommodation is the natural consequence.

Beyond the specific person-problem relationship, the influence of personal factors on strategies is also of importance. The effect of educational level was found across different scenarios, thus showing the key role of this variable in accounting for the choice of strategy, even more relevant than income. This result, which enriches previous findings about a relationship between negative emotional reaction to domestic robots and lower educational level [2], suggests that the possibility of controlling technological devices is an essential requirement for their acceptability. Low educated people are less confident in their ability to master a novel device. As a consequence, designers and producers have to consider that ease of use and adequate training are as much important requirements as practical advantages provided by new technology.

Our results are thus compatible with a cohort effect. As a consequence, we will need to pose the question of what attitudes towards technologies and environmental adaptation strategies elderly people will have in the near future. On the one hand, it is possible to use these findings in order to improve technological devices in the light of actual needs and behaviors of aging people; on the other hand, it seems to be necessary to merge together data from different age groups in order to achieve an effective development of future technology.

A provocative paper [8] a few years ago invited reflection on the opportunity to reorient aging policy, suggesting that investing societal resources in promoting longer life beyond the Third Age, on the one hand, reduces the resources aimed at the welfare of the younger population, and, on the other

hand, reduces the opportunities for an increasing number of people to live and die in dignity. We think that a similar problem faces the technological community. Focusing on the development of technological devices easily acceptable by the younger old, or useful for caregivers, would probably constitute a more sensible agenda than trying to change, by means of technological devices, the everyday environment of the oldest old. To adjust themselves to such a situation could be too complex a task for the oldest old, conflicting with more adaptive accommodative strategies.

What is important to emphasize is the preventive approach which is implied in this perspective. If people can get used to using technology before a situation of impairment is palpable, they are less likely to fall into a state of need and dependence on others.

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