Impact of Training Programmes in Digital Skills to Reduce Unwanted Loneliness in Older Andalusian Women

Ana Perandrés-Gómez[1], María Merdeces Párraga-Vico[1], David Díaz-Jiménez[3], Javier Medina-Quero[2], and Aurora Polo-Rodríguez[2(✉)]

[1] Ageing Social Lab, 23620 Mengíbar, Spain
{ana.perandres,maria.parraga}@ageinglab.org
[2] Department of Computer Engineering, Automatics and Robotics, University of Granada, 18071 Granada, Spain
{javiermq,auro}@ugr.es
[3] University of Jaén, Jaén, Spain

Abstract. This study evaluates the impact of training sessions and follow-up workshops focused on digital skills among older Andalusian women, with the ultimate goal of reducing unwanted loneliness through handheld technology, specifically social networks and tablets. The research presents a comparative analysis of social groups with various educational sessions aimed at older women, highlighting the significant role of human interaction and strategic planning in these workshops. The findings underscore the need for customised educational interventions that promote adherence and effective use of technology among this demographic. The results show the critical need for well-structured training sessions that address both technical skills and the social dimensions of technology use among older adults.

Keywords: training sessions · digital skills · unwanted loneliness · active ageing

1 Introduction

The demographic transition towards an increasingly aged population is a global phenomenon that is reshaping social and economic structures worldwide. This shift is attributed to a combination of factors such as declining fertility rates and increased life expectancy, resulting in a significant increase in both the number and the proportion of older people [7]. In Spain, and particularly in the Andalusia region, this trend towards an aging population is especially pronounced. Andalusia has undergone a significant demographic shift characterized by a rapid increase in its elderly population, which presents both challenges and unique opportunities for the adoption of new technologies that improve the quality of life of this sector of the population [12]. According to data from the Spanish National Institute of Statistics, Andalusia had over 1.5 million older adults in 2023 [1], a figure that is expected to double by 2050. It is noteworthy that Andalusia has the lowest life expectancy (81 years) among the Spanish autonomous

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communities. This factor is further aggravated by the fact that the region also has one of the highest poverty rates in the country [6]. This regional context underscores the urgent need to implement specific and tailored approaches to address the unique needs of this growing population. The importance of adopting and adapting new technologies for the ageing population lies in addressing the challenges associated with ageing, including healthcare, emotional well-being, promotion of autonomy, and prevention of dependency [10]. Emerging technologies such as telemedicine, home health monitoring devices, and personal or cognitive wellness applications are crucial to improve healthcare and enabling greater independence for seniors. Likewise, digital communication technologies such as social networks can have a profound impact on the social sphere, reducing loneliness and fostering meaningful social connections [3, 11].

However, despite the transformative potential of these technologies, significant barriers hamper their widespread adoption among older adults [13]. One key barrier is the digital divide, which is more pronounced among older women. Women are often at a disadvantage in terms of digital literacy and access to technology compared to their male counterparts [2]. The reason why literature studies should delve deeper into understanding what happens in women, in order to comprehend this specific population sample more thoroughly. Many seniors have not had the same exposure or access to technology as younger generations, leading to a significant digital divide. Unfamiliarity with devices such as computers, tablets, or smartphones can be an initial hurdle to embracing new technologies. Another significant barrier is the negative perception or fear of technology among some older individuals. For many, the idea of learning to use new technological tools can be overwhelming or intimidating, stemming from past negative experiences or a general aversion to the unfamiliar. Furthermore, digital interfaces designed without considering the specific needs of older adults, such as vision impairments or reduced motor skills, can pose a significant challenge to adoption [9].

Addressing these barriers requires customised approaches to facilitate digital inclusion among seniors. Education and training in technological literacy designed specifically for this demographic are essential. Training programmes can help develop basic skills in using technological devices and build confidence in their handling. It is crucial to design programmes tailored to this population, as programme type often determines learning outcomes and ultimately device usage. It is also important to raise awareness among professionals in the sector about the impact these technologies have on the quality of life and health of older people [4]. In addition to addressing individual barriers, systemic challenges that affect the adoption of technology by older adults must also be considered. These include issues of physical and economic access to technology, as well as the availability of technical support services and customer care tailored to older adults. Public policies can also play a crucial role in promoting digital inclusion through technological literacy initiatives and device acquisition subsidy programmes [13].

In summary, the ageing population and the increasing number of older adults underscore the critical importance of harnessing new technologies to improve the quality of life and care of older adults. However, to maximise the positive impact of these innovations, it is essential to address existing barriers to technology adoption by older adults, from technological literacy to inclusive design and equitable access to digital infrastructure.

1.1 Aim and Hypothesis

In this context, the objective of this article is to determine the importance of training and follow-up programmes for this population of older women in their future acquisition and use of technology. Hence, our initial hypothesis is that continuous and individualised training and follow-up will lead to better outcomes in technology usage and dropout index among the older women compared to a limited and unsupported training and follow-up programme.

2 Materials and Methods

In this section, we present the methods, inclusion criteria, and evaluation groups used in the study. This detailed description ensures a clear understanding of the procedures and the specific characteristics required for participants' eligibility. The section also outlines the distinct groups formed for assessment purposes, each designed to measure different outcomes based on the defined criteria.

2.1 Research Context

This specific study is part of a broader protocol within the Andalusian pilot of the large-scale Pharaon project (Pilots for Healthy and Active Ageing). Specifically, this study implemented a series of interoperable technological devices that are part of the Pharaon catalogue. These devices are adapted to the needs of older adults in the Andalusian pilot [8], and therefore three technological scenarios were set up; 1) socialisation scenario (Sentab social network), 2) activity monitoring scenario (Miss Activity pocket sensor), 3) Cognitive Stimulation Scenario (NeuronUP, cognitive stimulation platform). This study focusses only on the socialisation scenario.

The general aim of the Pharaon project is to test technology in older adults [9] and to understand its impact on their health (measured using different metrics). However, this study does not focus on the impact of technology on health, but rather on the importance of designing training and follow-up programmes that affect the use of such technology. Therefore, we tested how 3 different training and follow-up protocols (2 with on-demand follow-up and one without follow-up) affect subsequent usage.

2.2 Inclusion Criteria

Older women 65 years or older living in Andalusia. They are alone or feel lonely. They do not present cognitive impairment that prevents them from making decisions autonomously and independently. The total sample included: 122 Older women from several villages of Andalusia (Martos, La Carolina, La Puerta de Segura, Arjona, Bailén, Alcaudete, Fuerte del Rey, Castillo de Locubín, Huelma, Santiesteban del Puerto, Mengíbar, Rus, Los Villares, Torredelcampo, Torres, Jaén, Baeza, Villacarrillo, Canena and Porcuna).

2.3 Exclusion Criteria

Exclusion criteria for the study included individuals who have withdrawn from the programme (16) and those for whom sociodemographic data could not be obtained for analysis (6). These exclusions ensured that the study results reflect accurate and complete information from participants fully engaged in the intervention and for whom comprehensive background data are available.

2.4 Questionnaires and Data Collection

In the study, a variety of questionnaires were used to collect quantitative data to investigate the impact of continuous training compared to single session training on the use of the Sentab social network application among older adults to reduce unwanted loneliness. The tools were designed to collect sociodemographic information from the sample, as well as specific data on the participant's experience and use of the app.

– Sociodemographic questionnaires include multiple variables: age, educational level, living status, degree of dependency, and level of technological experience. Specifically, we specify some variables:

  - Education based on International Standard Classification of Education (ISCED), reference for organizing educational programmes and related qualifications by levels and fields. ISCED levels: early childhood education, primary education, lower secondary education, upper secondary education, post-secondary non-tertiary education, short-cycle tertiary education, bachelor's or equivalent level, master's or equivalent level, doctoral or equivalent level.
  - Degree of dependency (DIM 6) assessed according to the Spanish Law 39/2006, of December 14, on the Promotion of Personal Autonomy and Care for People in a Situation of Dependence (Spanish Law) where the dependency is based on levels: grade 0 (no dependency), grade 1 (moderate dependency, grade 2 (severe dependency), grade 3 (high dependency).
  - Living status (DIM 13): this nominal variable assess if the person leaves alone or not alone.
  - Technology experience (DIM 14). Yes / No.

– Data Collection on App Use Frequency: The frequency of use of the Sentab app was measured through given technological indicators provided by the OneSait platform, which collects quantitative data that are reported in real-time. The number of user interaction collected in this work is related to the number of calls between participants, number of screen views, number of posts published and 'likes' given to other posts. This user interaction straightforwardly describe the participation in the social network to reduce unwanted loneliness. In this work, we evaluated three dimensions of use depending on the number of user interactions within the year of evaluation: low/none, less than 100 user interactions; medium, between 100 and 365 interactions; high, greater than 365 interactions.

2.5 Procedures and Evaluation Groups

After the deployment of the technology, initial individual and group training sessions were held. Individual sessions were held in nursing homes and lasted between one and half / two hours. The group sessions, held in the Social Services Centres of the municipalities and in the Residential Centres for older adults, lasted between two and three hours and had between 9 and 15 participants. Basic concepts of digital literacy were taught in the training sessions. Training on the use of the tablet technological device began: how to turn on the tablet, how to charge the tablet, basic tablet controls, how to navigate the Internet. After mastering the device, they were instructed on how to use the Sentab social networking app, which they used for 12 months.

After completing the initial training sessions, participants were randomly divided into three distinct groups: Group 1 (G1), which continued with training focused on individual sessions and included 31 participants; Group 2 (G2), which continued with training focused on group sessions and also included 31 participants; and Group 3 (G3), which received a single training session and consisted of 28 participants. A random assignment method was used to minimise bias and ensure comparability between groups.

– G1, G2. Continuing training. Group of participants who received ongoing training on the Sentab social networking application. This additional training was designed to strengthen and update the knowledge acquired during the initial training sessions. The continuing training sessions were conducted in person and addressed new developments of the platform, as well as practical advice to maximise the experience of the participants. In addition to face-to-face sessions, continuous monitoring was initiated through telephone calls, email (created exclusively for the study) and via WhatsApp. These weekly and biweekly communications allowed feedback to be established with the participants, providing the opportunity to resolve doubts, provide technical assistance, and collect comments about their experience with the application. In addition, 5 monthly one hour group video calls were held. During these video calls, participants had the opportunity to share their experience with the application, interact with each other, and share experiences from their life history, tastes, preferences, and any other topic of common interest. These video calls strengthened the bond between participants and provided a space for knowledge sharing and community building around the use of the Sentab app. To encourage the use of the application and increase motivation, voluntary activities were proposed through the application itself. These activities were designed to involve users in app usage practices, such as posting content, interacting with other users, participating in discussion groups, or sharing relevant events and news. These voluntary activities not only served to consolidate the learning and practice of the knowledge acquired in the training sessions, but also contributed to creating an active and participatory community around the use of Sentab. In G1, the training sessions were conducted one-on-one, face-to-face between the stakeholder and the elderly woman, whereas in G2, the training sessions were held in social groups, face-to-face between stakeholders and elderly women. The stakeholders were professionals from social services centres and researchers responsible for the training sessions.

– G3: Single training. Participants who received a single training session on the same topic as Group 1 (G1) focused on basic use of the Sentab social networking application. During this initial session, instructions on how to turn on and use the tablet were provided, as well as an introduction to the basic operation of the Sentab application, including how to navigate the platform and use its main functions.

Unlike G1-G2, G3 participants did not receive additional training or follow-up on the use and functionalities of the Sentab application. The follow-up they received focused exclusively on technical issues and technological incidents, such as internet connection problems, technical difficulties with the tablet, or any other difficulty related to the device or application. Therefore, this group provides an important comparison point to evaluate the impact of ongoing training and regular follow-up offered to G1-G2 compared to one-time training without ongoing follow-up in G3.

3 Statistical Analyses and Results

This section presents the results of the sociodemographic characteristics and the use of technology among the different groups within the study. The software that was used to analyse the data is Scipy.

3.1 Homogeneous Sociodemographic Data Across the Groups

In order to demonstrate the homogeneity of the social groups G1, G2 and G3, we have analysed the sociodemographic variables by computing the mean and standard deviation of continuos variables (Age, ISCED-Educational level, see Table 1) and computing the percentage of people per group of nominal variables (DIM 6 , DIM 13- Living Status, and DIM 14-Experience with technology; see Tables 2, 3 and 4 respectively).

Similarly, analyses have been conducted to verify that there are no differences between groups in the mentioned variables. The types of analyses performed include t-tests for continuous variables and chi-square (x^2) tests for nominal variables (DIM 13, DIM 14) and the Mann-Whitney U-test (DIM 6) . It was found that there are no statistically significant differences (see Table 5).

Table 1. Sociodemographic variables (mean and standard deviation across groups).

Variable (obtained from questionnaires)	G1 (μ, σ)	G2 (μ, σ)	G3 (μ, σ)
Age	(80.26, 11.53)	(74.95, 5.46)	(78.38, 17,79)
ISCED	(1.26, 1.46)	(1.03, 1.15)	(0.82, 1.39)
DIM 6	(0.23, 0.55)	(0.16, 0.51)	(0.25, 0.57)

As we observe, there is no significant differentiation between the populations of groups G1, G2, and G3. The only notable distinction is in age between groups G1 and G3, with G3 being slightly younger.

Table 2. Sociodemographic variables for DIM 13 (Living Status), DIM 14 (Experience with technology), and DIM 6 (Degree of dependency) across three groups.

DIM 13: Living Status	**G1 n(%)**	**G2 n(%)**	**G3 n(%)**
Lives Alone	24 (77.42%)	25 (80.65%)	24 (85.71%)
Does not live alone	7 (22.58%)	6 (19.35%)	4 (14.29%)
Total	31 (100%)	31 (100%)	28 (100%)
DIM 14: Experience with technology	**G1 n(%)**	**G2 n(%)**	**G3 n(%)**
Previous experience	26 (83.87%)	25 (80.65%)	24 (85.71%)
Without experience	5 (16.13%)	6 (19.36%)	4 (14.29%)
Total	31 (100%)	31 (100%)	28 (100%)
DIM 6: Degree of dependency	**G1 n(%)**	**G2 n(%)**	**G3 n(%)**
None dependency	26 (83.87%)	28 (90.32%)	23 (82.14%)
Moderate dependency	3 (9.67%)	1 (3.23%)	3 (10.71%)
Severe dependency	2 (6.45%)	2 (6.45%)	2 (7.14%)
Total	31 (100%)	31 (100%)	28 (100%)

Table 3. Correlation of sociodemographic variables by t-test and p-values across groups.

Variable (obtained from questionnaires)	G1-G2	G2-G3	G1-G3
Age	t: 1.902 p: 0.06	t: -0.79 p: 0.44	t: 0.58 p: 0.56
ISCED	t: 0.6660 p: 0.5080	t: 0.6261 p: 0.5337	t: 1.1540 p: 0.2533
DIM 6	t: 509 p: 0.4906	t: 526 p: 0.8707	t: 400 p: 0.3996
DIM 13	x^2:2.48 p: 0.29	x^2: 0.27 p: 0.87	x^2: 3.274 p: 0.195
DIM 14	x^2:0.648 p: 0.422	x^2: 0.042 p: 0.837	x^2: 1.193 p: 0.275

3.2 Homogeneous Sociodemographic Data Across the Groups

In this section, we analysed the impact of training programmes on the use of technology by older Andalusian women. To this end, we have categorised the quantitative variable 'number of interactions' with the Sentab platform based on three terms (low, medium and high) to determine whether a user has had little to no use, moderate or high use, respectively. To understand how the frequency of use groups were generated (see Sect. 2.4). In this regards, Table 4, presents the means and standard deviations of the different training

groups (G1, G2, and G3) in frequency of use (by category - low, medium, high). Additionally, t-tests have been conducted to assess whether there are differences between the training groups in frequency of use by category (see Table 5).

As we can see, the use of social network has been successful in groups G1 and G2, in terms of medium and high use due to continuous training and workshops, although they kept a significant low use (close to 50%). The lack of monitoring in workshops of the G3 group has generated a generalised low use of 93%, highlighting the great impact and difference in use carried out by continuous follow-up.

Table 4. Classification of users based on the use of technology (mean and standard deviation across groups).

Use of technology (number of interactions)	G1 (μ, σ)	G2 (μ, σ)	G3 (μ, σ)
low/none	(0.58, 0.49)	(0.52, 0.50)	(0.93, 0.26)
medium	(0.19, 0.40)	(0.26, 0.42)	(0.04, 0.18)
high	(0.26, 0.44)	(0.23, 0.41)	(0.04, 0.18)

Table 5. Correlation of use of technology by t-test and p-values across groups.

Use of technology (number of interactions)	G1-G2	G2-G3	G1-G3
low/none	t: 0.5032 p: 0.6167	t: -3.8550 p: 0.0003	t: -3.2852 p: 0.0017
medium	t: -0.5994 p: 0.5512	t: 2.4513 p: 0.0173	t: 1.8973 p: 0.0629
high	t: 0.2919 p: 0.7713	t: 2.1787 p: 0.0335	t: 2.4513 p: 0.0173

4 Conclusions

As previously stated, this research aimed to highlight the importance of ongoing training and support for older adults in learning and continuing to use technology, and to evaluate how such support influences usage frequency and other factors. The findings underscore the essential role of sustained, tailored training and support initiatives for the older adult population. These initiatives not only improve technological competence, but also play a crucial role in enabling this group to adopt and effectively use technology.

Participants who participated in regular training and support showed higher rates of technology use, which translated into better use of technology in everyday life. Furthermore, our data indicate that whether sessions are conducted individually (G1) or in groups (G2), the frequency of use of technology remains unaffected. Hence, the effectiveness of promoting the use of technology lies in the consistency of the support provided.

The review of the literature [5] pinpoints at least five obstacles or challenges that hinder the acquisition of digital skills among older adults: 1) age-related issues, 2) technology design or feature-related problems, 3) perceived self-efficacy deficits, 4) adverse societal perceptions, and 5) the complexity of educational materials. Furthermore, our research suggests that the nature of the training programme significantly influences learning outcomes and subsequent use of technology. In this context, it has been demonstrated that well-structured post-training support programmes are effective in technology adoption, potentially influencing technology dropout rates among adults. It is believed that ongoing support and addressing individual concerns are crucial in keeping older adults engaged and active in the use of technology, thus improving their retention and maximising the advantages of technology.

These insights, although clear, carry significant importance and can inform future guidelines. They underscore the necessity for public policies that foster training and follow-up initiatives designed specifically for older adults. By focusing on tailored technological education for this group, substantial enhancements in their life quality, independence, and overall well-being can be achieved. Consequently, it is vital to develop robust strategies that enable older adults to reap the full benefits of technological advancements, thus improving their well-being and quality of life in today's digital era by ensuring easy access to new technologies, providing educational programmes, and offering consistent support.

This research also illustrates the transformative impact of technology on social integration and communication among older adults in order to reduce unwanted loneliness. It underscores the need to design interfaces and software that specifically cater to the ergonomic and cognitive needs of the older demographic, facilitating a more inclusive digital environment. This approach not only empowers older adults, but also integrates them more fully into the digital world, thus bridging the generational digital divide. Moving forward, our recommendations call for more proactive participation from technology designers and policy makers to consider the unique needs of the ageing population in technology development and deployment. This will ensure that technological advances are accessible and beneficial to all age groups, thus fostering a more inclusive society.

Finally, the conclusions of the results should be taken with caution, because the methodology used has certain weaknesses. In this sense, it must be taken into account that the methodology only includes certain limited sociodemographic and technology use variables. For future studies, it will be considered to include a more rigorous measurement, using variables of usability, frequency of use and deeper accessibility/acceptability. However, it is worth mentioning that in the present study the usability variable could not be measured in depth given the complexity of the sample. The study sample being an older population, in which a dense evaluation criterion and protocol is established to measure other psychosocial variables. These results will be presented in future studies.

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