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# Investigating the impact of sociodemographic factors on training efficacy and its correlation with technology usability in older adults: Lessons Learned in Italian and Murcian pilots

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# Highlights

- Sociodemographic measures impact training effectiveness
- Policies should boost digital literacy for better training outcomes.
- Training and usability are linked—better training entails higher usability.
- Assistive technology should be pre-validated, easy and provide ongoing support

# Abstract

**Introduction**: Technology training supports technology adoption among older adults. However, guidelines and insights into personal and sociodemographic factors affecting its effectiveness are lacking. This study explores how these factors influence training effectiveness in older adults and its impact on technology usability.

**Methods**: This paper focuses on two pilot sites of the Pharaon project that implemented similar health monitoring scenarios. A total of 114 older adults were recruited and trained on monitoring technologies following which they filled in sociodemographic and usability questionnaires.

**Results:** Our findings indicate that age, digital literacy, educational attainment, and perceived loneliness significantly affect training evaluation, while quality of life and gender do not show a significant impact. Training efficacy was also found to be connected to system usability (all $p<0.005$). Furthermore, the experience of professionals involved with providing training to older adults was elaborated highlighting the importance of tailored training approaches and continuous support mechanisms to enhance technology adoption among older populations.

**Discussion**: The results showed that training programs aimed at enhancing usability should consider tailoring the content to the user, as there are personal factors which can influence how the training is received. Finally, the results provide actionable recommendations for optimizing training protocols to facilitate the integration of digital health solutions across diverse environments.

**Conclusions:** The findings highlight the need for standardized yet adaptable training guidelines that address individual differences, offering practical direction for future implementations and policies to support long-term technology adoption in older adults.

# Introduction

In a world where the population is rapidly growing and is experiencing a shortage of medical personnel, technology can be identified as potential aid. Although older adults (OA) tend to adopt technology at lower rates than younger individuals, recently there has been a notable increase in the use of internet-based technologies by OA, such as smart TVs, personal computers, and smartphones [1], [2], [3], [4]. Concurrently, technology is becoming an integral part of everyday life and society is becoming more digitalized. As a result, to participate fully in modern society, OA are progressively engaging with these technologies, whether for communication, accessing services, or staying connected.

Technology acceptance and future use appear to be linked to age. However, a meta-analysis showed that this relationship was moderated by perceived ease of use and usefulness [5]. Rapid technological advancements can be overwhelming for OAs, especially those that experience cognitive and physical barriers (e.g., reduced short-term memory and manual dexterity) which can hinder digital adaptation [6]. Creating specific, accessible apps is crucial to facilitate OA's integration and enhance their quality of life (QoL). Therefore, to foster OA's technological adoption the system should address a specific need, easy to use and learn, which in turn will be evaluated as highly usable [7].

In this regard, and because of the lower digital literacy of the silver population, training becomes essential, as it provides the skills to master technology. In fact, a focus group found that OA identified pre-use training as a promoter for device use [8]. This was further confirmed in a scoping review which reports insufficient training as one of the main concerns, which translated into increased workload for the staff [9]. This is a big problem, especially for healthcare systems, where healthcare professionals (HP) have limited time for training. Despite in-person training being preferred over telerehabilitation, virtual training is preferred over no support at all [10]. Furthermore, a scoping review [11] identified training as a facilitator of e-health use. In that review, training on how to use technology was an external factor that promoted use, especially with external support for initial and continued support. Furthermore, extra training has been found to be associated with increased usability and overall user experience [12]. The literature emphasizes that digital training is important for future intentions to use, and that policymakers and government and agencies involved in aging should provide education and training [4], [13]. Indeed, individualized training dependent on the person's attitude and interest towards technology has been shown to overcome barriers on technology use [14]. Yet, the role of personal factors (i.e. sociodemographic, perceived loneliness and QoL) as well as specific recommendations on how to facilitate technology usage and provide "good" training are still less explored.

This study aims to assess how personal and sociodemographic factors — including sex, age, education, digital skills, loneliness, and perceived health — influence participants' subjective evaluation of the training. We also examine whether training efficacy affects system usability, and if this relationship differs between two pilot sites (Italy and Spain), which share similar socio-economic contexts but vary in public digital service implementation. Ultimately, we seek to derive guidelines for effective training to support the adoption of digital health technologies among older adults.

# Material and methods

## Definition of Scenario to be tested

The large-scale Pilots (LSP) for Healthy and Active Ageing (Pharaon) project[1] (GA 857188) aims to promote independence and healthy and active aging through digital platforms, devices and services. Six pilots were located in five European sites (Italy, Murcia, Andalusia, the Netherlands, Slovenia and Portugal). Each pilot was had multiple city locations depending on the peculiarities of each site. [15][15]The most prevalent functional goals identified in the needs analysis [15] was to monitor health, receive advice and information regarding initiatives, which was translated in each pilot into services that addressed the common need of "health management and monitoring at home" (from now on "monitoring scenario").

In this scenario, the OA was provided with a smartwatch to keep track of their daily number of steps. Environmental sensors were installed in their home to monitor daily activity, energy consumption and air quality. The caregivers could monitor remotely the information of

[1] www.pharaon.eu

physical activity and the information provided by the sensors installed in the OA’s home through a custom user interface.

The monitoring scenario was deployed both in Murcia and in Italy. Both pilot sites, before deployment, investigated the monitoring service through a pre-validation phase that gives hints on technology usability and reliability before long-term use [16], [17].

## System description

Although both pilot sites addressed similar needs, they implemented different commercial technologies. In Murcia, participants in the intervention group were divided into three progressive tiers: Silver, Gold, and Premium. The Silver group received a smartband, smart scale, and a tensiometer to monitor vital signs, physical activity, daily weight, and blood pressure. The Gold group received these same devices plus Amicare, a system that detects anomalies in daily routines and sends alerts. Premium participants had all Gold technologies along with the uGRID, a system that monitors home energy consumption and environmental conditions. All devices were connected to a platform, enabling real-time monitoring by HP and facilitating bidirectional communication between OA, HPs, and informal caregivers (ICs) through an app. In Italy, OAs in the intervention group used a smartwatch to track physical activity, sleep, and calorie expenditure. Environmental sensors were also installed in participants’ homes to measure temperature, humidity, and air quality. Data were transmitted and stored on an online platform, with caregivers accessing the information through a dashboard. The manufacturer of the different technologies and technical details are reported in Supplementary Methods and in Table 1.

## Participants and training methodology

Participants were recruited in Murcia and Italy. In Murcia, the pilot site collaborated with the Region Murcia Health Service, as one of the inclusion criteria was to be diagnosed with chronic heart failure. In Italy, participants were recruited in Apulia in a research hospital, and Tuscany among the network of social cooperatives throughout the region. Details of the recruitment, informed consent and ethical statements are reported in Supplementary Methods.

Training was mainly done to educate participants about how to install and use the technologies. The training sessions were designed for OA and their IC, and formal caregivers (FC). In this paper we focus on OA. The overall training session structure was:

1. Explanation of the technologies and their usage.
2. Independent use of technology to identify unclear points in the training and acquire basic knowledge.
3. Training evaluation questionnaire.

The pilot training responsible, or direct personnel instructed by the pilot training responsible, was in charge to conduct the training session. The instructor was requested to adopt a gentle, collaborative and positive attitude for all the training session.

The training approach also helped develop novel, user-friendly, and easily accessible training materials tailored to the user profile, needs, and impairments. For instance, if users generally lacked digital skills, training would first cover technology basics before delving into specific device usage. Technical details were also provided to the IC to assist patients with any technical issues or usage challenges.

The overall training approach was similar in the pilot sites, however specific peculiarities emerged based on the enrolled users, center and geographic locations (summarized in **Table *1*** and detailed in the Supplementary Methods).

**Table 1**. Summary of the training peculiarities in the two pilot sites

| **Location** | **Murcia Region, Spain** | **Tuscany and Apulia Regions, Italy** |
|---|---|---|
| **Technology Used** | Smartband, smart scale, tensiometer, Amicare system, uGRID system, MyHealth app, Onesait HealtCare | Smartwatch, environmental sensors, IoTool, Discovery dashboard |
| **Training delivery** | Face to face meetings (f2f) in groups, individually for patients with mobility challenges. | f2f individually, cascade method, informal caregiver involvement |
| **Location characteristic in f2f session** | A quiet and comfortable location | A quiet and comfortable location |
| **Training Material** | • Instructional videos on YouTube channels<br>• Printed manual | • Online repository<br>• Simplified printed user manual |
| **Support mechanisms** | Call center for continuous support | Caregivers trained alongside participants; home visits/calls for re-explanation |

# Evaluation tool

## Sociodemographic, training and usability questionnaires

Demographic data (age, sex, education, digital skills, marital status, living environment and living situation) were collected in the recruitment process. QoL and feeling of loneliness were assessed with the EQ-5D-3L [19] VAS score and UCLA Loneliness Scale [20] respectively. Quality of training was evaluated with the Training Evaluation Inventory (TEI) [21]. Usability of the system was assessed using the System Usability scale (SUS) [22], no modifications to the questionnaire were needed. Details about the questionnaires and score calculations are found in the Supplementary Methods.

## Final Questionnaire

A questionnaire was circulated among health-professionals and training providers in the Murcia and Italian pilots to understand the difficulties during training and what was done to solve them. Each question was open-ended, with no word limit (Supplementary Methods). Google Form was used as a tool for questionnaire administration.

## Statistical analysis

Cronbach's alpha was calculated for the SUS and the TEI (and its domains) to assess questionnaire reliability. A value ≥0.7 was considered reliable. All statistical analyses were performed using RStudio (version 4.3.3) and a p-value <0.05 was considered statistically significant.

### Comparison of Sociodemographic Characteristics

Pilot sites were compared for demographic data, perceived loneliness, QoL and usability. Continuous variables were checked for normality using the Shapiro-Wilk test. If the variable was normally distributed within each pilot site, t-test was used for comparison; otherwise, Mann-Whitney U test was performed. Ordinal variables were also analyzed using nonparametric tests. Nominal variables were compared using the Chi-square test or Fisher's Exact test.

### Training effectiveness

To assess training effectiveness, we first assessed the impact of demographic data on training. We performed Kendall's correlations between TEI (mean and domains) and the ordinal/continuous variables, and point-biserial correlations for the dichotomous variable sex.

Secondly, we investigated the impact of training on the usability of technology by correlating TEI (and its domains) and SUS score. Since TEI is measured on a Likert scale, Kendall's correlations were performed. Partial correlations ("ppcor" R package [23]) were preferred if the pilots differ in sociodemographic characteristics.

As a sensitivity analysis, given unequal sample sizes of the two pilot sites, and to assess the robustness of the findings, the analyses reported in the "training effectiveness" paragraph were repeated employing bootstrapping (1000 iterations).

### Final questionnaire analysis

A thematic analysis was manually conducted by two independent researchers who identified key themes from the questionnaire responses. These themes were then compared and consolidated through joint discussion to ensure reliability. Themes were grouped to determine whether there were commonalities between pilots that could be attributed to differences in methodology. Based on the highlighted topics, for each questions tips and guidelines were also provided. Finally, a printable version of the key lessons is available as Supplementary Material.

# Results

## Comparison of sociodemographic characteristics

A total of 114 OA were included in this study: 40 from the Italian pilot and 74 from the Murcia pilot. There were no significant differences between pilots in terms of sex, age, education, marital status, living environment, living situation, usability or VAS, but participants in Murcia felt less lonely and reported higher digital skills compared to those in Italy (***Table 2***).

**Table 2.** Sociodemographic characteristics of the participants in the two pilot sites

| | **Italy (N=40)** | **Murcia (N=74)** | **P value [effect size]** |
|---|---|---|---|
| **Sex (%Male)** | 60.0 | 62.2 | 0.980 |
| **Age, median [IQR]** | 71.0 [65.8, 82.0] | 68.0 [63.0, 81.5] | 0.189 |
| **Digital skills** | | | **<0.001 [0.445]** |
| *%No experience* | 30.0 | 14.9 | |
| *%Some experience* | 60.0 | 23.0 | |
| *%Experienced* | 10.0 | 62.2 | |
| **Education** | | | 0.564 |
| *%Primary school* | 30.0 | 28.4 | |
| *%Secondary school* | 55.0 | 50.0 | |
| *%Tertiary school* | 15.0 | 21.6 | |
| **Marital status** | | | 0.120 |
| *%Divorced* | 2.5 | 8.1 | |
| *%Married* | 72.5 | 62.2 | |
| *%Single* | 0.0 | 9.5 | |
| *%Widowed* | 25.0 | 20.3 | |
| **Living environment (%Rural)** | 10.0 | 4.1 | 0.238 |
| **Living situation (%Alone)** | 22.5 | 27.0 | 0.761 |
| **UCLA, median [IQR]** | 39.5 [30.8, 47.0] | 26.0 [23.0, 32.0] | **<0.001 [0.46]** |
| **SUS, median [IQR]** | 70.0 [60.0, 76.9] | 73.8 [57.5, 87.5] | 0.299 |
| **VAS, median [IQR]** | 75.0 [53.8, 80.0] | 65.0 [50.0, 80.0] | 0.144 |

Note. Bold font in the "p values" column denotes statistical significance.

## Training effectiveness results

In Murcia the training sessions were individual or group f2f sessions that involved the OA and their IC. The individual sessions lasted on average 1 hour, whereas the group sessions lasted 1.5-2 hours. In the Italian pilot, training sessions were held independently in the two pilot locations and were conducted as individual in-presence f2f sessions or virtual when not otherwise possible. The recruitment session ordinarily lasted 1 hour of which 20-30 minutes were devoted to training sessions and the rest to the administration of baseline questionnaires (demographic information, SUS, UCLA, VAS and cognitive battery).

For SUS and TEI (and domains), Cronbach's alpha was higher than 0.8. The usability and training were positively evaluated in both pilot sites, with overall SUS scores higher than 68

(**Table 2**) and median scores for TEI and domains higher than 4 (TEI=4.62, SE=5.0, PU=4.5, PD=4.75, SKG=4.33 and ATT=4.67).

Correlations between sociodemographic variables are shown in **Figure *1***. Age was significantly negatively correlated with TEI and its domains except SE. Education was positively correlated with TEI and its domains apart from ATT. Digital skills were significantly positively correlated with TEI and all domains. UCLA scores were negatively correlated with TEI and all domains. Sex and VAS were not correlated with training efficacy. Comparable results were obtained using bootstrap analyses (Supplemental Table 1).

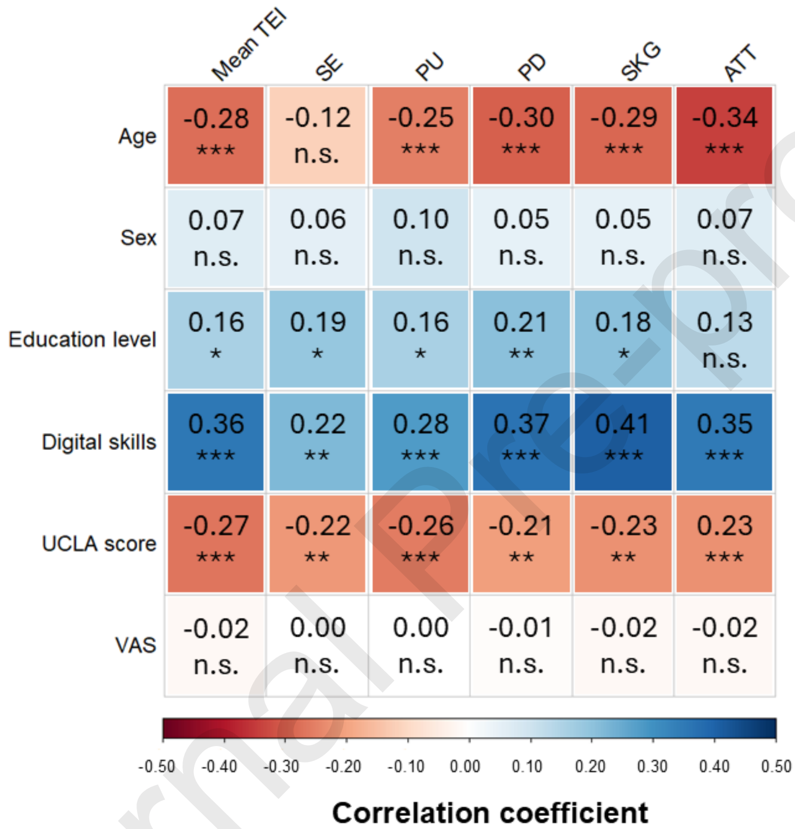


**Figure 1.** Correlations between sociodemographic variables and training. Note that Kendall's correlation coefficients (τ) are shown and significant correlations are highlighted by significance star, specifically: ***$p<0.001$, **$p<0.01$, *$p<0.05$ and not significant (n.s.). The figure was created with the "corrplot" R package [24].

Partial correlations, correcting for digital skills and UCLA score (i.e., variables of which the two pilots differed), showed significant positive correlations between usability and mean TEI (τ=0.21), and its domains (SE τ=0.19, PU τ=0.16, PD τ=0.26, SKG τ=0.26, ATT τ=0.24; all $p<0.005$). The results using bootstrapping are reported in Supplemental Table 1. All correlations were positive, showing that higher training evaluation was related with higher usability score of the technology.

## Guidelines for Good Training

The Murcia pilot completed the questionnaire as a team after group discussions. For Italy, 5 people involved with providing training to OA filled in the questionnaire. Answers were grouped according to the thematic content (**Table 3**) and six pillars representing guidelines for good training were identified (summarized in Figure 2 and in Supplementary Material). The answers to the final questionnaire grouped according to themes are reported.

**Table 3.** Final questionnaire thematic results highlighting the main topics touched upon by the pilots and developed tips and policy recommendations.

| Main topic and Description | Tips and recommendations |
|---|---|
| ***Question 2 and 3:*** *Best Practices and areas for improvement: what went well and what did not during training* | |
| 1. *Personalized, f2f interaction:* In Italy, the cascade method and f2f training, especially with the involvement of caregivers, significantly boosted the effectiveness of training. This allowed for more tailored guidance and interaction.<br>2. *Small group dynamics:* In Murcia, training was more effective when performed in small groups of people. In this setting participants felt more comfortable and could engage more actively<br>3. *Learning over time:* In Italy, participants struggled with the lack of training sessions spread out over time. When the sessions were too close together, it limited their ability to absorb information. On the other hand, in Murcia, training was boosted by phone calls, and this helped with reinforcement.<br>4. *Supportive materials:* The online repository created in Apulia was found to be neither necessary nor useful for participants, as it proved challenging for older participants to access it due to unavailability of digital devices or low digital skills. Similarly, in Tuscany, the materials provided were not particularly appreciated by OA because they were not practical in situations where technologies were not working. Conversely, in Murcia, providing OA with supportive materials (e.g., printed manuals, instructional videos) was found to be helpful because these materials allowed participants to review the content at their own pace, especially those with low digital literacy.<br>5. *Available Support during the use:* In Italy, the ICs were trained with their OAs and receiving a special training for solving common problems that may occur (e.g. how to connect the devices to internet). It was reported that this strategy will support the use of the system. The Murcia pilot decided to activate a call center to support the OAs during the use. This experience was considered very positive by OAs [25].<br>6. *Geographical location:* In Murcia, it was also noticed that geographical location could be an impediment. Training that relied on distant, geographically inconvenient locations was a barrier | To improve the training it is important to organize f2f sessions, home visits when feasible and limit group sizes. When possible, organize training at accessible locations and in familiar environments. Involving caregivers, when possible, as their participation can enhance comprehension and engagement. Additionally, it would be beneficial to follow up with participants through phone calls or online messaging to reinforce learning and provide them with a variety of practical support materials such as manuals and instructional videos that are easy to refer to in case of need. Allow enough time between training sessions and avoid combining them with other mentally demanding activities to allow participants to process the information.<br><br>**Policy recommendation**: Fund community-based digital literacy workshops for OA, especially targeting rural, peri-urban, and underserved urban areas, to avoid digital exclusion due to both infrastructural limitations and lack of local digital support services. Furthermore, incorporate caregivers, caregiver training and tailored materials. |
| ***Question 4****: Strategies to Enhance Training Efficacy: actions implemented to improve training* | |
| 1. *Regular participant check-ins:* In both countries, regular communication with participants proved to be key in maintaining engagement. Italy implemented | To enhance training efficacy, it is important to implement regular updates and reminders to keep participants |

| | |
|---|---|
| home visits, re-call/re-explanation sessions, and rescheduling group f2f sessions. Murcia provided weekly updates and information regarding the pilot's progression were given to the OA, as well as reminders about the availability of educational material.<br>2. *Personalized training session:* In Italy, the need to adapt training based on participants' physical and mental capabilities was highlighted. Tailoring content to the specific needs and digital literacy levels of OA made training more effective. | engaged and informed. Conduct pre-assessments to identify the participant's needs and adapt the pace and complexity of instruction accordingly; this will allow the customization of training sessions to match each participant's abilities. Home visits or group meetups can be used for re-explanation or addressing challenges participants may face, making them feel more secure and supported.<br><br>**Policy recommendation**: Provide ongoing technical support, such as regional call centers or peer-support networks, to ensure that OA will continue using technology after initial training. Develop personalized training that enable adaptive, need-based digital education for OA. This action could be implemented by creating new job positions that will act as technology facilitators for OA. |
| **Question 5**: *Challenges faced by training responsible: the most difficult aspect encountered during training* | |
| 1. Motivation and engagement: In Italy, it was challenging to keep participants motivated, especially because training was performed after the delivery of other questionnaires, when the OA were already tired and not receptive. Additionally, the engagement dropped when technical instructions were involved.<br>2. Low digital skills: Both pilot sites found that participants' low digital skills were a major barrier to success.<br>3. Caregiver involvement: In Murcia, the lack of IC support negatively impacted training. Caregivers play a crucial role in helping participants engage with and retain new information. | To facilitate the training sessions, it is important to keep training sessions short and interactive and include engaging activities that are simple and user-friendly to maintain motivation throughout the process. Start with basic digital skills training if needed and ensure that instructional materials are accessible even to those with minimal experience using technology. Involve caregivers in the training process and provide them with resources to assist their dependents.<br><br>**Policy recommendation:** Explicitly fund digital literacy workshops tailored to regional contexts, especially targeting areas identified with lower baseline digital skills among OA. These should be tailored to local contexts. Support the creation of inclusive digital training content and provide dedicated resources for IC assisting OA. Invest in digital training for IC and FC to facilitate technology use. |
| ***Question 6:*** *Recommendations for future projects: suggestions and tips for future projects involving technology testing in real environments.* | |

| | |
|---|---|
| 1. <u>Use mature and reliable technology:</u> Both pilot sites emphasized that the technology used for training needs to be stable and reliable to avoid user frustration. If the technology is not functional, participants lose trust and interest in the training.<br>2. <u>Co-creation and interoperability:</u> In Murcia, the need for better co-creation and use of open standards was noted. Ensuring interoperability between partners of a research project and across its pilot sites will improve consistency.<br>3. <u>Collaboration with authorities:</u> To ensure engagement, resources should be directed to authorities or stakeholders to promote the project from the patient/user point of view. | Future projects should ensure that all technological tools and platforms are fully tested and user-friendly before implementation. Make sure to involve participants and stakeholders in the co-creation process early on, ensure smooth collaboration between technical providers, partners within and among different pilot sites and collaborate with local authorities, community leaders, and organizations to promote the project and foster trust among participants.<br><br>**<u>Policy recommendation:</u>** Promote co-design approaches by involving OA in the development of training materials, ensuring relevance and accessibility. Encourage public/private partnerships to co-fund and co-develop accessible training tools, including multilingual content and simplified user manuals, especially for those with cognitive or sensory impairments. |

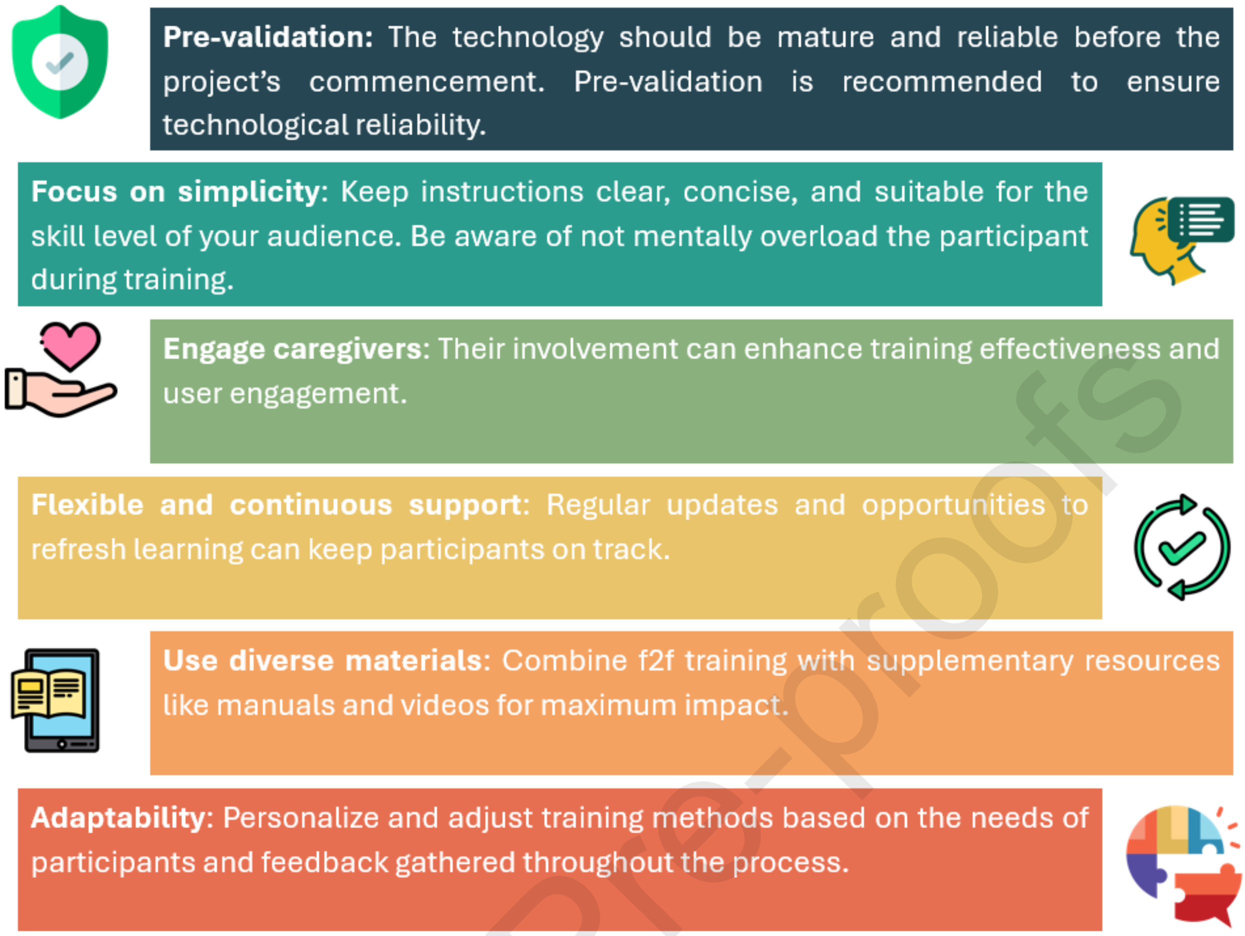


**Figure 2.** Key takeaways for good training

# Discussion

In this paper, we evaluated the personal and sociodemographic factors that can influence training efficacy. We found that age, digital skills, education and perceived loneliness have an influence on training, whereas sex and VAS do not (**Figure *1***). Furthermore, training efficacy has an influence on usability. Qualitative feedback also outlined methodological factors which can influence training efficacy, as well as the support by caregivers and the importance of continuous learning over time. The two pilot sites share many socio-economic similarities with Human Development Index scores of very high human development (i.e. 2022 Italy 0.906 and Spain 0.911) [26]. While cultural differences were out of the scope of this study, it is worth noting that the digitalization of public services is different in the two countries[2], which could suggest that the infrastructure and accessibility could limit embracing technology. We found a significant negative correlation between age and training domains, similarly to [21]. As individuals age, their evaluation of training tends to be lower but did not impact SE. Possibly this is because of the technological barriers stemming from lower digital skills in older compared to younger individuals. There was also a significant positive correlation between education and training, except ATT. Those with higher educational levels evaluated training more positively possibly because their academic

[2] https://digital-strategy.ec.europa.eu/en/library/country-reports-digital-decade-report-2023

experiences have helped them develop effective learning strategies and a deeper appreciation for structured learning.

Similarly, there was a significant correlation between digital skills and all training domains. This result highlights the importance of participants' pre-existing abilities in interacting with technology. Training programs aimed at enhancing usability should consider tailoring content to different levels of digital skills, as those with higher skills may respond better to the training. This finding is aligned with qualitative feedback which specified low digital skills as a major barrier for training efficacy. Moreover, the type of support material should be adapted to OA's digital skills, as materials in the two pilot sites were perceived differently. Simply said, personalized training sessions will maximize the overall training effectiveness (**Figure *2***).

We did not uncover a significant correlation between sex and training, nor between VAS and TEI domains. Training could therefore be perceived in a similar way, independently from gender and perceived health status. Nevertheless, loneliness was related to training evaluation. The result suggests that OA feeling lonely during training, and possibly also during technology use, will evaluate it more poorly. As such, developing continuous and flexible training support after training sessions may be an operative action that can prevent the OA from feeling alone. In fact, lack of support in using assistive products is one the most reported barrier in using assistive products [4]. Additionally, qualitative remarks highlighted the necessity of involving IC in the training process, even if they live far from OA. Indeed, training is preferred when provided informally by family members and friends [27]. Conceivably, supplemental informal support to formal one, could represent the missing link to achieving future technology usage, especially when there is a lack of trained personnel [4]. In other words, if the OA feels they can rely on their caregivers, they feel less "alone" when introduced to new technology. Indeed, in Murcia the continuous support and immediate assistance provided by the call center allowed the participants to feel more confident in using the technology and rely less on the initial training sessions.

Other than the aforementioned factors, there was a positive correlation between training and usability scores accentuating the importance of devising successful training for OA's future technology usage. The results confirm preliminary results of the Italian pilot [28], and are partially in line with findings from the Slovenian pilot [29], where the TEI and loneliness and TEI and usability correlations had the same direction. However, the Slovenian pilot did not find significant correlations. Given the positive relation between usability and acceptance [30], these results and qualitative remarks resulting in the guidelines for good digital training should be applied not only to OA but also all the actors involved in pilot studies across EU member states. Indeed, part of the key takeaways were also reported in the Guidelines on action research for LSP [31] stating that training must be designed and addressed in LSP projects not only from the researcher's and stakeholder's side, but for all involved actors. Furthermore, evidence from previous studies supports the link between training and perceived usefulness or ease of use [32], [33], reinforcing our findings that effective training is crucial to improve user experience and its adoption. Finally, World's health organizations' recommendations also state that training is still only partially covered and should be provided to professionals involved in all aspects of assistive technology and involve families or caregivers [4].

Despite the valuable insights gained from this study, some limitations should be acknowledged. First, the sample size of the two pilot sites was unequal, which may have influenced our findings. There were significant differences in digital skills and UCLA scores which might have played a role in the learning experience and participants' engagement with the training. Furthermore, societal and cultural differences between pilots may have influenced training and usability perceptions. For instance, OA in the Murcia pilot reported higher digital literacy, which could reflect Spain's nationally coordinated efforts to boost digital competence, whereas Italy's support is often regional or community-based, possibly leading to more fragmented access. Additionally, the Murcia sample had demographic characteristics (not significant) that may collectively contribute to greater ease in adapting to technology and training protocols. Future research should address these limitations by ensuring more balanced sample sizes, be mindful of digital skill levels, and exploring the role of national and local policies as well as cultural factors in training effectiveness.

## Conclusion

The paper shows personal and socio-demographic factors that may play a role in training efficacy, which is connected to technology usability. Additionally, it also presents practical guidelines for projects employing assistive technology. Future implementation should be focused on the OA's age, digital skills, education and perceived loneliness. These findings emphasize the need for standardized digital training guidelines across the EU as some of these factors can be addressed in other pilot studies and by policy makers. Optimizing digital training through personalized approaches and structured/social support will enhance technology adoption and long-term engagement among OA.

## Summary points

**What was already known?**

- Technology usability is related to technology acceptance and intention to use
- The majority of studies that assess training di not investigate whether sociodemographic and personal factors could influence training assessment and future use.
- There is the lack of practical guidelines for training implementation in pilots

**What does this study add to our knowledge?**

- Age, digital skills, education and perceived loneliness have an influence on training effectiveness, which implies that policymakers should implement actions to improve digital literacy to increase the efficacy of the training.
- When planning training for assistive technology, it is important to pre-validate technology, focus on simplicity, engage caregivers, plan continuous support, prepare training materials and adapt them to the different users.
- When training is positively evaluated the usability of technology will also be perceived as high.

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**Declaration of interests**

☒ The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

☐ The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: