Social network intervention enhances attention and memory functions in elderly women: a neuropsychological study

Intervenção em redes sociais eleva funções de atenção e memória em idosas: um estudo neuropsicológico

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ABSTRACT

The cognitive functions of elderly people who interact online were assessed. Interventional research of a descriptive-analytical nature was conducted. A sample of 41 elderly women was evaluated both before and after the intervention. The data analysis was carried out using the Friedman test, with a significance level set at $p \leq 0.05$. The empirical material was examined through content analysis. A significant improvement in cognitive functions of attention and memory in the groups that underwent the intervention was observed. It is concluded that cognitive training on social networks can promote healthy aging by improving certain cognitive functions in the elderly.

Keywords: Older people; Cognitive training; Social network; Attention; Memory.

RESUMO

As funções cognitivas de pessoas idosas que interagem na internet foram avaliadas. Uma pesquisa intervencionista de caráter descritivo-analítico foi conduzida. Uma amostra de 41 idosas foi avaliada antes e depois da intervenção. A análise dos dados foi realizada utilizando o teste Friedman, com um nível de significância estabelecido em $p \leq 0,05$. O material empírico foi examinado através da análise de conteúdo. Uma melhoria significativa nas funções cognitivas de atenção e memória nos grupos que passaram pela intervenção foi observada. Conclui-se que o treinamento cognitivo nas redes sociais pode promover um envelhecimento saudável ao melhorar certas funções cognitivas em idosos.

Palavras-chave: Pessoas idosas; Treinamento cognitivo; Redes sociais; Atenção; Memória.

INTRODUCION

We are surrounded by technological devices that are fundamental to our convenience, such as remote controls, cell phones, computers, and ATMs. It is essential that people learn and develop the necessary skills to correctly manage these devices (Freitas & Junior, 2016, Nimrod, 2020). Information and communication technology (ICT) is defined as using e-mail, the Internet, social networking sites, and voice/video technology on devices such as mobile phones, computers, and tablets (Kim et al., 2017). ICT users require certain knowledge and the skills acquired through the correct handling of these devices can help, economically and socially, the process of individual and collective emancipation (Mansell & Gaëtan, 2015). A person who is unable to use technology can be excluded from the social interactions that occur in digital networks. ICT use has become a common practice among older adults in many countries (Nimrod, 2020). For older people to adequately develop these skills, they must participate in spaces that foster learning and promote social inclusion (Freitas & Junior, 2016, Cotten, 2017, Nimrod, 2020). Thus, there is an increasing concern on how to improve older people inclusion and well-being through the adoption of technology and Internet services (Bianchi, 2021).

The use of ICTs contributes in various ways to the transmission of knowledge, that is, it allows the sharing and socialization of knowledge. Digital social networks are another tool that contributes to people's lives through social interaction. Through these networks, the elderly can increase social contact with friends and family, thereby, they reduce social isolation and contribute to an active aging lifestyle. Users discover the various possibilities and purposes of these devices, and this is a means of changing social relations (Páscoa & Gil, 2015, Nimrod, 2020).

Internet has modified some of the ways in which interactions between people occur. It has brought several benefits, including the stimulation of cognitive functions, which has improved personal satisfaction and quality of life. The Internet is a totally new environment for the elders, but it is a space that can foster the search for information, knowledge, leisure, interactivity, and social insertion (Alves & Oliveira, 2015). To enable a better cognitive capacity, it is necessary that this population learn to use the Internet (Dunsmoor et al., 2015; Farias et al., 2015; Ferreira et al., 2015; Kieling et al., 2017; Vargas & Santos, 2015). As for Internet access and social networks, there are no restrictions on who can use these as it is an open space for all ages, fostering interaction

and inclusion. All society can use this tool but many people, for various reasons, do not have access to it, and most of the elderly are excluded from its processes (Souza & Luca, 2014).

While ICT hold great potential for healthy active aging, use among older people is still low (Vicente, 2022). Some people may be afraid to use the Internet, as they do not yet know digital language in depth but, as soon as they realize that they can use it, they are amazed and continue to enjoy its benefits (Corbett et al., 2015, Nimrod, 2020). Considering technological and behavioral changes, and the convenience and facilities they have given us, the present study analyzes how learning is perceived and experiments with some methodologies that are better adapted to the use of technology by the elders. More specifically, we analyze computer and Internet use and the gains that this can bring to the memory of participants in computer workshops on the use of the social network Facebook.

TECHNOLOGICAL CHANGES AND AGING

Due to technological evolution, with the passage of time, people have changed their habits, to the point that today it is difficult to live without having contact with technological devices. Digital technology has the potential to improve life and alter the workplace substantially, and it has radically changed the way we interact, consume, possess, and share. In recent years, it has revolutionized our lives. These resources trigger changes in relationships with people, knowledge, and the world. Patterns of behavior are changing, and people are connecting and interacting in an increasingly virtual manner. They are attracted to the Internet as it is easy to interact with other people there virtually, in the comfort of home, without the limitations of geography and time (Kachar, 2010; Kieling et al., 2015). Although much research examines the factors that affect technology adoption and use, less is known about how older adults as a group differ in their ability to use the Internet (Hargittai et al., 2019).

Technological development is associated with progress; it is a phenomenon that is good and positive. With progress comes ever more advanced technologies, which facilitate and improve the lives of people. With digital technologies comes equipment that brings convenience and comfort, making life more pleasant. They improve living conditions in society and determine development by fostering progress (Nimrod, 2020). Scientific and information technology knowledge makes life in cities possible because

without its transportation, food distribution, communication, education, health care, and traffic control would be chaotic. These are needs that, if not satisfied, would make life almost unviable. Needs increase as innovations arise, and we do not even realize how dependent we are on them (Carvalho et al., 2014).

The Internet is a constantly changing tool with diverse uses and, within its vast network, the user can enjoy numerous digital media. Considering communication, it embodies the agility, practicality, and instantaneous nature of the medium, bringing together distant environments. The use of this tool enables numerous functions to be practiced by the "simple click" of a button, without limitations or restrictions. Regarding access, there are no restrictions on its use, it is a democratizing space of interaction and inclusion, where users can freely express opinions and thoughts and exchange information without limits. All society can use this tool but many people, for various reasons, do not have access to it. Some older adults are examples of those who are excluded from the process (Souza & Luca, 2014).

Computer use has brought various changes to society, both in the way of thinking and acting. All socioeconomic changes generate great lifestyle transformations, and we are always in search of new knowledge. This is part of being human (Orlandi & Pedro, 2014; Pereira & Neves, 2011). Access to information and communication technologies (ICT) can benefit the quality of life for the older people. When reaching old age, we become psychologically and physiologically compromised, therefore, to increase the older's use of technology, we must consider their physical, psychological, and social limitations. The importance of older people participating in groups promoting learning lies in the fact that, in these spaces, it is possible to find social inclusion and interaction. Digital inclusion is strictly aligned with social inclusion and aims to develop autonomy and citizenship (Kachar et al., 2009).

ICTs contribute in various ways to the transmission of knowledge, using digital tools that allow research, and conditions in which knowledge is shared and socialized. With technology and the use of digital social networks, older people can increase the possibility of contact with family and friends, thus reducing social isolation and loneliness. Therefore, it is a facilitating tool for the promotion of active aging. This recognizes the potential of the different uses of digital social networks as a means of changing social relations (Páscoa & Gil, 2015).

OLDER PEOPLE LEARNING IN COMPUTER WORKSHOPS

Regarding Internet use in Brazil in 2022, of the 149 million Internet users in Brazilian territory, 142 million connect every, or almost every day. The presence of Internet in homes reached 60 million Brazilian residents, which corresponded to 80% of the total number of homes in the country. Most of users (62%) accessed the network exclusively via mobile phone. Even so, using the Internet only via cell phone predominates among women (64%). With specific regard to older people, it was found that they: sent and received e-mails (43%), already accessed the internet (48%), looked for information about products or services (40%), carried out multimedia activities - watching videos, online programs, films, or series - (11%), sharing content (53%), accessing the Internet via cell phone (98%). It appears that older people in Brazil are still not fully using Internet services and that sharing content is a common practice among this group of people (Nic.br, 2022). It can be verified that the portion of the population that most accesses the Internet and is most connected are the young and that a large section of the population is being excluded from information and progress.

This research data highlights the possibility that the younger generations are more at ease and familiar with technology than the older generations, since they have coexisted with it from a very early age and can easily assimilate changes. However, the older generation of adults, born before this technological evolution, lack the ability and assimilation skills to enjoy the benefits of the digital era and the Internet in the same way as young people. This is especially so considering the cognitive difficulties of this age group when some mental functions no longer respond with the same ease. Individuals who are unfamiliar with digital language and technology may be subject to exclusion from the entire technological evolution process (Kachar, 2010; Silveira et al., 2014).

Digital inclusion in Brazil is still not part of the lives of most of the elders, but the existing programs of digital inclusion produce astonishing results regarding the participation, acceptance, and results reported by these individuals. The impact on an older person's life brought about by digital inclusion is directly related to increased levels of self-esteem, making them more confident with family, society, and technology (Bolzan & Löbler, 2013; Silveira et al., 2014). Two factors may be increasing in importance in the context of aging and the use of technologies (Orlandi & Pedro, 2014). One is the importance of access, learning, and use of technological resources; the other are concerns about health and disease. The Internet may promote better health insofar as it can be a

facilitating path for the elders to acquire knowledge and information about diseases and health care, thus promoting transformations and changes to healthier behaviors.

With changes in the attitudes of the elders, they regain the fundamental dimensions of independence and autonomy and attain assumptions of active aging. For this, it is important that schools prepare and offer courses on using technological devices in a way that respects the rhythm of the elderly, and that human resources are trained to understand human aging, promote digital literacy and, consequently, the health and citizenship of the aging population (Orlandi & Pedro, 2014; Rocha et al., 2014). Understanding the complexity of aging, be it physical, cognitive, or emotional, regarding computing can help the elderly in adapting to the technological world, expanding interpersonal and inter-generational relationships, sharing knowledge and life stories, increasing self-esteem and self-realization, and opening new possibilities and opportunities (Silveira et al., 2014). It is important that there be ongoing education that can be adapted and geared to the needs of each elderly person, since this mental stimulation can benefit them cognitively, emotionally, and in their quality of life. Therefore, this can help to eliminate or reduce the exclusion levels of older citizens (Rocha et al., 2014).

DIGITAL INTERACTIONS OF OLDER PEOPLE IN CYBERSPACE

Interactions of the elders with technology will enable communication with other people, access to information, a source of leisure, distraction, and work and, consequently, may intervene in the interpersonal relations and cognitive levels of these individuals. From the moment that the elderly come to have access to the computerized devices, they begin to realize that the technologies are not as complex as previously imagined and that they can learn to use them, thus, they feel more valued (Kieling et al., 2015).

Being familiar with technology is important because it is inferred that the individual who is not will be digitally illiterate, and this illiteracy can result in the exclusion of the individual from technological innovation in society. The form of communicating is changing, behaviors are changing, people are relating differently, everything is more virtual, interactions are happening virtually, and if people do not know this digital language, there is a high possibility of them not interacting with and being excluded from this process (Kieling et al., 2015).

One study verified the benefits of the use of technology in the older people, and the subjects presented improved cognitive attention, memory, and social interaction (Cutler et al., 2016). To reduce the existential void common in the elderly, they are inserted in groups and/or projects for their age group. Research reveals that another way of reducing loneliness is interpersonal communication through the computer, which promotes digital inclusion (Silveira et al., 2014). This practice is increasingly sought after among older people; it is behavior which reduces isolation, improves quality of life, increases the interaction and formation of friendship circles, brings families together, and values the elders as people; thus, it elevates self-esteem, which generates higher life expectancy, and significantly improves health. This contact makes an older person acquire goals, to feel useful in society and, consequently, helps to eliminate an existential void (Silveira et al., 2014).

FACEBOOK AND DIGITAL INTERACTIONS

The phenomena of interaction between individuals in virtual communities concern virtual meanings and experiences. Interactions cease to be face to face, and the computer intervenes between the people using it. "In computer mediated interaction, in complete harmony, the object becomes part of the subject, and the subject becomes part of the object, with one of the products of this relationship being the social networks rooted in this process." In the virtual communities of cyberspace, one can study the essence of social networks on the Internet (Henriques, 2012). With the "Social Web" came the social networks, and these have grown substantially in the digital era. They are the means of communication used by people for relationship interaction, but also as a form of entertainment. The most popular is Facebook, with the largest number of users, and its function is to keep people connected, by stimulating relationships and the exchange of information (Gil, 2014). Social networks are the mode of communication that has evolved the most in recent years, reaching people of different social classes, degrees of education, age group, and cultures. In social networks, personal information can be exposed through a profile, photo sharing, links, videos, and interaction between users. For Brazilians, the Internet has become synonymous with social networks, and the use of Twitter, Facebook, and Skype are the principal online activities (Souza & Luca, 2014; Gil, 2014).

One of the places where it is relatively easy to pursue social interaction are social networks such as Facebook, YouTube, and Twitter. These applications are easy to use

and act as a kind of gateway to the digital environment; they are used by all age segments, including older people. Social networks can be a space to see and be seen, tell stories, exchange ideas, be heard and listen, and to establish new social bonds, so scarce in this phase of life. Using digital media generates ambivalent feelings, while at the same time it brings anxiety and anguish in how to handle them, such as expectation, joy, and curiosity about news and acquired knowledge (Pasqualotti, 2008).

EMOTIONS AND EMOTIONAL REGULATION IN AGING

Considering the nature of emotions is a complex and multifaceted endeavor, and several philosophers have attempted to find answers to this. They have found that emotional expressions evolve and change with the passing of time, becoming more sophisticated over the course of human development. We encountered some of these concepts, the principal among them being that emotions prepare the organism to respond to environmental stimuli, and these evolve over the years. However, their essential function is the survival of the human being, both physically and psychologically, and also the quality of this survival. Psychologically, emotions have the role of collaborating with psychological well-being, that is, with emotional adaptation and regulation (Roazzi et al., 2011; Vasco, 2013).

Emotions are complex events, encompassing the entire body, and are caused by many factors: environmental, chemical, neurological, personal, social, and religious. They are activated by triggers that have some emotional significance for the person. Emotions originate and are sensed biologically, but culture and the environment act as stimuli that activate them; to a large extent, these emotions are in the subconscious. When a stimulus or environmental factor occurs, it communicates to the subconscious, and the organism reacts with an emotion, such as the fear of imminent danger. The interpretation of the unconscious determines the automatic triggering of the emotion, and this interpretation may change with new information and is associated with body movements and facial expressions (Toit, 2014). The expression of emotions depends very much on the cultural context in which the person is inserted. Some cultures give more value to expressions of positive emotions like joy and excitement, and they devalue negative emotions; the opposite can also be reported, in which negative emotions, like anger and aggression, are more valued (Ford & Mauss, 2015, Vasco, 2013).

As people age, they develop strategies of emotional regulation, which allow them from adulthood until old age, to present higher levels of well-being. Studies on daily life reveal an increased emotional functioning as people age (Martins et al., 2016; Sims et al., 2015). However, some people have difficulties in regulating their emotions, which can increase the possibility of the appearance of deficits in several areas, such as social, professional, academic, and clinical relationships and these can trigger emotional disorders (Veloso et al., 2011). The ability to perceive and understand emotions helps in the detection and interpretation of their internal and external signs, and can directly influence social relations, quality of life, and mental health.

COGNITIVE FUNCTIONS AND NEUROPSYCHOLOGICAL EVALUATION

Neuropsychological assessment is an investigative procedure that uses a variety of tools, such as interviews, observation, screening, and psychometric tests to evaluate cognitive capacity and possible impairments of cognitive functions (Ramos & Hamdan, 2016). There are eight principal cognitive functions: time-space orientation, attention, perception, memory (subdivided into: working memory, verbal memory: immediate recall, late recall and recognition, long-term semantic memory, short-term visual memory, and prospective memory), arithmetic skills, language (subdivided into oral language and written language), praxis (ideomotor, constructive, and reflexive) and executive functions (problem solving and verbal fluency) (Fonseca et al., 2009; Pawlowski et al., 2007)

With aging, among the various changes is the loss of physical and cognitive capacity. The physical body no longer follows the same rhythm of the brain and mind and, in a society in which physical force is overvalued, the subject finds in cyberspace the opportunity to continue developing the greatest tool of human production, the mind. It is by exercising the mind that the older person can stimulate cognitive functions, establish new relationships in the environment in which they live, find personal satisfaction, and enable behavioral change. If the elders can access lifelong education using information and communication technologies, it can be an alternative for their continued learning and, consequently, a form of occupying their time.

The use of a computer in a network can open new possibilities and opportunities, which reinforce the importance of digital inclusion in social interactions (Silveira et al., 2014). This occurs because, in aging, there are many changes, as much physiological and

cognitive as related to independence and emotion, caused by the death of family and friends. The scientific evidence shows a positive result in studies of memory rehabilitation in the older people, in that they can learn new behaviors and absorb new content, or even compensate for their deficits, allowing them to remain independent and active for a longer time (Carvalho et al., 2014). ICTs can serve as tools for rehabilitation and stimulation of memory development, perception, and attention, avoiding stagnation and regression in the elder—provided that specific guidance and care is given to the management of the technology (Binder et al., 2016; Ferreira et al., 2015; Otsuka et al., 2015).

METHODS

This is an interventionist type study, with a descriptive-analytical and qualitative character. The sample was defined in a randomized and stratified manner, based on a study developed with participants of groups from the Coordinating Body for Elders Care of the city of Passo Fundo, Rio Grande do Sul Estate, Brazil. The sample consisted of 41 elder women computer users, aged between 62 and 76 years who have between 4 and 11 years of education. The sample was taken from the 850 older people surveyed in the initial study. The women were divided into three groups: motivated intervention (MIG), n = 13; without motivated intervention (WMIG), n = 18; and control (CG), n = 10. The control group performed no interaction activity on the Internet. The distribution in the groups was performed in a random manner, accounting for age and years of study. The women were evaluated before and after intervention in an interval period of five months. Figure 1 shows a group of older women interacting in the computer workshop.

**Figure 1** – Older women interact on Facebook. Font: authors.

Font: Kieling, Oliveira, Gil & Pasqualotti (2023).

The subjects' cognitive functions were evaluated using the Brief Neuropsychological Assessment Instrument - Neupsilin (Fonseca et al., 2009). There were fifteen meetings, once per week, in the morning and afternoon shifts, lasting two hours each. The intervention was accomplished through interaction in cyberspace and was performed on the social network Facebook.

Two closed groups were created on Facebook, with the two MIG groups participating in one group and the two WMIG groups participating in the second group. The women chose the name for each group, and they could interact with their respective groups. With MIG the activities were developed on the Facebook group page through online interaction, with exposure to emotional stimuli through photo/subject/video. Figure 2 presents examples of images used to stimulate memory.

Figure 2 – Images used in the social network info-interaction program of the Regional History Museum of Passo Fundo in three different epochs. Font: authors.
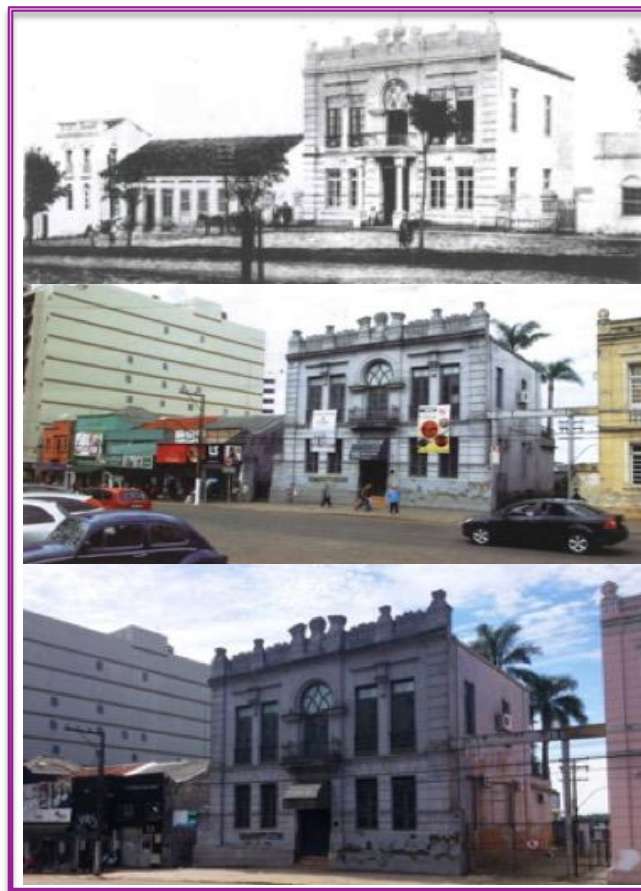
Font: Kieling, Oliveira, Gil & Pasqualotti (2023).

We chose and worked on controversial issues and/or current events that appeared in the media at the time of the research and with photos of significant places in the city of Passo Fundo. The tasks performed in the WMIG were neutral, and related to the basics of computer use, such as Internet browsing. Specific Internet information was worked on, such as accessing Facebook, chat, and Google searches, and copying and pasting images and messages on Facebook. The CG did not participate in any intervention.

The first meeting had the objective of getting to know the class, checking who had a computer and the time for its use, their participation in other computer workshops, and the importance of learning how to use those devices. We used the Kruskal-Wallis and Friedman tests to analyze the quantitative data. The significance level used was $p \leq 0.05$. The analysis of the qualitative and empirical data of the women's statements allowed us to evaluate their understanding of their participation in the computer workshops. Content analysis was used to examine the empirical material. The research was approved by the Research Ethics Committee of the University of Passo Fundo, report 1.389.671, and all the participants signed the Informed Consent Term.

RESULTS

In relation to computers, most of the subjects answered that they did not have one; while a few had a computer or used a device provided by relatives. Approximately ten older women reported that they had taken part in other computer workshops but had learned practically nothing in their previous experiences. They indicated that the teachers were very young, that they explained things very quickly or in a way that they did not understand, and that the teachers had no patience to deal with their difficulties. These facts can be seen in the following statements:

"I already did another course but did not learn anything, I had two teachers and they explained things very quickly and had no patience, so I gave up."

[Woman 5]

"In the other course I took, I also learned almost nothing, the teachers spoke in a way that I did not understand."

[Woman 9]

"In the course that I did the teacher did not pay much attention to us, he was not interested if we learned or not, we continued through the content, even if I had not

understood.”

[Woman 19]

As for participating in computer courses, the women said that it was essential to learn how to handle computers; they understood that technology is everywhere and that it is very important to know how to properly use these machines. They also said they did not like to ask their relatives or neighbors to assist them in using computers so as not to bother them. This argument can be seen in the following statements:

“I need to learn how to use the computer, when I go to the bank I have to always ask for help, and I want to look after myself.”

[Woman 1]

“Today I need to know how to use this, all my family use them, except me, so I’m left out of what is happening.”

[Woman 20]

“Nowadays there are a lot of interesting things on the Internet, and I would like to know about them, but I do not have anyone to help me at home, they are always working and running around and don’t have the time or the patience to teach me.”

[Woman 30]

When we started the proposed activities, the first obstacles appeared. The activities were developed in a computer lab and used desktop computers. We observed that some of the women, because they were more accustomed to typing on notebook machines, said that the keyboard and how the equipment was connected was different and this confused them. Two members chose to bring their own notebook computers. They claimed that they knew the keyboard and the operation of their machine and that this would allow the activities to be conducted with greater security and tranquility.

Another obstacle was the need to enter a password to access the account in the social network. Many women did not remember the password, because in their personal notebook the password was saved, and Facebook opened automatically. We requested that they make a note of the password and bring it with them to speed-up the process, a situation that did not always occur, because they forgot to write it down and could not remember it. To use equipment other than they are accustomed to and remembering the password were the situations that the participants showed greatest difficulty in adaptation. After some time, the difficulties were solved through repetition of the procedures. At the first meeting, two participants reported being afraid of handling the keyboard, as they

could press the "delete" key and damage the computer, a situation that can be seen in the following statement:

"I'm really scared to mess with it, and if I hit this delete key? And ruin the whole computer, my grandson told me never to touch there."

[Woman 15]

We also noticed a difficulty in the operation of the mouse. They did not understand the difference between a single "click" and a double "click," perhaps because of the difficulties some had in fine motor coordination. We taught the use of the mouse through the following strategies: a) we took the woman's hand to demonstrate manually how the device was used; b) to memorize which finger to use, we adopted an old popular children's song, the song about the family of the fingers, where fictitious names are given for each finger[1]. The purpose of the song was to help the subjects to memorize which finger should be used to perform a specific function. When we used the strategy of association with the song, there was a significant understanding about which finger they should use.

Some women were not able to progress in performing some initial functions. This caused a change of mood owing to failures in using the computer; two elderly women reported that they wanted to give up attending the workshop, as is clear from the following statements:

"I can't do this, it does not work, I always do it wrong, there's no way, I'm going to give up."

[Woman 21]

"I don't know what I'm doing here, it does not work, it's annoying me, I'm not coming back, there's no use trying."

[Woman 35]

In the face of difficulties, we presented individualized instructions to demonstrate which commands should be used to perform the proposed tasks. This pedagogical process was fundamental for the successful execution of the tasks. It helped the women to improve their self-confidence and continue to participate in the computer workshop. The great majority of them showed much insecurity in handling the machine and in the execution of the activities. However, after some meetings, the women started

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[1] This song does not conveniently translate in English, but roughly means: His little finger (little finger), his neighbor (ring finger), father of all (middle finger), sticks in cake (index finger), and kills lice (thumb)

to show greater confidence and joy when they were able to successfully perform their tasks on their own, a situation that can be seen in the following statements:

"My God, I did it, hurray! I can't believe it."

[Woman 21]

"Wow, it's working, I'm doing it, I'm going to have to show this to my grandson."

[Woman 35]

At the end of the research, a questionnaire was applied to investigate the degree of satisfaction with participation in the workshop; of the thirty-one participants, twenty-seven responded to the proposed questionnaire. As for having a Facebook account, twenty-one women indicated that they thought it important to have an account, a fact that can be perceived in the following statement:

"It's important to be able to communicate."

[Woman 15]

Regarding the issue of performing the activities in the University, twenty-five participants reported great satisfaction and only two were neutral, a fact that can be observed in the following statements:

"I always had the dream of studying at a university, I did not have the opportunity, now I'm somehow studying at one."

[Woman 5]

"Having the workshop at the University makes us feel more important, even valued."

[Woman 38]

"The University is a little bit far from some neighborhoods like mine, but it's worth coming here."

[Woman 28]

As for the evaluations being carried out in the Coordinating Body for Elderly Care, fifteen participants thought it could occur in this place; seven were neutral regarding the site, and five indicated little satisfaction if the evaluations did not occur in the University. As for the feeling of interacting on Facebook, twenty-five were satisfied and two were neutral. Regarding the evaluation that the elderly women performed on the teacher, all were satisfied, a fact that can be seen in the following statements:

"The teacher is very attentive and dear."

[Woman 10]

"Note 10."

[Woman 38]

"Courageous and persistent."

[Woman 27]

"The teacher had a lot of patience with us, that's why I learned better."

[Woman 15]

As for the time of participation in the workshop, one showed little satisfaction and another showed to be neutral; twenty-five women reported that they had great satisfaction, and eight indicated that the workshop could be extended for a longer time, which is seen in the following statements:

"If possible, more course time to learn more, for the reason that at our age we forget even when the teacher has taught very well, thank you."

[Woman 15]

"There could be more course time."

[Woman 31]

Regarding the results of the cognitive evaluation of the women, performed with the Neupsilin Brief Neuropsychological Assessment Instrument, the Kruskal-Wallis's test did not indicate significant differences owing to age (p = 0.643) and years of study (p = 0.259) among the participants in the MIG and WMIG groups. Table 1 presents the results of the evaluation of the cognitive function of attention and a sub-test of the area.

Table 1 - Evaluation of cognitive function of memory and sub-tests by group.

FUNCTIONS	GROUPS	PRE-TEST		POST-TEST		p
		MEDIAN	Q25-Q75	MEDIAN	Q25-Q75	
Ascendant Digit Ordering	MIG	0.3	[-1.1; 0.6]	0.3	[-1.0; 0.4]	1.000
	WMIG	-0.4	[-1.6; 0.5]	-0.2	[-0.8; 0.6]	0.033
	CG	-0.2	[-0.9; 0.8]	-0.1	[-1.3; 0.7]	0.480
Verbal memory of immediate recall	MIG	0.3	[-0.6; 0.5]	1.0	[0.5; 1.5]	0.007
	WMIG	0.0	[-0.6; 0.8]	0.7	[-0.5; 1.2]	0.134
	CG	-0.5	[-1.1; -0.3]	0.0	[-1.1; 1.3]	0.014
Long-Term Memory	MIG	0.2	[-0.2; 0.5]	0.5	[0.2; 0.7]	0.025
	WMIG	0.4	[-0.3; 0.7]	0.4	[-0.9; 0.7]	0.180
	CG	0.5	[-1.1; 0.6]	0.5	[-0.5; 0.5]	0.655
Short-Term Visual Memory	MIG	0.5	[-2.7; 0.6]	0.5	[-0.3; 0.7]	0.046
	WMIG	0.5	[-1.0; 0.7]	0.7	[0.5; 0.9]	0.003
	CG	0.7	[-0.9; 0.8]	0.7	[0.7; 0.9]	0.655

Font: Kieling, Oliveira, Gil & Pasqualotti (2023).
MIG: Intervention group with motivation; WMIG: Intervention group without motivation; CG: Control group; Friedman's test; significant for a p ≤ 0.05.

The results indicate that WMIG showed a significant improvement (p = 0.033) in the sub-test of ascending digit ordering (memory) in comparison to MIG which remained stable; WMIG improved (p = 0.046) in relation to the other groups regarding the episodic-semantic verbal memory test; in the immediate recall memory test the MIG groups (p = 0.007) and CG (p = 0.014) presented significant improvements; in long-term semantic memory, the MIG improved significantly (p = 0.025); finally, in short-term visual memory, there was a significant improvement in the MIG (p = 0.046) and WMIG (p = 0.003) groups, while the CG (p = 0.655) did not change (Table 2).

Table 2 - Results of cognitive functions that demonstrated significant improvements by group.

FUNCTIONS	Groups		
	WMIG	MIG	CG
Short-Term Memory	☑	☑	—
Verbal memory of immediate recall	—	☑	☑
Episodic-semantic verbal memory	☑	—	—
Long-Term Memory	—	☑	—

Font: Kieling, Oliveira, Gil & Pasqualotti (2023).
MIG: Intervention group with motivation; WMIG: Intervention group without motivation; CG: Control group.

In WMIG, the cognitive functions that presented significant results were episodic-semantic verbal memory and short-term memory. In MIG, the improvement occurred in the areas: of verbal memory of immediate recall, long-term memory, and short-term memory. In the CG, the improvement occurred in verbal memory of immediate recall.

DISCUSSION

The population is increasingly connected. This can be seen when we analyze the results of the survey. As for the use of the Internet, the age group with the highest use was young adults. It may indicate that, in the older adult population, the use of the more modern technologies is less stimulating. Therefore, it is fundamental to provide computer workshops to enable this section of the population to use the Internet.

As for access to the use of the technologies, there are no restrictions on who can use them. It is a space of varied practices, serving as an instrument to search for information and to interact and express oneself freely. This tool can be used by all, however, for many reasons, many people do not have access to it, especially the elderly

(Souza & Luca, 2014). Despite these difficulties, there is an increased demand from older people to learn how to use computers and digital technology (Orlandi & Pedro, 2014). As an example of a positive impact on the lives of the older people, the Internet can promote health as it facilitates the acquisition of knowledge and information about healthcare and disease prevention, promoting transformations and healthier behaviors (Kieling et al., 2015).

ICTs can contribute to transmitting knowledge, and digital tools provide conditions for sharing and socializing this knowledge. The use of digital social networks can facilitate the promotion of active aging through independence and autonomy. Older people can increase their contact with family and friends, thus reducing social isolation and loneliness. The use of digital networks can change social relations (Páscoa & Gil, 2015). To facilitate an effective learning process in the use of technological devices in this population range, it is important to structure and prepares courses that respect the rhythm of older people, to train human resources to understand human aging and to promote digital literacy and, consequently, health and citizenship for the aging population. When education is continued, tailored, and geared to the individual needs of older people, they can benefit from cognitive, emotional, and quality of life gains, thus eliminating or reducing their levels of exclusion (Orlandi & Pedro, 2014; Rocha et al., 2014).

In our study, in the running of computer workshops, many challenges emerged, such as the lack of knowledge of the digital language and the need for the adaptation of language and methodology to improve group understanding and learning; the difficulty the elders have with different machines, or the difficulty those who did not have one at home have to practice their newly acquired knowledge; the challenge of dealing with differences in the classroom, considering that each person has a different learning time, in addition to the memory difficulties inherent to age. By adapting contact with the computer, the elder women came to realize that the technologies were not so complex, demystifying their fears and helping them to realize that they could update their knowledge, and feel more valued. Thus, the computer can promote digital inclusion. A lack of familiarity with technology can imply that the subject will be digitally illiterate, and this illiteracy can lead to difficulties in interaction with technological innovations because society is changing the way it communicates and behaves. Relationships are also occurring virtually and an elder person who is not aware of this type of interaction is likely to be excluded from this process (Kieling et al., 2015; Silveira et al., 2014).

One study verified the benefits of the use of technology in the elders, and the subjects presented improved cognitive attention, memory, and social interaction (Cutler et al., 2016). To reduce the existential void common in the elderly, they are included in groups and/or projects for their age group. As far as cognitive development is concerned, ICT can serve as a tool for rehabilitation and stimulation of memory, avoiding stagnation and regression in the elderly—provided it is carefully managed (Binder et al., 2016; Ferreira et al., 2015; Otsuka et al., 2015). When the elders adapt to the environment of new digital technologies, it can bring benefits to their health, such as stimulation of fine motor and cognitive skills, through the development of reasoning (Farias et al., 2015).

There are some studies that have found an increase in the use of technologies in elder people that is effective and provides an alternative for cognitive stimulation in old age (Martel et al., 2016; Millán-Calenti et al., 2015). Other studies found stronger associations between intellectual and social activities and better cognitive performances (Sposito et al., 2015). It was verified that the groups that received intervention presented significant improvements in memory and attention in comparison to the control group, which, because it was not stimulated, presented poorer results. Another study, which carried out a comparison between young adults and elder adults found that, in general, older adults had an inferior visual mnemonic performance than young adults, suggesting that in the former there were effects of aging on the processing of episodic visual memory in the short and medium term (Wong et al., 2015).

CONSCLUSION

Cognitive training using a computer for navigation in cyberspace can become a useful tool to stimulate the improvement of some cognitive functions. Cognitive stimulation, carried out through computer workshops and from interaction in cyberspace, can contribute to an improvement in the cognitive functions of both attention and memory in the older people.

Technological stimulation using Facebook, along with emotions, stimulates the memory, more specifically, the long and short-term verbal memory of immediate recall. Using Facebook, computer activities and the handling of info-interaction, also improves attention performance and some areas of memory, such as, verbal episodic semantic and short-term memory. Older people using Facebook may have increased social interaction,

a process that impacts their self-esteem and self-realization, and opens new possibilities and opportunities for the learning process using digital technologies.

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