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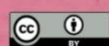
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ABSTRACT: Alzheimer's dementia leads to a progressive decline in the individual's cognitive capacity, interfering with activities of daily living. Applying cognitive stimuli in the early stages can add value to slowing cognitive decline. In this process, can the use of digital technologies help to avoid the use of medication and delay the institutionalization of Alzheimer's patients? Therefore, the general aim of this article was to identify their perceptions of the use of digital technologies in the cognitive stimulation of Alzheimer's patients with formal careers. To this end, an action research methodology was applied, researching the state-of-the-art digital technologies that could be used in Alzheimer's disease from the perspective of formal careers. Sixty-two formal careers participated in this study, 74.2% of whom were female and the rest (25.8%) male. All those interviewed can identify signs of Alzheimer's dementia in patients. Regarding working with digital technologies with Alzheimer's dementia patients, a large percentage of the interviewees (73.6 percent) replied that they only use them sometimes, and 26.4 percent said they never use them. The data suggest that there is still resistance or a lack of confidence in the use of digital technologies on the part of formal careers working with patients with Alzheimer's dementia. However, even if they have never received specific training in this area, especially in cognitive stimulation, we can admit this is understandable.

KEYWORDS: Alzheimer's dementia; Digital technologies; Formal caregivers.

RESUMO: A demência de Alzheimer leva a um declínio progressivo da capacidade cognitiva do indivíduo com interferência nas atividades de vida diária. A aplicação de estímulos cognitivos nos estágios iniciais pode ser um valor agregado para retardar o declínio cognitivo. Nesse processo, será que o uso de tecnologias digitais pode contribuir para evitar o uso de medicamentos e retardar a institucionalização de pacientes com Alzheimer? Assim, o objetivo geral deste artigo foi identificar as percepções destes pacientes sobre o uso de tecnologias digitais na estimulação cognitiva de pacientes de Alzheimer com cuidadores formais. Para tal, foi aplicada uma metodologia de investigação-ação, tendo sido pesquisado o estado da arte sobre as tecnologias digitais que pudessem ser aplicadas no âmbito da doença de Alzheimer a partir da perspectiva dos cuidadores formais. Sessenta e dois cuidadores formais participaram neste estudo, dos quais 46 (74,2%) são do sexo feminino e os demais 16 (25,8%) são do sexo masculino. Todos os entrevistados são capazes de identificar sinais de demência de Alzheimer nos pacientes. Com relação ao trabalho com tecnologias digitais com pacientes com demência de Alzheimer, uma grande percentagem dos entrevistados (73,6%) respondeu que

só as usa às vezes, e 26,4% disseram que nunca as usam. Os dados sugerem que ainda há resistência ou falta de confiança no uso de tecnologias digitais por parte dos cuidadores formais que trabalham com pacientes com demência de Alzheimer. Contudo, mesmo que eles nunca tenham recebido formação específica nessa área, especialmente sobre estimulação cognitiva, podemos admitir que é compreensível.

PALAVRAS-CHAVE: Cuidadores formais; Demência de Alzheimer; Tecnologias digitais.

RESUMEN: La demencia de Alzheimer conduce a un deterioro progresivo de la capacidad cognitiva del individuo, lo que interfiere en las actividades de la vida diaria. La aplicación de estímulos cognitivos en las primeras fases puede suponer un valor añadido para ralentizar el deterioro cognitivo. En este proceso, ¿puede el uso de tecnologías digitales ayudar a evitar el uso de medicación y retrasar la institucionalización de los enfermos de Alzheimer? El objetivo general de este artículo fue, por tanto, identificar sus percepciones sobre el uso de las tecnologías digitales en la estimulación cognitiva de los pacientes de Alzheimer con cuidadores formales. Para ello, se aplicó una metodología de investigación-acción, investigando el estado del arte sobre las tecnologías digitales que podrían aplicarse en el contexto de la enfermedad de Alzheimer desde la perspectiva de los cuidadores formales. En este estudio participaron 62 cuidadores formales, de los cuales 46 (74,2%) eran mujeres y los 16 restantes (25,8%) hombres. Todos los cuidadores entrevistados fueron capaces de identificar signos de demencia de Alzheimer en sus pacientes. En cuanto al trabajo con tecnologías digitales con pacientes con demencia de Alzheimer, un gran porcentaje de los entrevistados (73,6%) respondió que sólo las utiliza a veces, y el 26,4% dijo que nunca las utiliza. Los datos sugieren que aún existe resistencia o falta de confianza en el uso de las tecnologías digitales por parte de los cuidadores formales que trabajan con pacientes con demencia de Alzheimer. En cuanto al trabajo con tecnologías digitales con pacientes con demencia de Alzheimer, un gran porcentaje de los encuestados (73,6%) respondió que sólo las utiliza a veces, y el 26,4% dijo que nunca las utiliza. Los datos sugieren que todavía existe resistencia o falta de confianza en el uso de las tecnologías digitales por parte de los cuidadores formales que trabajan con pacientes con demencia de Alzheimer. Sin embargo, aunque nunca hayan recibido formación específica en este ámbito, especialmente sobre estimulación cognitiva, podemos admitir que es comprensible.

PALABRAS CLAVE: Cuidadores formales; Demencia de Alzheimer; Tecnologías digitales.

1. Introduction

Dementia is defined as a progressive decline in an individual's cognitive ability, with interference with activities of daily living (Cummings et al., 2019; Marquetand et al., 2021). This decline may be associated with several pathophysiological processes, the most common being Alzheimer's disease. According to the World Health Organization (WHO), dementia is the fifth leading cause of death, representing a worrying public health problem worldwide (Sharp et al., 2011). Globally, about 50 million people have dementia, with Alzheimer's dementia accounting for 60% to 70% of cases, a number that is likely to increase, as there are approximately 10 million new cases each year (Selkoe & Hardy, 2016; Snowden et al., 2002). The European Collaboration on Dementia Project (Eurocode) estimated that 7.3 million European citizens were diagnosed with Alzheimer's dementia (Meijer et al., 2022). In the future, it is predicted that there will be about 153,000 people with dementia and 90,000 with Alzheimer's disease (Meijer et al., 2022). In this sense, these data are considered alarming, and the warning signs should be known and recognized early and carefully examined so that cognitive stimulation tools can be created (Van Cauwenberghe et al., 2016).

Alzheimer's dementia is understood as a disease of enormous complexity, and it is not possible to define it as a set of simple pathophysiological mechanisms. From this multiplicity, both at the level of these mechanisms and predisposing factors, challenging research in the search for a treatment with curative capacity arises (Robinson et al., 2017). Regarding the pharmacological treatment of Alzheimer's dementia, it should be noted that, apart from drugs aimed at temporarily relieving symptoms, there is no effective curative treatment focused on its neurodegenerative processes (Arbor et al., 2016; Van Cauwenberghe et al., 2016). Clinically, Alzheimer's dementia manifests with an initial impairment in memory capacity, which slowly progresses, and impairment in the performance of day-to-day activities (Dubois et al., 2007). Patients with

dementia are those who have a persistent decline in their memory and cognitive abilities that is severe enough to interfere with everyday activities, has lasted at least six months, and is accompanied by a disruption of at least one of the following functions: language, appraisal, changed abstract thinking, praxis, agnosia, or alteration of personality (Dubois et al., 2007; Loi et al., 2018). Non-pharmacological strategies stand for the first line, where the caregiver plays a vital role, and include aromatherapy, phototherapy, music therapy, animal therapy, and social activities, currently combined with new technologies (Abraha et al., 2017). Currently, one of the areas where technologies have an increasingly relevant contribution is health, where mental health stands out, specifically, Alzheimer's dementia (Abraha et al., 2017; Li et al., 2014).

Cognitive stimulation has been described as a valid strategy to delay or prevent the decline of Alzheimer's dementia (Clare & Woods, 2004; Zucchella et al., 2018). One of the strategies proposed by the WHO aims exactly to promote physical and cognitive stimulation associated with a healthy lifestyle and cognition (Cale & Harris, 2009). In this context, cognition is a complex collection of mental functions that include attention, perception, understanding, learning, memory, problem-solving, and reasoning (Immordino-Yang & Damasio, 2007). Clare & Woods (2004) defined cognitive stimulation as a technique whose primary purpose is to improve cognitive and social functioning, along with other techniques used for neuropsychological rehabilitation. Also, cognitive stimulation allows a set of techniques and strategies to improve the effectiveness of the individual's intellectual abilities and their psychological processes (Zyda, 2005). Applying interventions through these means for non-pharmacological control may be helpful in several situations of this dementia (Clare & Woods, 2004; Immordino-Yang & Damasio, 2007).

Recently, a survey review was conducted with formal caregivers, which raised the issue of digital technologies and their use in exercising their professional skills to promote cognitive stimulation in Alzheimer's disease (Yamagata et al., 2013). Training for these caregivers in using digital technologies in their work (Koumakis et al., 2019). Thus, it is fundamental to recognize the digital skills that formal caregivers of patients with Alzheimer's disease have and the importance of these skills in exercising their activity (Zyda, 2005). It is also expected to contribute to literacy in the area, especially in raising awareness of the importance of digital training and empowering these professionals. The general objective of this research study was to identify the perception of formal caregivers of patients with Alzheimer's dementia about the use of new technologies in the cognitive stimulation of these patients. Additionally, the specific objectives were formulated for guiding the research, namely: (1) To use digital technologies for the exercise of professional skills of formal caregivers; (2) To establish digital technologies as an essential tool for cognitive stimulation of patients with Alzheimer's dementia; (3) To make formal caregivers aware of the need for training in the use of digital technologies for the exercise of their activity.

2. Material and methods

2.1. Research design

This research is based on the action research method, articulating the quantitative and qualitative paradigms of an exploratory nature, using questionnaire surveys for this purpose.

Participants were selected using the procedure for convenience by sending the questionnaire on social networks on the right pages and sending letters to Residential Structures for the Elderly (ERPI), Continuing Care Units, Hospitals, Specialized Clinics, and Day Centers.

The investigation followed ethical and deontological principles of confidentiality. Through the information provided at the beginning of each survey, all participants were informed about the goal of the research, the anonymity of responses, the importance of collaboration, and the guarantee of sincerity and confidentiality, with the assurance that the data collected would only be used for the intended purpose. This investigation began in January 2022 with the pre-test; the application began in February and ended in April 2022.

2.2. Participants

Sixty-two formal caregivers participated in this research, of whom 74.2% are female and the remaining (25.8%) are male. Their ages ranged from 18 to 59 years old. The professional profiles they occupy are diverse: 29.0% are social educators, 21.0% are direct action assistants, 17.7% gerontologists, and the remaining 32.3% are included in professions such as psychologist, sociologist, sociocultural animator, social worker, professional

fireman, general services, among others. The places of work are also diversified, including daycare centers, home support services, residential structures, hospitals, specialized clinics, long-term care units, firefighters, and special education centers, among others.

They practice their profession in the country's different regions (north, center, and south) and islands.

Table 1

Professional profiles in the sample.

Professional profile	Participants	
	<i>n</i>	(%)
Social Educators	18	29%
Immediate action Assistants	13	21%
Gerontologists	11	17,7%
Other	20	32,3%

Source: Elaborated by the authors.

2.3. Procedures

The convenience method has the advantage of being quick, cheap, and easy (Hill & Hill, 2009). Nine participants were used to pre-test the administered survey to detect any possible error or difficulty, having later made some adjustments. The questionnaire was applied in two phases: the pre-test questionnaires were applied in January 2022. Subsequently, between February and April 2022, all the questionnaires were applied, and the data obtained were analyzed using the SPSS program, version 24.0, and then described and discussed. The results of the study were obtained through the use of a survey developed by its authors and are focused on four dimensions: first, to know the socio-demographic data in order to define the intervening population; second, to obtain data on the work of formal caregivers with Alzheimer's patients; third, to collect the information on digital technologies in Alzheimer's dementia; and, finally, to listen to the respondents' opinion on the training oriented towards the use of digital technologies in the context of Alzheimer's dementia. It should be noted that the questions were formulated with the utmost care to be clear and relevant, with adequate vocabulary for the participants.

3. Results

3.1. Formal caregivers' work with Alzheimer's dementia patients

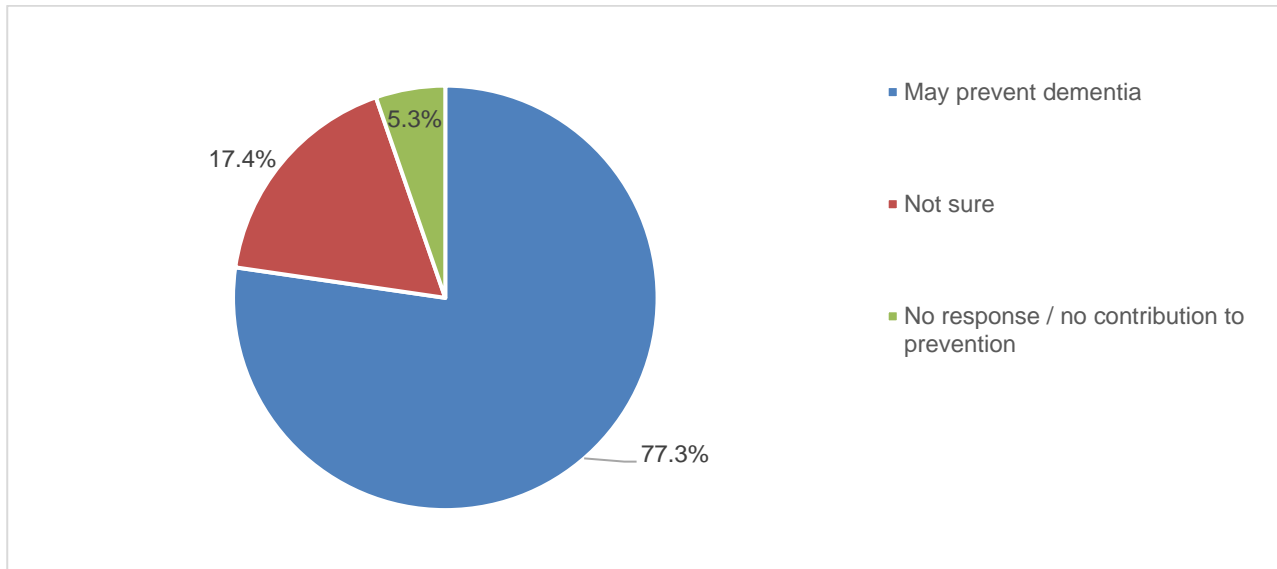
After analyzing the data collected, it was found that all the respondents have had the opportunity of working, or work, with patients with Alzheimer's dementia, ensuring that they can identify signs of this dementia in patients, although they have never had specific training in the area and more specifically on cognitive stimulation identifying, however, a set of resources (proverbs, music, photographs/images, among others) to promote this stimulation.

3.2. Digital technologies in Alzheimer's Dementia

Regarding the use of technologies (Figure 1), 77.3% of the respondents considered that using digital technologies can contribute to the prevention of Alzheimer's dementia. However, 17.4% are not sure about this, and the remaining 5.3% prefer not to answer or consider that technologies are not crucial for the prevention of Alzheimer's dementia.

Figure 1

Contribution of digital technologies in the prevention of Alzheimer's disease.

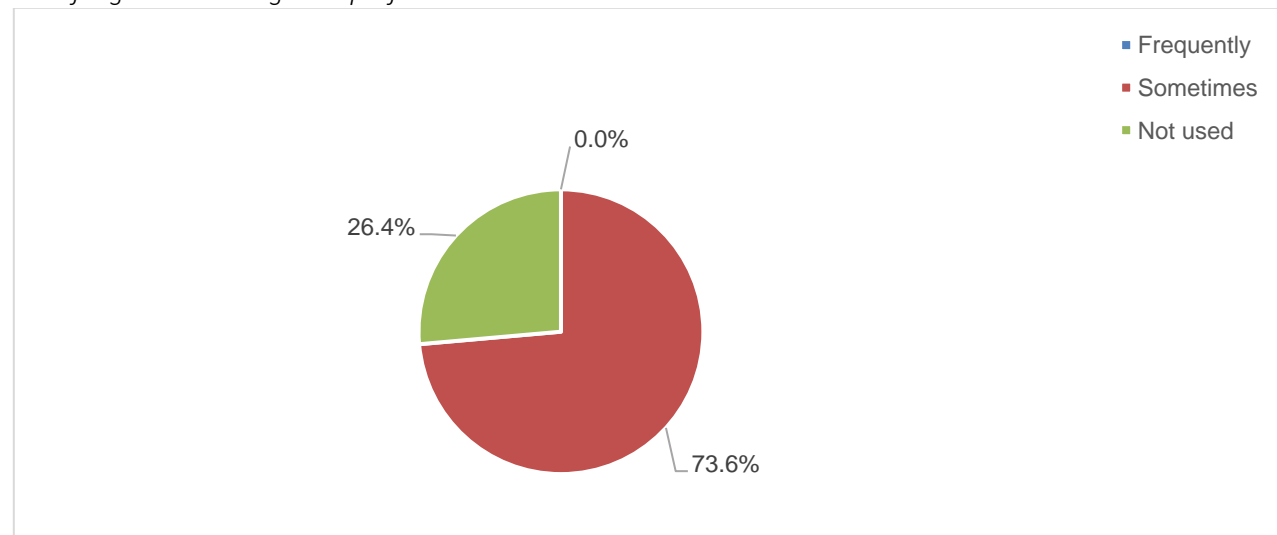


Source: Elaborated by the authors.

Regarding the type of contribution that technologies may offer to the prevention of Alzheimer's dementia, the respondents consider that there are several, namely cognitive stimulation (proverbs, songs, photos/images...), interactivity, relaxation, greater openness of users because it is something different from the usual and something new that they like to explore, greater attention, ease of use, new learning, delaying the evolution of the disease, improving the user's self-esteem, fun, creation of a diary to help the patient remember moments, creation of resources and memory games. About working with digital technologies with patients with Alzheimer's dementia, 73.6% of respondents said they only use them sometimes, and 26.4% said they never use them.

Figure 2

Use of digital technologies in professional activities.



Source: Elaborated by the authors

As the results show, most participants (77.3%) consider using digital technologies to prevent Alzheimer's dementia, confirming the study's first specific aim. It is still a point of analysis that about the use of technologies (Figure 2), the average of participants who often use them is similar (73.6%), which leads to the conclusion that there is an explicit acceptance of the importance of digital technologies as prevention.

Likewise, those who do not use digital technologies have similar results to those who do not answer or do not consider technologies to be necessary.

3.3. Training in the use of digital technologies for the exercise of the activity

Regarding training promoted by employers in the use of digital technologies in the context of Alzheimer's dementia, 74.6% of respondents said they had never had training in this area, and only 8.5% had this opportunity. The remaining respondents are not aware of this type of training. It should be noted that most respondents who have never had training believe it would be beneficial to invest more in education and training in digital technologies for Alzheimer's dementia. "I feel sorry for not having training.". Regarding how they consider these can contribute to the prevention of Alzheimer's dementia, the following responses were recorded: "They help to stimulate. Different stimuli than usual"; "At this moment, digital technologies allow us to have access to everything, whether recent or old in terms of date. Stimulating their memory with things they liked to see or with proverbs and songs that they hum easily can help make everything more familiar and stimulate something that is "obscured"; "View recent images"; "Stimulation through digital technologies has a much greater degree of positive influence"; "Create resources that stimulate cognitive abilities" and "Stimulation of users".

4. Discussion

The general objective of this research study was to identify the perception of formal caregivers of patients with Alzheimer's dementia about the use of new technologies in the cognitive stimulation of these patients. The results show that all the respondents can identify signs of Alzheimer's dementia in the patients. Considering that this is a progressive disease, this is understandable, even though they had never received specific training in this area, especially regarding cognitive stimulation.

Concerning the latter, the opinion formulated by several researchers is that it is of extreme importance and, therefore, contrary to what was inferred from the results of this study, where it is evident that institutions undervalue training in this area, it is increasingly studied and valued, as it is considered that it may delay or prevent the decline of Alzheimer's dementia (Clare & Woods, 2004; Snowden et al., 2002) opinion shared by the WHO when promoting physical and cognitive stimulation associated with a healthy lifestyle (Sharp et al., 2011). However, despite this gap, they found several resources to promote such stimulation, such as proverbs, songs, and photographs/images (Li et al., 2014; Robinson et al., 2017). Regarding the use of digital technologies, most respondents (77.3%) believe that these can contribute to the prevention of Alzheimer's dementia. However, a significant percentage (17.4%) is unsure about this, and the remaining 5.3% prefer not to answer or consider that technologies are not important for preventing this disease. These results suggest that there is still some lack of knowledge and uncertainty regarding the role of digital technologies in preventing Alzheimer's dementia among formal caregivers (Howard et al., 2021). Regarding the type of contribution that technologies can offer to the prevention of Alzheimer's dementia, the respondents consider that there are several, namely cognitive stimulation, interactivity, relaxation, and greater openness of users because it is something different from usual and something new that they like to explore, greater attention, ease of use, new learning, delayed disease progression, improved self-esteem of the user, fun, creation of a diary to help the patient remember moments, creation of resources and memory games (Van Cauwenbergh et al., 2016; Yamagata et al., 2013). About working with digital technologies with Alzheimer's dementia patients, many respondents (73.6%) answered that they only use them sometimes, and 26.4% said they never use them. These results suggest that formal caregivers working with Alzheimer's dementia patients still resist or lack confidence in using digital technologies. However, the study participants recognize the potential benefits that they can bring to the prevention and treatment of the disease (cognitive stimulation, interactivity, fun, and the creation of memory games), among which most formal caregivers believe that digital technologies can contribute to the prevention of Alzheimer's dementia (Abraha et al., 2017; Zyda, 2005). It is important to mention that most formal caregivers who taken part in the study have never received specific training on using digital technologies in the context of Alzheimer's dementia (Clare & Woods, 2004). This suggests the need for investment in training programs for formal caregivers to increase confidence and effectiveness in using these technologies to help the users (Rodríguez et al., 2014; Yamagata et al., 2013). In another study, Talbot and Briggs (2022) also provide a positive outlook on using digital technologies by people with dementia during the

COVID-19 pandemic. According to the authors, digital technologies can provide opportunities for communication, entertainment, and social connection, helping to improve users' quality of life (Zucchella et al., 2018; Zyda, 2005). Therefore, it is necessary for healthcare professionals, including formal caregivers, to be empowered and trained regarding the use of digital technologies for the prevention and treatment of Alzheimer's dementia (Cale & Harris, 2009; Clare & Woods, 2004; Loi et al., 2018). In this way, it will be possible to exploit the potential of these technologies better and provide more effective and personalized care for patients with Alzheimer's dementia. Regarding the literature, it is considered that the chosen themes were duly and sufficiently explored (Cale & Harris, 2009; Robinson et al., 2017). In this sense, it is concluded that Alzheimer's dementia is the most common and increasingly feared by everyone today. Alzheimer's is a degenerative disease that destroys memory and compromises the performance of daily activities, which makes the patient dependent on other people (Abraha et al., 2017). Of the various symptoms that this dementia presents, psychological symptoms are the main cause of institutionalization (Li et al., 2014). As it is an incurable disease, there are no solutions to the difficulties it causes in interpersonal relationships. It is essential to develop new strategies and show innovative targets that prevent its evolution (Abraha et al., 2017). Of the various symptoms that this dementia presents, psychological symptoms are the main cause of institutionalization (Li et al., 2014). As it is an incurable disease, there are no solutions to the difficulties it causes in interpersonal relationships. It is essential to develop new strategies and find innovative targets that prevent its evolution (Abraha et al., 2017). Although the results showed that most caregivers recognize the potential benefits of digital technologies in cognitive stimulation and the treatment of Alzheimer's dementia, they also revealed a significant gap in the specific training of professionals in this area (Cale & Harris, 2009; Jellinger, 1998). This lack of training can lead to resistance or lack of confidence in using digital technologies by formal caregivers, evidenced by the fact that many respondents only use digital technologies occasionally, and some never use them. Furthermore, uncertainty about the role of digital technologies in preventing Alzheimer's dementia indicates the need for further training/education on this topic. Therefore, it is recommended that health institutions and health policies invest in specific training programs for formal caregivers, focusing on using digital technologies in the context of Alzheimer's dementia. These programs can address aspects such as the proper selection and use of digital applications and devices, strategies for integrating digital technologies into daily patient care, and the importance of digital cognitive stimulation in preventing and treating Alzheimer's dementia. Furthermore, it is important that health policies encourage and financially support the implementation of these training programs, ensuring that formal caregivers have access to opportunities for continuous learning and updating knowledge in this area. By empowering formal caregivers with the skills and knowledge necessary to use digital technologies effectively in the care of patients with Alzheimer's dementia, it will be possible to improve the quality of care provided, promote patients' independence and quality of life, and reduce the emotional and financial impact of the disease on families and society.

5. Discussion of Limitations

The main limitations of this research study on the perception of formal caregivers of patients with Alzheimer's dementia regarding the use of new technologies in cognitive stimulation are based on: the generalization of the results, that is, the results obtained in this study reflect the perception of the formal caregivers who participated of the research, but do not fully represent the opinion of all caregivers; a sample was selected in a non-representative way, with a concentration in certain institutions/geographic regions, which limits the generalization of the results to a broader population of formal caregivers of patients with Alzheimer's dementia; formal caregivers have a tendency to provide socially acceptable answers or answers that correspond to researchers' expectations, rather than expressing their genuine opinions, influencing the validity of the study's conclusions; In terms of methodological limitations, it is worth highlighting the fact that the study took a long time, using methods that did not fully capture the complexity of formal caregivers' perception of the use of new technologies in cognitive stimulation, for example, the use of more structured and less qualitative questionnaires. Did not allow for an in-depth exploration of participants' opinions and experiences; finally, greater diversity in the sample could offer a more comprehensive view of perceptions about using new technologies in cognitive stimulation.

6. Conclusion

Cognitive stimulation performed continuously and associated with drug treatment can help improve early and moderate cognitive and functional deficits in patients with Alzheimer's dementia. However, digital technologies are not recognized as the preferred choice for this purpose. However, the use of these technologies can contribute to its prevention, cognitive stimulation, interactivity, relaxation, greater attention, new learning, delaying the progression of the disease, and fun, among others, which is why they consider it advantageous for employers to invest more in education and training in digital technologies in their daily lives, as caregivers and more specifically in Alzheimer's dementia. Through the data collected, it was possible to conclude that most formal caregivers consider that the use of digital technologies in the cognitive stimulation of patients with Alzheimer's dementia is important and can contribute to the prevention of this dementia, which responded to the general objective of this work. Based on these findings, it becomes clear that continuous cognitive stimulation, combined with drug treatment, can play a crucial role in improving cognitive and functional deficits in the early and moderate stages of Alzheimer's dementia. Although digital technologies are not currently recognized as the preferred choice for this purpose by formal caregivers, data reveals that their use can play a significant role in preventing dementia, as well as promoting cognitive stimulation, interactivity, relaxation, improved attention, acquisition of new knowledge and slowing the progression of the disease. This diverse set of benefits highlights the importance of employers investing more in education and training in digital technologies in the daily lives of caregivers, especially in the context of Alzheimer's dementia. Therefore, it is considered that the findings of this study have significant implications in the care of patients with Alzheimer's, suggesting that the proper incorporation of digital technologies in the practice of caregivers can substantially improve the quality of life of patients and slow the progression of the disease. Furthermore, the need for a more comprehensive and integrated approach to the treatment of dementia is highlighted, which is not limited to just drug therapy but also includes cognitive stimulation through technological means. In terms of practical implications, the results of this study show that employers in the healthcare sector should consider implementing specific training programs for formal caregivers, emphasizing the practical and proper use of digital technologies in the care of patients with Alzheimer's dementia. Additionally, healthcare professionals can routinely incorporate digital technologies as an integral part of care plans for dementia patients, thus offering a more holistic and personalized approach to treatment.

As for future research, it would be relevant to further explore the effectiveness of different types of digital technologies in cognitive stimulation of patients with Alzheimer's dementia, as well as investigate the long-term effects of their use in slowing disease progression. Investigating how formal caregivers' attitudes and beliefs towards digital technologies may change as more evidence and experiences are introduced into this evolving field would also be pertinent.

Contribution

Conceptualization: C. VAZ, V. GONÇALVES, C. NOVAIS, B. F. GONÇALVES, A. ROCHA, E. SILVA, P. FORTE, J. E. TEIXEIRA, R. BAPTISTA, and H. M. CARVALHO; methodology: C. VAZ, V. GONÇALVES, C. NOVAIS, B. F. GONÇALVES, A. ROCHA, E. SILVA, P. FORTE, J. E. TEIXEIRA, R. BAPTISTA, and H. M. CARVALHO; validation: C. VAZ, V. GONÇALVES, C. NOVAIS, B. F. GONÇALVES, A. ROCHA, E. SILVA, P. FORTE, J. E. TEIXEIRA, R. BAPTISTA, and H. M. CARVALHO; formal analysis: C. VAZ, V. GONÇALVES, C. NOVAIS, B. F. GONÇALVES, A. ROCHA, E. SILVA, P. FORTE, J. E. TEIXEIRA, R. BAPTISTA, and H. M. CARVALHO; investigation: C. VAZ, V. GONÇALVES, C. NOVAIS, B. F. GONÇALVES, A. ROCHA, E. SILVA, P. FORTE, J. E. TEIXEIRA, R. BAPTISTA, and H. M. CARVALHO; resources: C. VAZ, V. GONÇALVES, C. NOVAIS, B. F. GONÇALVES, A. ROCHA, E. SILVA, P. FORTE, J. E. TEIXEIRA, R. BAPTISTA, and H. M. CARVALHO; writing-original draft preparation: C. Vaz, and V. GONÇALVES; writing-review and editing: C. VAZ, and V. GONÇALVES; visualization: C. VAZ, and V. GONÇALVES; project administration: C. VAZ, and V. GONÇALVES. All authors have read and agreed to publish this version of the manuscript.

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