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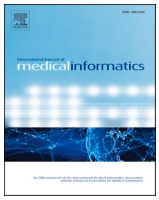

Effects of a home care community-dwelling intervention on cognition, mental health, loneliness and quality of life in elder people: The VERA study

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ABSTRACT

Background: New technologies can provide practical solutions that respond to the needs of the elderly, improving their quality of life and well-being. The aim of this research was to validate a multimodal approach based on a video call system, by comparing the scores of different clinically validated tests at baseline and at the end of the intervention.

Methods: A longitudinal study was conducted with 7 healthy participants aged 61 to 92 years over a 6-month period. To measure the effectiveness of the intervention, five variables were assessed: cognitive impairment, quality of life, general health, perceived loneliness, and depression. The following inventories were used as instruments to measure the aforementioned variables at baseline, mid intervention and after intervention: MEC-35 scale, Fototest, FUMAT scale, WHOQOL-BREF scale, Yesavage Geriatric Depression Scale, the Spanish adaptation of the Hamilton Scale, the revised ESTE scale and the Goldberg's GHQ28 Mental Health scale.

Result: The obtained results confirmed our hypothesis and the participants showed significant improvements after intervention in all the assessed domains except the cognitive domain, as expected. Results in FUMAT, WHOQOL-BREF, Yesavage Geriatric Depression, revised ESTE and the Goldberg's GHQ28 Mental Health scales were statistically significant ($p < 0.05$) and the effect sizes were large after intervention compare to baseline.

Conclusions: We have shown that the intervention has been effective in providing the participants with psychological and social benefits in the variables of quality of life, general health, perceived loneliness and depression. The high clinical relevance achieved from the results obtained makes the system a very suitable tool to promote the independence and well-being of people who receive community-dwelling home care.

1. Introduction

The elderly stage is full of changes and new needs appear which require the presence of a process of adaptation, development of capacities and mechanisms to cope with them. Retirement, loss of social relationships, feelings of uselessness and a lack of social validity are some of the different vital events that have to be faced during this stage. Likewise, aging not only entails the loss of capacities on a physical level, but also changes on the cognitive, emotional, social and functional level [22]. The special interest of recent studies that focus on improving the quality of life, life satisfaction and well-being within this population group is then justified [13]. To achieve a healthy and active aging, it is not only important to optimize physical components, but also psychological and social ones [5]. However, when dealing with this population group, its uniqueness and heterogeneity must be taken into account, as well as the different areas of quality of life, such as emotional, physical, cognitive, functional, economic and cognitive well-being [13].

Faced with a world in which changes are generated too quickly, it can be difficult, especially for this population group, to achieve a satisfactory adaptation, which could cause social isolation due to the impossibility of adapting, resulting in a feeling of loneliness [29]. The feeling of loneliness plays an important role in the development of

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various chronic conditions, an increase in health problems and mortality risk [26], as well as a decrease in self-care and adherence to treatment [6]. Depression can also appear due to increased social and sensory losses, stressful events, role changes, and perceived loneliness [4]. There have been numerous efforts to develop and implement programs aimed at enhancing these dimensions [13].

The effectiveness of virtual programs and interventions has been proven and comparable to face-to-face interventions[19], although in almost all cases applied to other age groups and fields [8,32] and also aimed solely at sanitary use focused on dysfunctional aspects [13]. Internet-based interventions can be a useful social tool to connect people and create online spaces that allow users to receive and seek support and maintain lines of communication with people beyond their close social circle [15]. In the case of interventions for elderly dementia patients, we found a systematic review carried out by Wen et al. [33] that suggested that virtual reality-based nursing interventions for this type of patients have a positive effect on cognitive function, quality of life and activities of daily living, respectively. However, given the small number of studies included in this review, the authors pointed to a necessary validation with a larger and higher quality sample of studies.

The objective of this research is to validate (through a pilot project) a technological system based on videoconferences that allows users to receive comprehensive attention focused on the different bio-psychosocial spheres (psychological-cognitive, physical and recreational). We hypothesized that after applying a multimodal approach based on a videocall system for a period of 6 months, the participants will show significant improvements in performance in the different clinically validated tests.

2. Methods

2.1. Study design

The study is quantitative quasi-experimental with a longitudinal pre-test and post-test within subject design. The objective was to determine if after the application of a multimodal intervention for 6 months (from November 2022 to March 2023), the subjects obtain significant improvements in the score of different clinically validated tests. The study was carried out in accordance with the Declaration of Helsinki. The protocol used in this study was approved by the Community of Aragón Research Ethics Committee (CEICA) on October 19, 2022 (protocol PI22/431) with the understanding and written consent of all the participants before the study.

2.2. Methodology

At the beginning of the intervention, an initial evaluation was carried out using the different tests for all the participants (baseline). During the intervention, the users received weekly sessions via videoconference from a social worker, a psychologist, a sociocultural entertainer, and a physiotherapist. Appointments were previously arranged according to the availability of each user. Table 1 shows a typical schedule for one of the participants.

Three months after the start of the intervention, the same instruments were applied again and right at the end of the intervention, in order to verify our hypothesis. Therefore, in addition to the baseline measures, we obtained two more measures (an intermediate data collection at the middle of the intervention and another one at the end).

The main variables used to measure the effectiveness of the intervention were five: cognitive impairment, quality of life, general health, perceived loneliness, and depression. The following inventories were used as instruments for its measurement. To cognitively assess the participants, the MEC-35 scale [20] and the Fototest [7] were used. The FUMAT scale [17] and the WHOQOL-BREF scale [21] were used to assess quality of life. The abbreviated version of the Yesavage Geriatric Depression Scale [23]and the Spanish adaptation of the Hamilton Scale [27]were used to assess depression. Loneliness was assessed using the revised ESTE scale (ESTE-R) [29]while general health status was assessed using Goldberg's GHQ28 Mental Health scale[16]. A brief description of all the scales used is included as supplementary material.

2.3. Sample

The sample for this pilot project was drawn from the group of people who receive home assistance from the Social Services of the Teruel City Council. The inclusion criteria were voluntary acceptance through informed consent, without gender discrimination, and being included in the group of people who receive home assistance, with or without light-medium-advanced physical and/or cognitive dependence, as well as being in a process of unwanted loneliness. As an exclusion criterion, it was taken not to meet any of the above characteristics. Seven participants were finally recruited, whose demographic data are presented in Table 2. Relevant demographic data were obtained for each participant, i.e., gender, age, education level (years of education), degree of dependency, loneliness condition, and marital status. The degree of dependency for individuals was obtained by means of the Spanish scale for assessment of degrees and levels of dependency (BVD)[3]. All participants voluntarily agreed to be part of the study by signing an informed consent.

The average age of the participants was 71 years (SD = 10.55), with ages ranging from 61 to 92 years. Regarding gender, 29 % were men (2) and 71 %.

women (5). Regarding the degree of dependency, assessed by their social worker, 43 % had no degree of dependency, 28 % had degree I and 28 % degree II. The average number of years of formal education was 8.7, ranging between 6 and 11 years. Living alone and widowhood are important variables connected with perceived loneliness. Regarding these variables, 43 % of the participants were widow or with no couple, 51 % were married. Furthermore, 43 % lived alone while 51 % lived with their family.

2.4. System description

The platform on which the videoconference system is based is owned by OHLA-INGESAN is called VERA. VERA is a virtual social center whose objective is to transfer, with the help of technology, the entire activity of any traditional social center to the users' homes, in order to eliminate physical and distance barriers that prevent movement. The platform

Table 1
Schedule of a typical weekly intervention for one of the participants.

Time	Monday	Tuesday	Wednesday	Thursday	Friday
	Cognitive group session with psychologist		Cognitive group session with psychologist		Individual follow-up session with social worker
	Physical rehabilitation group session with physiotherapist	Physical rehabilitation group session with physiotherapist	Individual follow-up session with psychologist	Physical rehabilitation group session with physiotherapist	
15:00				Recreational group session sociocultural entertainer	
17:00		Individual session with physiotherapist			

Table 2
Demographic data of participants.

Participant	Age	Gender	Level of education (years)	Degree of dependency	Living alone	Widow
1	92	F	6	II	Yes	Yes
2	74	M	10	No degree	Yes	Yes
3	62	M	11	I	Yes	No couple
4	65	F	8	II	No	No
5	61	F	8	I	No	No
6	72	F	8	No degree	No	No
7	71	F	10	No degree	No	No
Mean (SD)	71 (10.5)		8.71 (1.7)			

makes services available to users that range from psychological care and social workers to facilitating the individual and collective integration of the elderly or promoting their maximum degree of autonomy. The system consists of a TV set, remote control, video camera and, if necessary, a router (see Fig. 1). The installation of the system is plug & play on the user's television. The system is connected to a conventional television through an HDMI connection, making it easy to use.

2.5. Statistical analysis

Given the normality of the variables involved (checked by the Kolmogorov-Smirnov test), parametric statistics were used for all analyses. First, a one-way ANOVA of repeated measures was performed to study the effect of the variable time in test performance and the estimated marginal means were also plotted. Likewise, paired *t*-test analyzes were carried out to verify the differences between each of the time intervals in which measurements were taken and thereby determine whether the intervention period had provided benefits to the participants. As a complementary analysis, the Pearson's correlation coefficient was used to check for any degree of association between age and test performance as well as level of education and test performance. Version 26 SPSS software was used to perform all the statistical analyses. The level of significance was set at 0.05.

3. Results

Below, we present (see Table 3) a detail of the results (mean values and standard deviation) obtained from the tests throughout the project at the three points of analysis (baseline or pre-test, mid-intervention and final intervention). We also present the results of the ANOVA of repeated measures (F, p-value) together with the partial eta-squared (η_p^2) as a measure of the effect size.

Fig. 1. Equipment needed for the Vera system.

Table 3
Test results for the three measurement time intervals (t_0: baseline, t_1:mid intervention, t_2: end of intervention) and results from the one-way ANOVA of repeated measures (F, p, and partial eta-squared, η_p^2).

TEST	Value at t_0M (SD)	Value at t_1M (SD)	Value at t_2M (SD)	F	P-value	η_p^2
MEC-35	30.14 (3.8)	30.14 (4.74)	30.71 (4.38)	0.345	0.578	–
Fototest	38.43 (13.68)	39.43 (14.73)	42.29 (11.99)	1.263	0.318	–
Yesavage	3.71 (2.29)	3.29 (2.36)	1,29 (1.38)	18.063	0.005	0.751
Hamilton	7.14 (4.88)	4.86 (2.54)	4.57 (3.45)	1.76	0.233	–
GHQ28	3.43 (3.15)	1.14 (1.34)	0 (0.0)	8.26	0.028	0.579
ESTE-R	69.14 (11.03)	57.14 (5.39)	57.14 (15.23)	9.786	0.020	0.62
Fumat	208.29 (15.29)	195.71 (16.71)	197.29 (15.37)	6.228	0.047	0.508
WHOQOL-BREF	77.71 (12.07)	86.71 (10.99)	87.57 (11.28)	18.477	0.005	

The following figures show the marginal means in the three moments in time in which data were taken for the rest of the scales. Fig. 2 depicts the depression scores (Yesavage scale and Hamilton scale), whereas Fig. 3 depicts the quality of life scores (Fumat scale and WhoQol-Bref scale). Fig. 4 shows the results of the Goldberg scale (mental health) and Fig. 5 shows the lowliness scores (revised ESTE scale). All the results are presented along the three temporal moments of the intervention.

Table 4 shows the results of the paired *t*-test analyses carried out between the time intervals of the intervention. Cohen effect size measures [11] or standardized mean difference (d) between intervals is also presented whenever there is statistical significance. According to this author, effect sizes below 0.2 are considered small, sizes between 0.2 and 0.5 are considered moderate, and sizes above 0.8 are already considered large. The size of the effect indicates the significance or practical relevance.

Finally, as a complementary analysis, we sought for the degree of association between age and test performance and level of education and test performance, respectively. Nevertheless, we did not find any association either at baseline or end of intervention.

4. Discussion

The objective of this study was to determine if a home-based intervention delivered over six months could improve the rate of functional decline among older adults who require some type of home care. In particular, there were five domains that were evaluated. Namely, general cognitive state, depression, general mental health, perceived loneliness and quality of life. The obtained results confirmed our hypothesis and the participants showed significant improvements after intervention in all the assessed domains except the cognitive domain, as expected. We discuss the results obtained in each of the domains below.

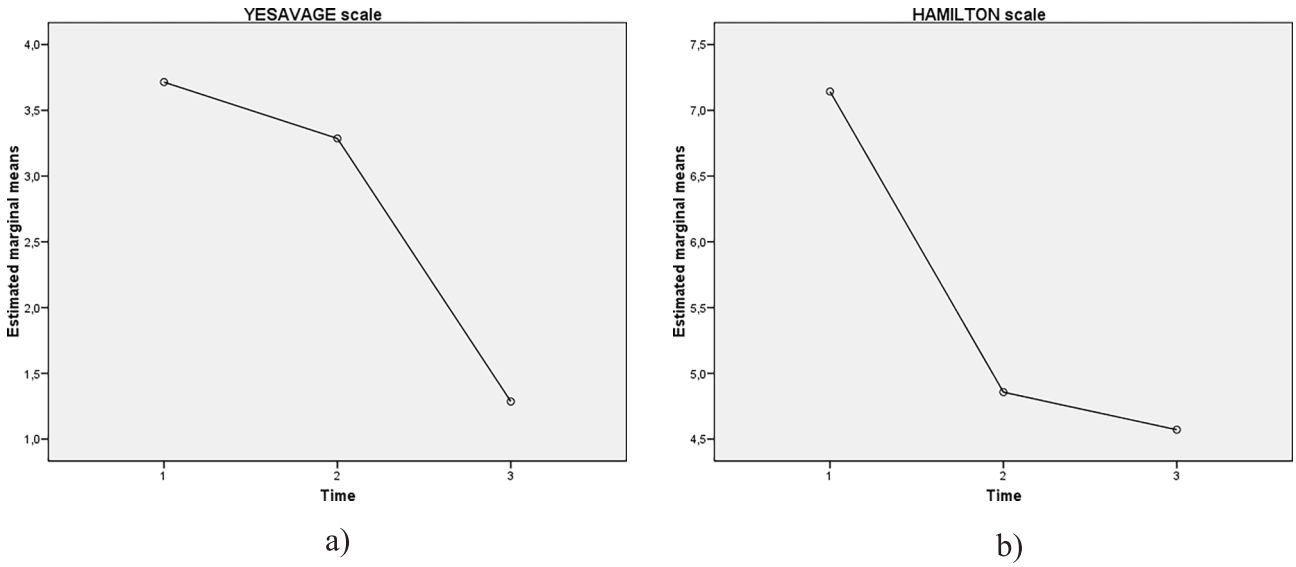

Fig. 2. Depression Scores. Estimated marginal means for the Yesavage scale (a) and the Hamilton scale (b) along the three temporal moments of the intervention. X-axis: 1: baseline, 2: mid intervention, 3: end of intervention.

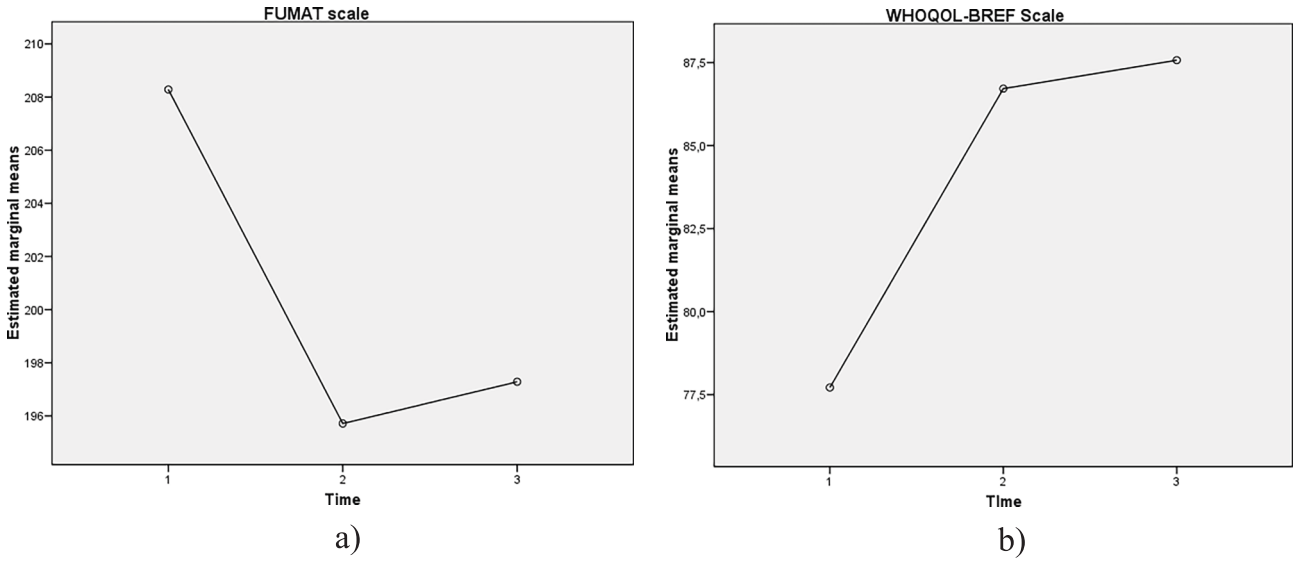

Fig. 3. Quality of life scores. Estimated marginal means for the Fumat scale (a) and WHOQOL-Bref scale (b) along the three temporal moments of the intervention. X-axis: 1: baseline, 2: mid intervention, 3: end of intervention.

4.1. General cognitive state

The results of the scales used to determine the cognitive state of the participants (Fototest and MEC-35) did not present significant statistical improvements after the intervention, although the scores obtained in the Fototest were higher. Previous studies have shown that the reliability of estimates of change for the MMSE test increases with longer duration between assessments[31]. Therefore, maintaining the cognitive level throughout the intervention makes complete sense considering that the duration of the study is very small in comparison to the average rate of decline (it usually spans over a longer period). These results are evident in different studies on cognitive decline in the geriatric population, such as the review carried out by Park et al.[25].

Obtaining these results can also be explained on the basis that the program did not include specific interventions adapted to the user that are aimed at improving this variable. However, programs specifically aimed at working at a cognitive level online from home have found high levels of acceptance by users and improvements in cognitive performance[14].

4.2. Depression

The evaluation of depression was carried out by means of the Yesavage and Hamilton scales, respectively. In the former, a statistically significant reduction in scores was observed with a large effect size, which represents a highly significant improvement with respect to baseline. However, in the latter (Hamilton scale), no significant improvements were obtained after the implementation of the program, although there is a reduction in the final scores. Although there were no statistically significant improvements in depression in the Hamilton Scale, there was a change in the range in which the mean is with respect to the baseline. At baseline, the mean value ($M = 7.14$; $SD = 4.88$) was associated to the category “light depression”, while at the end of the intervention the mean value ($M = 4.57$; $SD = 3.45$) was associated with

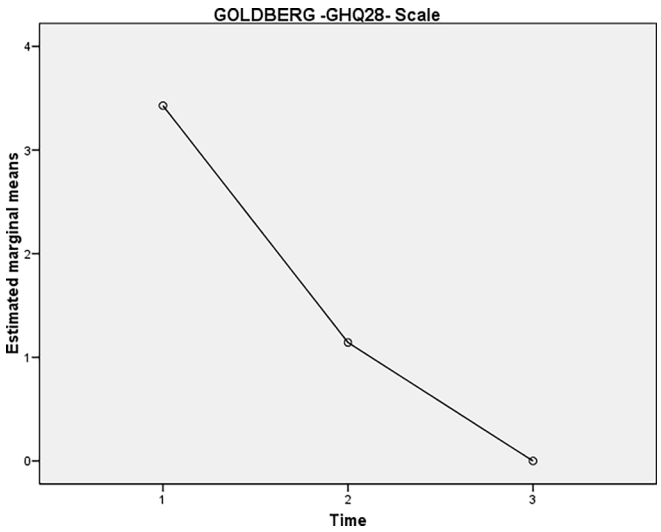

Fig. 4. Mental health scores. Estimated marginal means for the GHQ-28 scale along the three temporal moments of the intervention. X-axis: 1: baseline, 2: mid intervention, 3: end of intervention.

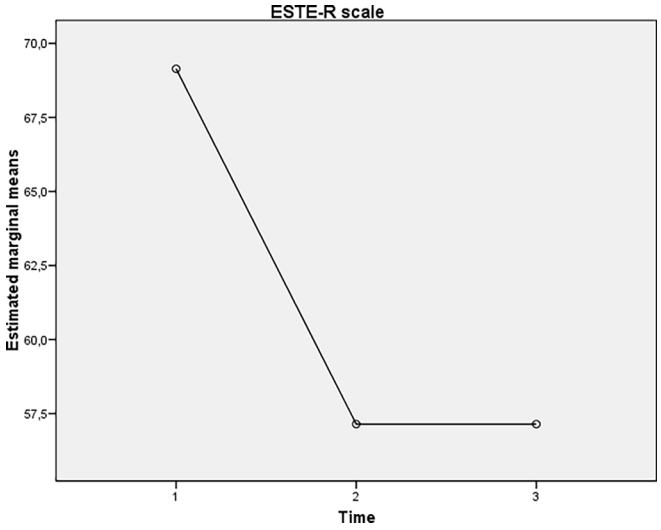

Fig. 5. Loneliness scores. Estimated marginal means for ESTE-R scale along the three temporal moments of the intervention. X-axis: 1: baseline, 2: mid intervention, 3: end of intervention.

the state categorized as "without depression". These results are consistent with those obtained by Mera et al.[24], who applied an intervention with physical-recreational activity in older adults, and also found that the decrease in the score on the Hamilton scale was not statistically significant. On the other hand, the Spanish adaptation of the Hamilton scale has been validated with a population with a previous diagnosis of depression[27]. However, the users of the program had not received this diagnosis at the beginning of the intervention, which is why statistically significant improvements could not be reflected in the scores on this scale.

The Yesavage scale was developed specifically for the evaluation of the geriatric population, so it is especially suitable for this population and takes into account its peculiarities. Likewise, this scale is considered the gold standard test used to detect depressive elements in the elderly, being the one recommended by the Geriatrics Society of Great Britain to evaluate this construct in the elderly [28]. That is why the possibility of using the Yesavage scale as an instrument of diagnostic and screening value, and the Hamilton scale in order to establish a baseline is being considered[2].

On the other hand, there is literature regarding brief online interventions for the treatment of depression that obtained better results in maintaining the decrease in this measure with the Wagner scale[32]. Depression in old age tends to be chronic and recurrent, since it is related both to loneliness and to comorbid medical illnesses, drug treatments, and family problems[10]. That is why including specific interventions beyond psychological support in this type of distance programs would be beneficial for users and could prevent the appearance of more serious conditions.

4.3. Perceived loneliness

The implemented program has managed to significantly reduce (and with a high effect size) perceived loneliness in the first part of the intervention, remaining without significant changes until the end of the intervention. These results must be taken based on the multi-causality and complexity of perceived loneliness[1]. In addition, the results obtained by the ESTE-R scale should be taken with caution due to the limitations of this scale for widows or singles, since this condition prevents them from answering some items[12], and almost half of the sample was in this situation. It is necessary to take into account that the scale measures four types of loneliness: marital loneliness, family loneliness, existential loneliness and social loneliness. Consequently, this scenario could constitute a confounding variable that we should consider in a study with a larger sample.

Remote group psychosocial interventions have been previously validated for the reduction of perceived loneliness in older adults[34]. Some telephone interventions obtained a decrease in the perception of loneliness in older adults that, although not significant, showed the need to promote the social integration of this age group beyond the family environment[1]. Programs such as Plymouth SeniorNet[18], which was an online intervention with the help of volunteers at home, reaffirm the importance of using the Internet to reduce perceived loneliness, as well as its impact on general well-being. The fact of feeling more integrated and increasing the social circle with which they interact on a daily basis has had a positive impact on their perception of loneliness.

Table 4
Tests results for the paired *t*-test between time intervals (t_0: baseline, t_1: mid intervention, t_2: end of intervention). T-student, p-value and effect size (d) are presented.

TEST	t_0-t_1			t_1-t_2			t_0-t_2		
	t	p-value	d	t	p-value	d	t	p-value	d
MEC-35	0.000	1.00	–	−0.679	0.522	–	−0.588	0.578	–
Fototest	−0.441	0.675	–	−1.6	0.159	–	−1.17	0.284	–
Yesavage	0.626	0.555	–	2.542	0.044	0.53	4.25	0.005	1.32
Hamilton	1.471	0.192	–	0.32	0.76	–	1.327	0.233	–
GHQ28	1.86	0.112	–	2.24	0.066	–	2.87	0.028	2.17
ESTE-R	3.02	0.023	0.91	0.0	1.0	0	3.12	0.02	0.91
Fumat	2.78	0.03	0.78	−0.661	0.533	–	2.49	0.047	0.72
WHOQOL-BREF	−4.5	0.004	0.78	−2.12	0.078	–	−4.29	0.005	0.91

4.4. Mental health

Taking into account the results in the GHQ-28 General Health questionnaire, a significant improvement was observed after the implementation of the program. The fact that users perceive themselves to be in better health may have to do with the fact that they feel less alone and the tendency for emotional symptoms to decrease throughout the development of the program. Since it is a questionnaire with response options that refer to a comparison between their current state and their usual state, it is coherent that users who suffer from chronic diseases accept them as part of their lives and their scores on this scale do not appear high for this reason.

4.5. Quality of life

Regarding quality of life, the variable was measured with the FUMAT and WHOQOL scales, respectively. The results after applying the FUMAT scale were not statistically significant between t_1 and t_2, but between baseline and t_2 and baseline and t_1. Therefore, the fundamental improvement in the test occurs between baseline and the first measurement. Very similar results were obtained on the WHOQOL scale, where the improvement was significant (and with a large effect size) between baseline and t_1, and between baseline and t_2. These results could be indicating that the increase in the perception of quality of life has been obtained with the first months of intervention, since users went from a situation of less stimulation, entertainment and greater loneliness, towards an active participation in the program and getting involved in their activities. In this line, we found studies that have empowered the participants (the elderly) to manage their disabilities, facilitate social engagement, provide mental stimulation and productive activities by means of virtual worlds[30].

5. Limitations

The project has some limitations. Firstly, the study is limited by its own design. Non-randomized selection of participants is a limitation of quasi-experimental studies and should be mentioned. In addition, the results should be considered with some caution because the sample was very small, and therefore the power of the contrast could have been low on some scale measurements. Secondly, after analyzing the results, we have identified different user profiles, translated into different availabilities to receive the sessions (qualified as high and low). Profiles with low availability are users who do not live alone, with a relevant social life outside the home. On the other hand, within the profile of users with high availability we found people who live alone and spend a lot of time at home. Thus, the number of sessions and their intensity have not been uniform for all. This fact may affect the variable “perceived loneliness”. That is why in the future the availability variable must be taken into account to provide a better service.

5.1. Future directions

As pointed out by Choukou et al. in their study[9], it is necessary to conduct more research to elucidate whether older adults really like the idea of assisted lifestyle (through telematic means) more than they like assisted lifestyle by a person. On the other hand, we believe that a future line of work should be dedicated to the study of indicators that make it possible to build the most appropriate user profiles to maximize the benefits of the system. Another very interesting line lies in the use of artificial intelligence to create dynamic user groups taking into account the previous indicators and that help the system when planning the sessions. As far as public health systems are concerned, we believe that the designed system offers the possibility of serving a greater number of users with a much lower investment than traditional centers, providing complementary assistance. To corroborate all of this, it would be interesting to carry out more multicenter studies, incorporating primary care services, in order to provide a more comprehensive solution for this age group.

6. Conclusions

With this work we have validated a videoconference system that extend the concept of traditional social service in all its facets (social, recreational, cognitive, physical) to a remote service, covering the needs of elderly in situations of dependency and/or loneliness. The intervention carried out with the system has been effective in providing the participants with psychological and social benefits in the variables of quality of life, general health, perceived loneliness and depression, measured through sufficiently validated instruments. The high clinical relevance achieved from the results obtained makes the system a very suitable tool to promote the independence and well-being of people who receive community-dwelling home care.

Ethical Statement

Ethical approval was obtained from the Community of Aragón Research Ethics Committee (CEICA) on October 19, 2022 (protocol PI22/431).

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What was already known on thetopic
Due to the aging of the population, there is a growing and critical need to help the elderly to manage the processes of grief, loneliness, depression, etc.
Research on home-based strategies is scarce, identifying few clinical trials with relevant results.
Most of the studies have been carried out in day care units or residential settings, focusing on behavioural, emotional and cognitive problems.
Nowadays, not all public health centers are prepared and have sufficient resources to deal with the aforementioned problem with guarantees of success, so remote assistance could be a good solution.
What this study added to our knowledge
A novel multimodal approach (focused on the needs of life of the elderly) for community-dwelling home care has been validated.
The intervention showed significant improvements (with large effect size) in the variables: quality of life, general health, perceived loneliness and depression.
The high clinical relevance achieved makes the system a very suitable tool to promote the independence and well-being of people who receive community-dwelling home care
It is possible to offer a quality remote service by means of a very simple system for the elderly

CRediT authorship contribution statement

Guillermo Palacios-Navarro: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. **Rebeca Santamaría:** Data curation, Investigation, Methodology, Resources. **David del Río:** Conceptualization, Funding acquisition, Methodology, Project administration, Supervision, Validation. **Pedro Ramos:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Resources, Software, Supervision, Visualization, Writing – original draft, Writing – review & editing. **Santiago Gascón-Santos:** Conceptualization, Investigation, Methodology, Supervision, Validation.

Declaration of competing interest

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.

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Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ijmedinf.2024.105378.

References

[1] D.L. Aguilera, E.G. Maldonado, B.U. Quiroz, Soledad en personas mayores una propuesta de intervención a través del acompañamiento telefónico en Santiago de Chile, Anales En Gerontología 13 (13) (2021) 117–144.
[2] E.A. Antón, Efectividad de las Pruebas Psicométricas en el Diagnóstico y Seguimiento de Deterioro, Depresión y Ansiedad en las Personas Mayores, Clínica y Salud, 2009, p. 20.
[3] L. Barbero Miguel, Intervención en la atención sociosanitaria en instituciones, (3rd ed.)., Ideas Propias, 2013.
[4] D.G. Blazer, Depression in late life: review and commentary, J. Gerontol.: Med. Sci. 58A (3) (2003) 249–265.
[5] D.S. Brown, W.W. Thompson, M.M. Zack, S.E. Arnold, J.P. Barile, Associations between health-related quality of life and mortality in older adults, Prev. Sci. 16 (1) (2015) Article 1, https://doi.org/10.1007/s11121-013-0437-z.
[6] C.M. Camargo Rojas, D.A. Chavarro Carvajal, El sentimiento de soledad en personas mayores: Conocimiento y tamización oportuna, Universitas Médica 61 (2020), 10.11144/Javeriana.umed61-2.essm.
[7] C. Carnero-Pardo, C. Sáez-Zea, L. Montiel Navarro, P. del Saz, I. Feria Vilar, M. J. Pérez-Navarro, J. Ruiz-Giménez, R. Vílchez-Carrillo, M.T. Montoro-Ríos, Utilidad diagnóstica del Test de las Fotos (Fototest) en deterioro cognitivo y demencia, Neurologia 22 (10) (2007) 860–869.
[8] Chen, X., Siau, K., Nah, F., 2011. Web-Conferencing Based Education: An Empirical Comparison with Face-to-Face Education.
[9] M.A. Choukou, Y. Sakamoto, P. Irani, Attitude and perceptions of older and younger adults towards ambient technology for assisted living, Eur. Rev. Med. Pharmacol. Sci. 25 (2021) 3709–3717.
[10] Cid, M. T. C. D. (2021). La depresión y su impacto en la salud pública. *Revista Médica Hondureña*, *89*(Supl.1), Article Supl.1. 10.5377/rmh.v89iSupl.1.12047.
[11] J. Cohen, Statistical power analysis for the behavioral sciences, 2nd ed., L. Erlbaum Associates, 1988.
[12] M. de Barros Barreto, B. Sosa de Canatta, Adaptación cultural de la escala para medir soledad en adultos mayores, Eureka 8 (1) (2011) 92–99.
[13] C. Díaz-Prieto, J.N. García-Sánchez, Identification of Relevant Elements for Promoting Effective Interventions in Old Age // Identificación de elementos relevantes para promover intervenciones eficaces en la vejez, Revista De Psicodidactica / Journal of Psychodidactics 21 (1) (2015) Article 1, https://doi.org/10.1387/RevPsicodidact.13854.
[14] E.G. Dupuy, F. Besnier, C. Gagnon, T. Vincent, C.-A. Grégoire, C.-A. Blanchette, K. Saillant, N. Bouabdallaoui, J. Iglesies-Grau, M. Payer, M.-F. Marin, S. Belleville, M. Juneau, P. Vitali, M. Gayda, A. Nigam, L. Bherer, COVEPIC (Cognitive and spOrt Virtual EPIC training) investigating the effects of home-based physical exercise and cognitive training on cognitive and physical functions in community-dwelling older adults: Study protocol of a randomized single-blinded clinical trial, Trials 22 (1) (2021) 505, https://doi.org/10.1186/s13063-021-05476-2.
[15] M.S. Eastin, R. LaRose, Alt.support: Modeling social support online, Comput. Hum. Behav. 21 (6) (2005) 977–992, https://doi.org/10.1016/j.chb.2004.02.024.
[16] D.P. Goldberg, V.F. Hillier, A scaled version of the General Health Questionnaire, Psychol. Med. 9 (1) (1979) 139–145.
[17] Gómez, L. E., M. A., V., Arias, B., & Navas, P. (2008). Evaluación de la calidad de vida en personas mayores y con discapacidad: La Escala Fumat. *Intervención Psicosocial*, *17*(2). 10.4321/S1132-05592008000200007.
[18] R.B. Jones, E.J. Ashurst, J. Atkey, B. Duffy, Older people going online: its value and before-after evaluation of volunteer support, J. Med. Internet Res. 17 (5) (2015) Article 5, https://doi.org/10.2196/jmir.3943.
[19] P. Lappalainen, A. Granlund, S. Siltanen, S. Ahonen, M. Vitikainen, A. Tolvanen, R. Lappalainen, ACT Internet-based vs face-to-face? A randomized controlled trial of two ways to deliver Acceptance and Commitment Therapy for depressive symptoms: An 18-month follow-up, Behav. Res. Ther. 61 (2014) 43–54, https://doi.org/10.1016/j.brat.2014.07.006.
[20] A. Lobo, P. Saz, G. Marcos, J.L. Día, C. De La Cámara, T. Ventura, F. Pascual, J. A. Montanes, S. Aznar, Revalidation and standardization of the cognition mini-exam (first Spanish version of the Mini-Mental Status Examination) in the general geriatric population, Med. Clin. 112 (20) (1999) 767–774.
[21] R. Lucas Carrasco, Versión española del WHOQOL, Ergón, D.L., 1998.
[22] Mansilla A., M. E. (2014). Etapas del desarrollo humano. *Revista de Investigación en Psicología*, *3*(2), Article 2. 10.15381/rinvp.v3i2.4999.
[23] J. Martínez de la Iglesia, M.C. Onís Vilches, R. Dueñas Herrero, C. Albert Colomer, C. Aguado Taberné, R. Luque Luque, Versión española del cuestionario de Yesavage abreviado (GDS) para el despistaje de depresión en mayores de 65 años: Adaptación y validación, Medifam 12 (10) (2002), https://doi.org/10.4321/S1131-57682002001000003.
[24] M.A. Mera, S.C. Morales, M.R.V. García, Intervención con actividad físico-recreativa para la ansiedad y la depresión en el adulto mayor, Revista Cubana De Investigaciones Biomédicas 37 (1) (2018) 47–56.
[25] H.L. Park, J.E. O'Connell, R.G. Thomson, A systematic review of cognitive decline in the general elderly population, Int. J. Geriatr. Psychiatry 18 (12) (2003) 1121–1134, https://doi.org/10.1002/gps.1023.
[26] Pinazo Hernandis, S., Donio Bellegarde, M., 2018. La soledad de las personas mayores: Conceptualización, valoración e intervención. Fundación Pilares para la Autonomía Personal.
[27] J.A. Ramos-Brieva, A. Cordero-Villafafila, A new validation of the Hamilton Rating Scale for depression, J. Psychiatr. Res. 22 (1) (1988) Article 1, https://doi.org/10.1016/0022-3956(88)90024-6.
[28] M. Rodríguez-Vargas, A. Rodríguez-Ricardo, L.L. Rojas-Pupo, Reliability of the Spanish version of the abbreviated Yesavage questionnaire in Cuban older adults, Arch Méd Camagüey 26 (2022) e8747.
[29] R. Rubio, M. Aleixandre, La escala "Este", un indicador objetivo de soledad en la tercera edad. *Geriatrika*, Revista Iberoamericana De Geriatría y Gerontología 15 (1999) 26–35.
[30] P. Siriaraya, C.S. Ang, A. Bobrowicz, Exploring the potential of virtual worlds in engaging older people and supporting healthy aging, Behav. Inform. Technol. 33 (3) (2014) 283–294, https://doi.org/10.1080/0144929X.2012.691552.
[31] G. Van Belle, R.F. Uhlmann, J.P. Hughes, E.B. Larson, Reliability of estimates of changes in mental status test performance in senile dementia of the alzheimer type, J. Clin. Epidemiol. 43 (6) (1990) 589–595, https://doi.org/10.1016/0895-4356(90)90163-J.
[32] B. Wagner, A.B. Horn, A. Maercker, Internet-based versus face-to-face cognitive-behavioral intervention for depression: a randomized controlled non-inferiority trial, J. Affect. Disord. 152–154 (2014) 113–121, https://doi.org/10.1016/j.jad.2013.06.032.
[33] J. Wen, H. Yan, S. Wang, J. Xu, Z. Zhou, The effectiveness of nursing interventions for elderly dementia patients based on virtual reality technology: A systematic review and meta-analysis, Ageing Res. Rev. 93 (2024) 102135, https://doi.org/10.1016/j.arr.2023.102135.
[34] M. Zubatsky, M. Berg-Weger, J. Morley, Using telehealth groups to combat loneliness in older adults through COVID-19, J. Am. Geriatr. Soc. 68 (8) (2020) Article 8, https://doi.org/10.1111/jgs.16553.