Behavioral Psychology / Psicología Conductual, Vol. 31, Nº 1, 2023, pp. 197-215
https://doi.org/10.51668/bp.8323112n

ENHANCEMENT OF QUALITY OF LIFE IN OLDER PEOPLE THROUGH POSITIVE REMINISCENCE INTERVENTION: A PILOT STUDY

Alba Villasán Rueda[1], Antonio Sánchez Cabaco[2], Manuel Mejía-Ramírez[3], Eduardo Castillo-Riedel[3] and Marina Alvelais-Alarcón[3]
[1]Catholic University of Avila; [2]Pontifical University of Salamanca (*Spain); [3]CETYS University* (*Mexico)*

Abstract

Older age is associated with a higher prevalence of cognitive and affective decline than in the younger population. For this reason, considering the increasing population aging, and with the continuous growth of this demographic, it is necessary to consider better types of interventions to prevent such decline from manifesting. This study measures the effectiveness of the "Positive reminiscence program" (REMPOS), a non-pharmacological therapy that increases life quality in older people, with a pre-post randomized design with control group in three types of aging: healthy aging (*n*= 24), mild cognitive impairment (*n*= 22) and Alzheimer's Disease (*n*= 21). The results of the experimental groups revealed higher cognitive levels, lower depressive symptoms, higher specific positive memories recall, and higher life satisfaction after intervention. This study extends the evidence of effectiveness of positive reminiscence interventions for older adults in other cultural backgrounds and types of aging.
KEY WORDS: *MoCA, LSI-A, GDS, MiniCognitive Examination, cognitive stimulation, reminiscence therapy*.

Resumen

En adultos mayores existe mayor prevalencia de deterioro o declive cognitivo y afectivo que la población más joven, por lo que, considerando la creciente población de adultos mayores, se precisa contar con mejores intervenciones que prevengan estas manifestaciones. En el presente estudio se planteó probar la eficacia del programa de reminiscencia positiva (REMPOS), intervención no farmacológica, para el aumento de la calidad de vida de personas mayores en tres situaciones de envejecimiento. Se utilizó un diseño aleatorizado con medida pre-pos con grupo control en tres tipos de envejecimiento: saludable (*n*= 24), deterioro cognitivo leve (*n*= 22) y enfermedad de Alzheimer (*n*= 21). Los resultados mostraron que los grupos experimentales obtuvieron mejoras cognitivas,

[1] This study received funding from "Becas Santander Iberoamérica, Investigación del Banco Santander". We would like to thank Marisela Gámez Portillo, Rosella Arce Prado, and the heads of the day care centers and nursing homes for their valuable contributions that made this study possible.
Correspondence: Alba Villasán Rueda, Faculty of Health Sciences, Catholic University of Ávila, c/ de los Canteros, s/n, 05005 Ávila (Spain). Email: alba.villasan@ucavila.es

disminución de sintomatología depresiva, mayor evocación de recuerdos específicos positivos, y mayor satisfacción vital después de la intervención. Este trabajo amplía la evidencia de la eficacia de intervenciones sobre reminiscencia positiva a personas mayores en otros escenarios culturales y en diferentes realidades del proceso de envejecer.
PALABRAS CLAVE: *MoCA, LSI-A, GDS, MiniExamen cognoscitivo, estimulación cognitiva, terapia de reminiscencia.*

Introduction

There has never been in human history such a large population of older people like we have today, and this comes with unforeseen consequences in every aspect of our daily lives (Amezaga & Saiz, 2019; Villasán, 2019). It's estimated that the population of people over the age of 60 will double its size by the year 2050, going from 11% to 22% (Moral, 2017). Studies show a high probability that by 2030 the life expectancy will surpass the age of 90 in some industrialized countries (Kontis et al., 2017), and in Mexico the population of people over the age of 65 increased from 6.2% in 2010 to 8.5% in 2020, showing signs of getting to 22.6% of the total population by the year 2050 (Consejo Nacional de Población, 2011).

The aging process is defined as a natural and inherent process in every cell and organism; although this process occurs differently in every organ and tissue in our body, therefore aging occurs differently in every person (Benvegnù & Dotti, 2017). Some consider that older people lose interest in living in their present lives because their state of mind is focused on their past and are constantly evoking memories to their present and future (Alonso et al., 2018). This perception of "losing interest" is thought to be influenced by myths and negative stereotypes linked to this stage in life that, taken to the extremes, will make older adults underestimate and perceive themselves in a negative way.

This sense of underestimating one's physical and mental capabilities can lead to premature loss of independence, cause greater disability, higher rates of depression and premature death in older people that, given the right conditions, could maintain a productive, satisfactory and healthy life (Gil et al., 2017). Although it's true that age has an influence in these outcomes, it is believed to be overestimated. This situation has been described through the "self-fulfilling prophecy" which refers to the false belief that deterioration is inevitable and, as a consequence of internalizing this idea, people reduce their efforts to avoid it (Gramunt, 2010).

The decline in functionality that comes with aging increases the probability to develop degenerative processes in older people (Cerquera et al., 2017), as in the case of dementia whose prevalence increases between the ages of 65 and 85, doubling its prevalence every 5 years reaching 20% in people over the age of 85. In 2012 WHO declared dementia as a global public health priority (Bayard et al., 2017), indicating that even though age is not the main cause of dementia it certainly is one of the most important risk-related factors. In addition, the importance attributed to dementia derives not only from the fact that this disease affects the people who suffer from it but also relatives and people who are responsible for their care. For

these reasons it's important to pay attention to the caregivers who deal with this disease since they tend to become potential patients (Martínez et al., 2014).

Up until now the Pharmacological Therapies (PT) are the most used in treating Alzheimer's Disease (AD). However, since PTs have a limited effectiveness and can cause unwanted side effects, there is a need to consider other types of interventions. In fact, recently, the usefulness of Non-Pharmacological Therapies (NPT) has been considered to assist in healthy aging process and in dementias due to the absence of adverse effects, their low cost, improvement in cognitive processes and affectivity, and increasing independence and quality of life in the older people (Gómez et al., 2010).

NPTs are described as non-chemical therapies that are theoretically based, focalized and replicable, carried out with the patient or caregiver (Bravo-Benítez & Navarro-González, 2018), and are potentially capable of obtaining significant benefits (Carballo-García et al., 2013). In this sense, many studies support the use of reminiscence narratives (evocation of memories) as they are beneficial and adequate for older stages in life, and can be used for personalized cognitive stimulation, especially when they focus on remembering positive things from their past with the goal to increase the quality of life in old age (Salazar-Villanea, 2007; Terrero, 2016; Villasán, 2020).

The evidence shows that reminiscence therapy interventions have become one of the most impactful non-pharmacological therapies in recent years with supporting evidence on its efficacy in the elderly (Afonso et al., 2011; González-Arévalo, 2015; Kirk et al., 2019; Rodrigues, 2017; Terrero, 2016). Although more research is needed to support its efficacy and effectiveness (Villasán, 2020). Therefore, one of the main contributions of this research is to show the efficacy of the techniques included in the REMPOS program, in contrast to the evidence provided by other types of therapy interventions that focuses on dimensions like forgiveness, in which the results usually show inconsistency (López et al., 2021). The present study also contributes evidence that these types of interventions can apply to different contexts so that they can be generalized to different cultural and social contexts. The transcultural dimension, in which this research focuses on, will help spread these types of interventions in countries that share cultural and linguistic elements, as in this case Mexico and Spain.

The main objective in this study was to test the effectiveness of reminiscence therapy in cognitive and affective variables in older people based in northern Mexico with different types of aging: healthy aging (HA), mild cognitive impairment (MCI) and Alzheimer's Disease (AD). Does REMPOS improve cognitive and affective processes in older people better than standard cognitive stimulation therapies?

We hypothesized that participants in the experimental group would improve in cognitive function (H1), improve in affective measures, decreasing depressive symptoms and increasing life satisfaction (H2), and improve in recalling specific autobiographical memories (H3), after intervention and those improvements would be greater than the ones observed in the control group.

Method

Participants

This study includes a total of 67 older people (51 female) from different retirement homes located in the city of Tijuana, Mexico. The mean age is 76.2 (SD= 9.74) years for all participants, 77.3 (SD= 8.65) years for men and 75.8 (SD= 10.1) years for women. We suspect that there were more women participants due to their greater life expectancy.

The inclusion criteria were as follows: 1) people over the age of 65; 2) from the DIF centers and nursing homes; 3) with healthy aging, MCI and previous diagnosis or indicators of AD. After reviewing different DIF centers, we decided to select DIF Casa del Abuelo and DIF Valle Verde because the elderly population was greater than the other centers, although the pathological population with MCI and AD were very low. Therefore, two nursing homes, Asilo los Años de Oro and Estancia Geriátrica las Lunas, were further included, to recruit the remaining participants with MCI and AD.

The sample was divided into six groups: experimental group with healthy aging, MCI and AD, and control group with healthy aging, MCI and AD, and were constituted by following a predefined criteria. Since there is no neuropsychological test that identifies AD in early stages (Ocampo et al., 2015) the AD groups were formed based on the medical history and criteria the nursing homes had of the subjects. To form the healthy aging and MCI group we used the MEC test results: healthy aging group (MEC$\geq$ 24), and MCI group (MEC$<$ 24), and with the absence of AD diagnosis and any neurological condition (table 1). The tests were administered by the main researcher or research assistants individually and orally.

Of the initial 67 participants, 64 completed the program and the second assessment. Of the 3 participants who did not complete the program, one person was from the control group with AD, one from the experimental group with MCI, and one from the experimental group of HA. Sample sizes were planned to allocate 10 participants per group, given that the intervention was applied by groups, and previous research has suggested to avoid groups bigger than 10 participants (Arroyo-Anlló et al., 2012; Asociación de Familiares y Amigos de Personas con Alzheimer de Guipuzkoa, 2020).

Each DIF center and each nursing home was randomly assigned to the experimental or control condition. The criteria used to select which center or nursing home should have the experimental or control group was randomized by simulating a coin toss. This was done prior to the pre-test assessment for the day care centers (DIF Valle Verde and DIF Casa del Abuelo), and nursing homes (Asilo Los Años de Oro and Estancia Geriátrica las Lunas). Therefore, the experimental groups included the participants from DIF Casa del Abuelo and Estancia Geriátrica Las Lunas, and the control groups included the participants from DIF Valle Verde and Asilo Los Años de Oro.

Table 1
Group formation

Groups	Alzheimer's disease	Mild cognitive impairment	Healthy aging	Total
Control	10	10	13	33
Experimental	11	12	11	34
Total	21	22	24	67

Instruments

a) *Montreal Cognitive Assessment* (MoCA; Nasreddine et al., 2005). The MoCA test assesses attention and concentration, memory, language, executive functions, visuoconstructive abilities, conceptual thinking, calculation and orientation (Nasreddine et al., 2005). It is a brief 10 minute screening test used to detect mild cognitive dysfunction. The maximum score possible is 30 points, scoring 26 or above is considered normal. This test has a sensitivity of 90% for MCI and 100% for AD, and a specificity of 87%.
b) *Mini-Mental State Exam* (MEC; Folstein, 1979), Spanish adaptation by Lobo et al. (2008). The MEC is a widely used brief screening test that assesses cognitive function in orientation, memory, attention and calculation, recall and language with a maximum score of 35 points (Lobo et al., 2008) that takes between 5 to 15 minutes to complete, and a cutoff point of 23/24 in geriatric patients. In a concordance study between MMSE and MEC it was found that the intraclass correlation coefficient was 0.864 (95% CI, 0.855- 0.873) and the kappa index was 0.788 at score 20 for MMSE and 23 for MEC (Vinyoles Bargalló et al., 2002).
c) *Geriatric Depression Scale* (GDS; Yesavage et al., 1982). The GDS is a yes or no questionnaire in which participants are asked about how they felt over the past week. It is one of the most widely used scales to assess depression in the older population (Fernandez-San Martín et al., 2002). The test has 30 items that consist of questions related to irritability, distress, affection, isolation and negative judgment, with a maximum score possible of 30 points and a cutoff point of 9/10. The score is obtained by adding the items associated with depression; the higher the score the more it is associated with depression. The test has a sensitivity of 75.3% and a specificity of 77% (Wancata et al., 2006).
d) *Life Satisfaction Index for the Elderly* (LSI-A; Neugarten et al., 1961). The LSI-A is a 20 item test that assesses the subjective well-being of the elderly through answering general life statements with "agree", "disagree" and "unsure" responses (Neugarten et al., 1961; Stock et al., 1994). The score ranges from 0 to 40 points and is obtained by summing up the scores for each item's answers, where 0 points are given to "disagree", 1 point is given to "unsure" and 2 points are given to "agree" responses (Wood et al., 1969). A higher score means higher well-being. The LSI-A has shown a reliability of 0.74 for the older population (Stock et al., 1994).
e) *Autobiographical Memory Test* (AMT; Latorre et al., 2012). The AMT is a test used to assess how well a person can recall self-related memories ranging from

specific episodic to conceptual memories in a specific time frame by giving them positive and negative valence word-cues (Latorre et al., 2012). The test has 5 positive word-cues (happiness, friendship, illusion, energy and smile), 5 negative word-cues (guilty, failure, concern, sadness and illness) and 4 neutral word-cues (car, tree, book and carry) that are read out loud to the participants, alternating between the 3 types of word-cues. The participants have 60 seconds to recall a specific memory which the word-cue reminds them of, and if no memory could be recalled in that time lapse that item was noted as an omission. If the recalled memory was an event that lasted no longer than one day in a certain place and time it is coded as "specific" (e.g., 'my graduation'), if it lasted longer than one day it was coded as "extended" (e.g., 'when I traveled in Spain'), and if it was more of a generic concurring event it was coded as "categorical" (e.g., 'the times I went to school'), but it's considered an "omission" if the participant did not recall a memory in 60 seconds or if they just recalled people names, animals or objects. In a study the inter-rater reliability was calculated separating the positive and negative word-cues, showing kappa index values of 0.86 for positive word-cues and 0.83 for negative word-cues (Latorre et al., 2012). The scores of interest were the positive and negative specific memories, which were coded as EPOS (specific positive memories) and ENEG (specific negative memories).

Procedure

PHASE 1. CONTACT WITH THE INSTITUTIONS: the host university of CETYS contacted the DIF Institution (System for the Integral Development of the Family, an institution that helps and protects vulnerable families in the city of Tijuana) to propose doing the study in their centers. In this phase we explained the main objective, the time frame needed, and the method required to complete the study. This process was done approximately 3 months before the intervention phase. Once the project was authorized, and one month before starting the intervention, participants signed an informed consent specifying the objectives and purpose of the study, and were administered the tests.

PHASE 2. INTERVENTION: the "Positive reminiscence program" (REMPOS) was given to the three experimental groups with AD, MCI and HA, and the cognitive stimulation therapy was given to each control group with AD, MCI and HA. Both therapies consisted of 12 sessions that were done over a period of 2 months (November-December), twice per week, with each session lasting 1 hour for both therapies (REMPOS and cognitive stimulation). The intervention was administered in all groups by the first author; the groups were formed by a maximum of 13 participants for HA and MCI groups and a maximum of 11 participants for the AD groups. Table 2 provides a brief description of the themes used on both therapies.

The control groups were treated with a cognitive stimulation program developed by the Pontifical University of Salamanca (Cabaco, 2016; Cabaco et al., 2017) with exercises that focused on attention, perception, memory, language, inhibition, planning, reasoning, calculation and drawing skills, excluding the autobiographical memory exercises. This was done to highlight the effects of an

exclusive autobiographical therapy and cognitive stimulation therapy without autobiographical exercises. While the experimental group were given REMPOS therapy program (Cabaco, 2019) that also focused on stimulating the same cognitive domains with the exception that it included group activities that helped stimulate social skills and interaction with other participants, and positive emotional expression.

PHASE 3. COMPLETION OF THE INTERVENTIONS: after both groups (experimental and control) completed the 12 session therapies they were reassessed using the same tests used previous to the intervention. These results were collected and compared to verify if there were any signs of improvement. All measurements were done between a 3 to 3.5 months.

Table 2
Themes used in each type of intervention

Session	REMPOS (Experimental group)	Cognitive stimulation (Control group)
1	Introduction to reminiscence	Cues to improve registry: concentration
2	Everyday things	Organizing information
3	My present-past-future	Visualization and misattributions
4	Interpersonal relationships	The importance of language
5	Important dates	Routes and semantic knowledge
6	Celebration dates/ holidays	Reading and comprehension, and procedural knowledge
7	Occupations and professions	Basic math and arithmetics
8	Games	Math skill stimulation
9	Remembering loved ones	Relational memory training I
10	Music and memories	Relational memory training II
11	Reirpos (positive emotions through laughter)	Importance of self-regulation and attention
12	Laughing more, living more	Breathing exercises

Data analyses

Three-factor repeated measures ANOVA were run for each dependent variable, each one with factors: "time" (pre or post, within subjects), "type of intervention" (Intervention or Control, between subjects), and "type of aging" (HA, MCI, or AD, between subjects). Results were considered statistically significant when $p < .05$. R 4.0.2 (R Core Team, 2018) was used to do statistical analyses, along with rstatix (Kassambara, 2020), ggplot2 (Wickham, 2016), WRS2 (Mair, & Wilcox, 2020) and MOTE (Buchanan et al., 2019) packages. After each ANOVA, if double or triple interactions were significant, *post-hoc* analyses were calculated to test differences between post and pre-test scores for each type of intervention and type of aging, p-values were adjusted for multiple comparisons using Holm correction.

Assumptions checks were done inspecting Q-Q plots and running Shapiro-Wilk's test to assess non-normality, and using interquartile ranges to check for the

presence of extreme outliers. For MoCA, GDS and LSI-A scores there were no extreme outliers, and none of the subgroups showed a significant deviance from normality. For MEC scores there were only four extreme outliers in the pre-test scores of the control healthy aging group, and two in the post-test scores of the same group; only one out of 12 subgroups (pre-intervention scores for the control healthy aging group) showed deviance from normality (p= .0004), but when inspecting Q-Q plots the deviance was unclear. MoCA, MEC, GDS and LSI-A scores were analyzed using parametric tests.

Specific positive memories (EPOS) and specific negative memories (ENEG) scores were analyzed using difference scores (post- minus pre-intervention scores) with two-factor ANOVAs: "type of intervention" (Intervention or Control, between subjects), and "type of aging" (HA, MCI, or AD, between subjects). For EPOS scores, three extreme outliers were identified (one in the post intervention scores of the experimental MCI group, and two in the post intervention scores of the experimental healthy aging group), and three subgroups deviated from normality: post-intervention scores of the three experimental groups (*all ps* < .0002), those groups showed significant deviance from normality in the Q-Q plots. ENEG scores showed no extreme outliers; two of the subgroups of the healthy participants (pre-intervention scores of the control group and post-intervention scores of the experimental group) deviated slightly from normality (p= .040, p= .044, respectively). Same assumption checks were done with difference scores (post-minus pre-intervention scores), showing only one extreme outlier in the ENEG scores of the experimental MCI group, and no group deviated from normality; for these reasons, ANOVA was used using difference scores. *Post-hoc* analyses were done using Wilcoxon paired sample tests to test which subgroups showed significant differences after intervention.

Results

Table 3 shows the main descriptive results of the types of intervention (experimental or control), types of aging (Alzheimer's, MCI, or healthy aging), and time (pre- or post-intervention).

Results for MoCA scores showed a non-significant three-way interaction ($F_{2,58=}$ 0.28, p= .76, η^2_G= 0.001, 95% CI [.00, .00]) between type of intervention, type of aging and time. There was only a significant double interaction between type of intervention and time ($F_{1,58=}$ 21.66, p< .001, η^2_G= 0.034, 95% CI [.00, .17]), but not for type of aging and time ($F_{2,58=}$ 1.78, p= .18, η^2_G= 0.006, 95% CI [.00, .06]), nor between type of aging and type of intervention ($F_{2,58=}$ 0.96, p= .39, η^2_G= 0.03, 95% CI [.00, .14]). There were significant main effects of time ($F_{1,58=}$ 65.43, p< .001, η^2_G= 0.10, 95% CI [.00, .27]) and type of aging ($F_{2,58=}$ 39.23, p< .001, η^2_G= 0.55, 95% CI [.35, .69]), but not of type of intervention ($F_{1,58=}$ 0.28, p= .60, η^2_G= 0.004, 95% CI [.00, .10]).

In *post-hoc* analyses of MoCA scores, the experimental groups in each type of aging, Alzheimer's ($t_{10=}$ 8.17, p< .001, Hedges' g= 2.27, 95% CI [1.04, 3.04]), MCI ($t_{10=}$ 4.77, p< .001, Hedges' g= 1.33, 95% CI [0.51, 1.87]) and healthy aging ($t_{9=}$

5.36, $p< .001$, Hedges' $g= 1.55$, 95% CI [0.45, 2.24]), showed improvement after intervention. Neither of the control groups, Alzheimer's ($t_{8=}$ 2.0, $p= .08$, Hedges' $g=$ 0.60, 95% CI [-0.21, 1.24]), MCI ($t_{9=}$ 1.57, $p= .15$, Hedges' $g=$ 0.45, 95% CI [0.004, 0.84]) and healthy aging ($t_{12=}$ 0.69, $p= .50$, Hedges' $g=$ 0.18, 95% CI [-0.45, 0.75]), showed significant differences after intervention (see Figure 1). The double interaction between type of intervention and time was indicating that the improvements after intervention only appeared in the experimental groups, independently of type of aging.

Table 3
Descriptive statistics for the cognitive variables assessed before and after intervention (control and experimental groups) for the three types of aging groups

Group / Cognitive variables	Control		Experimental	
	Pre *M* (*SD*)	Post *M* (*SD*)	Pre *M* (*SD*)	Post *M* (*SD*)
Alzheimer's group	*n*= 10	*n*= 9	*n*= 11	*n*= 11
MoCA	8,0 (7,06)	10,2 (7,69)	6,9 (3,59)	12,5 (4,68)
MEC	13,1 (8,05)	16,1 (7,69)	15,5 (5,28)	20,3 (5,04)
GDS	9,0 (7,02)	10,1 (7,85)	15,2 (6,94)	9,1 (3,94)
LSI-A	23,3 (6,85)	22,4 (5,73)	17,9 (6,17)	27,2 (4,12)
EPOS	1,4 (0,84)	1,3 (1,06)	2,1 (1,04)	4,7 (0,47)
ENEG	2,0 (1,76)	1,5 (1,35)	2,8 (1,25)	2,5 (1,13)
MCI group	*n*= 10	*n*= 10	*n*= 12	*n*= 11
MoCA	11,9 (4,10)	13,2 (4,73)	9,2 (3,22)	13,8 (4,36)
MEC	18,5 (3,47)	19,7 (3,62)	16,8 (4,18)	20,8 (4,79)
GDS	11,3 (7,18)	12,6 (7,53)	11,7 (7,70)	7,4 (4,99)
LSI-A	24,4 (5,34)	24,7 (6,40)	24,8 (7,02)	26,9 (6,70)
EPOS	2,0 (1,16)	2,0 (1,33)	2,0 (1,41)	4,4 (1,44)
ENEG	3,2 (1,69)	2,9 (1,60)	2,7 (1,72)	3,6 (1,56)
Healthy Aging group	*n*= 13	*n*= 13	*n*= 11	*n*= 10
MoCA	19,2 (3,36)	19,8 (3,31)	20,9 (4,37)	23,7 (3,86)
MEC	25,3 (1,49)	25,7 (2,25)	26,7 (1,79)	28,4 (2,07)
GDS	13,0 (6,39)	13,5 (5,83)	7,3 (3,55)	5,3 (3,13)
LSI-A	24,9 (6,24)	25,2 (5,61)	26,5 (5,39)	28,8 (6,14)
EPOS	2,2 (0,93)	1,8 (1,21)	2,4 (1,03)	4,8 (0,63)
ENEG	4,0 (0,91)	2,3 (0,95)	3,1 (1,38)	4,2 (0,92)

Notes: MoCA= Montreal Cognitive Assessment; MEC= Mini-Mental State Exam, Spanish adaptation; GDS= Geriatric Depression Scale; LSI-A= Life Satisfaction Index for the Elderly; EPOS= Specific positive memories; ENEG= Specific negative memories; MCI= Mild cognitive impairment. Groups with one less participant in post-intervention scores happened when a participant could not be assessed due to illness or death.

Results for MEC scores showed a non-significant three-way interaction ($F_{2,58=}$ 0.31, $p= .74$, $\eta^2_G= 0.001$, 95% CI [.00, 1.00]) between type of intervention, type of aging and time. There was a significant double interaction between type of intervention and time ($F_{1,58=}$ 13.51, $p< .001$, $\eta^2_G= 0.02$, 95% CI [.00, .14]), and between type of aging and time ($F_{2,58=}$ 4.64, $p= .01$, $\eta^2_G= 0.01$, 95% CI [.00, .09]), but not between type of aging and type of intervention ($F_{2,58=}$ 0.72, $p= .49$, $\eta^2_G=$

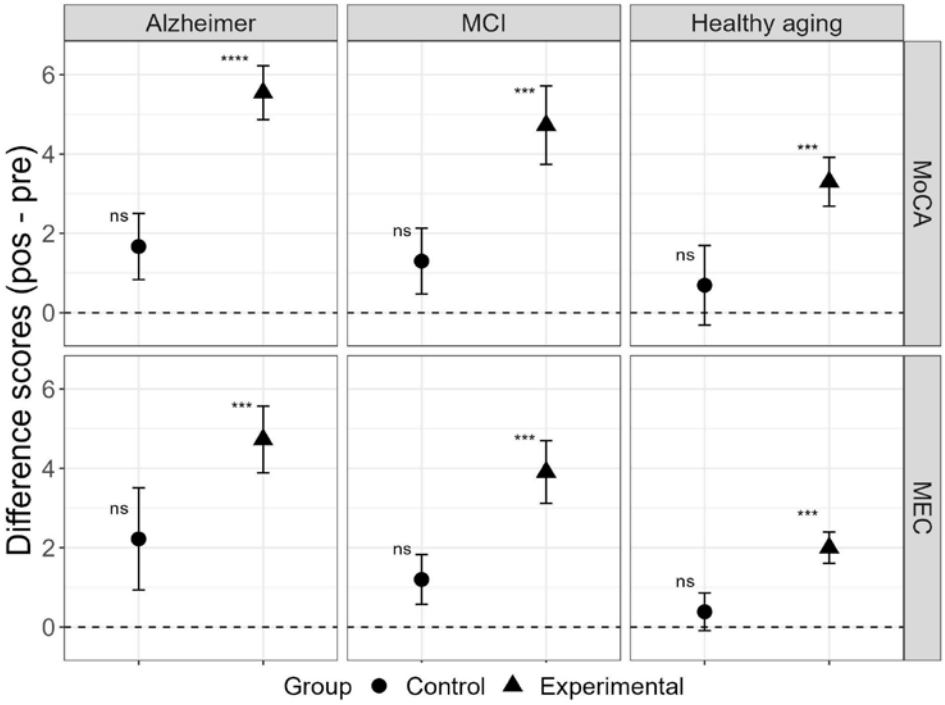
0.02, 95% CI [.00, .12]). There were significant main effects of time ($F_{1,58=}$ 60.44, p< .001, η^2_G= 0.07, 95% CI [.00, .24]) and type of aging ($F_{2,58=}$ 31.44, p< .001, η^2_G= 0.50, 95% CI [.29, .65]), but not of type of intervention ($F_{1,58=}$ 1.98, p= .17, η^2_G= 0.03, 95% CI [.00, .24]).

In *post-hoc* analyses of MEC scores, the experimental groups in each type of aging, Alzheimer's ($t_{10=}$ 5.61, p< .001, Hedges' g= 1.56, 95% CI [0.80, 2.10]), MCI ($t_{10=}$ 4.94, p< .001, Hedges' g= 1.37, 95% CI [0.46, 2.06]) and healthy aging ($t_{9=}$ 5.07, p< .001, Hedges' g= 1.47, 95% CI [0.75, 1.90]), showed improvement after intervention. Neither of the control groups, Alzheimer's ($t_{8=}$ 1.72, p= .12, Hedges' g= 0.52, 95% CI [-0.71, 1.51]), MCI ($t_{9=}$ 1.91, p= .09, Hedges' g= 0.55, 95% CI [0.18, 0.83]) and healthy aging ($t_{12=}$ 0.81, p= .43, Hedges' g= 0.21, 95% CI [-0.36, 0.69]), showed significant differences after intervention (see Figure 1). The double interaction between type of intervention and time was indicating that only the experimental groups showed significant improvements after intervention, independently of type of aging (see Figure 1). While the double interaction between type of aging and time was explained by the fact that Alzheimer's and MCI groups showed larger intervention effect sizes than healthy aging participants.

For GDS results, there was no significant three-way interaction ($F_{2,58=}$ 1.24, p= .30, η^2_G= 0.005, 95% CI [.00, 0.06]) between type of intervention, type of aging and time. There was a significant two-way interaction between type of intervention and time ($F_{1,58=}$ 24.51, p< .001, η^2_G= 0.05, 95% CI [.00, 0.20]), and between type of aging and type of intervention ($F_{2,58=}$ 3.29, p= .04, η^2_G= 0.09, 95% CI [.00, 0.24]), but not between type of aging and time ($F_{2,58=}$ 0.79, p= .46, η^2_G= 0.003, 95% CI [.00, 0.04]). There was only a significant main effect of time ($F_{1,58=}$ 11.30, p= .001, η^2_G= 0.02, 95% CI [0.00, 0.15]), but not of type of aging ($F_{2,58=}$ 0.23, p= .80, η^2_G= 0.007, 95% CI [.00, 0.07]), nor type of intervention ($F_{1,58=}$ 2.11, p= .15, η^2_G= 0.03, 95% CI [.00, 0.17]).

In *post-hoc* analyses of GDS scores, the experimental groups in each type of aging, Alzheimer's ($t_{10=}$ 4.46, p= .001, Hedges' g= 1.24, 95% CI [0.57, 1.69]), MCI ($t_{10=}$ 4.11, p= .002, Hedges' g= 1.14, 95% CI [0.40, 1.72]) and healthy aging ($t_{9=}$ 3.21, p= .01, Hedges' g= 0.93, 95% CI [-0.62, 1.77]), showed improvement after intervention. Neither of the control groups, Alzheimer's ($t_{8=}$ -1.05, p= .33, Hedges' g= -0.32, 95% CI [-0.92, 0.34]), MCI ($t_{9=}$ -0.77, p= .46, Hedges' g= -0.22, 95% CI [-0.82, 0.41]) and healthy aging ($t_{12=}$ -0.35, p= .74, Hedges' g= -0.09, 95% CI [-0.65, 0.47]), showed significant differences after intervention (see Figure 1). The double interaction between type of intervention and time was indicating that only the experimental groups showed significant improvements after intervention, independently of type of aging (see Figure 1), although the healthy aging group showed less improvement than the other two groups.

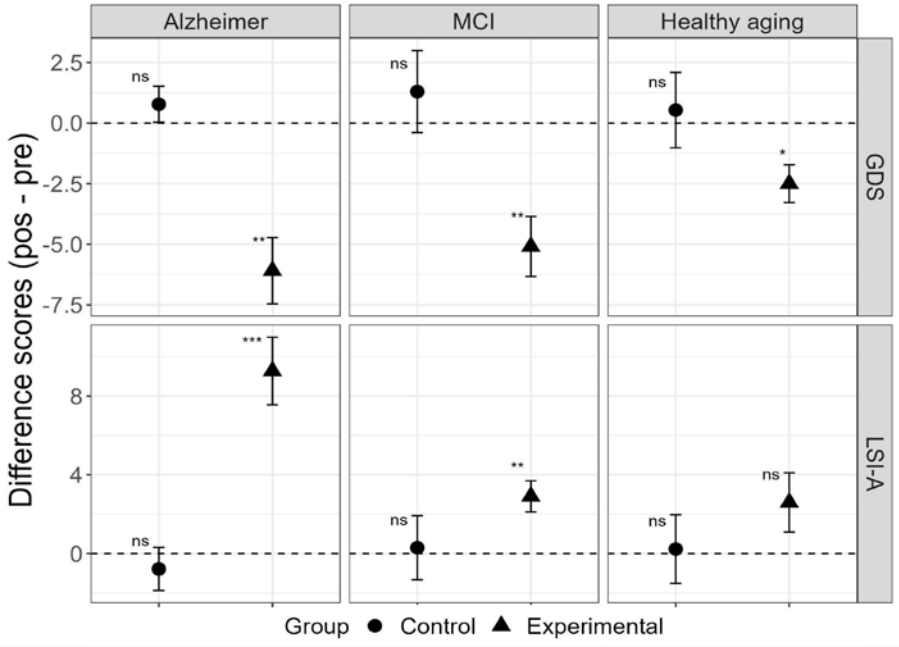
Figure 1
Differences in cognitive decline before and after the intervention for the three types of aging, comparing the REMPOS program with standard cognitive stimulation



Notes: MCI= Mild cognitive impairment; MoCA= Montreal Cognitive Assessment; MEC= Mini-Mental State Exam, Spanish adaptation. Error bars indicate standard errors. *p< .05; **p< .01; ***p< .001; ns= non-significant, testing a significant difference from zero.

For LSI-A results, there was a significant three-way interaction ($F_{2,58=}$ 4.05, p= .02, η^2_G= 0.02, 95% CI [.00, 0.12]) between type of intervention, type of aging and time, and a significant double interaction between type of intervention and time ($F_{1,58=}$ 16.47, p= .001, η^2_G= 0.05, 95% CI [.00, 0.19]). In *post-hoc* analyses of LSI-A scores, the experimental groups in Alzheimer's ($t_{10=}$ 5.40, p< .001, Hedges' g= 1.50, 95% CI [0.56, 2.05]), and MCI ($t_{10=}$ 3.68, p= .004, Hedges' g= 1.02, 95% CI [0.43, 1.45]) groups showed significant difference between scores post- and pre-intervention. The experimental group of healthy aging participants did not show a significant difference due to intervention ($t_{9=}$ 1.73, p= .12, Hedges' g= 0.50, 95% CI [-0.33, 1.17]). None of the control groups either in the Alzheimer's ($t_{8=}$ 0.71, p= .50, Hedges' g= -0.22, 95% CI [-0.92, 0.65]), MCI ($t_{9=}$ 0.18, p= .86, Hedges' g= 0.05, 95% CI [-0.65, 0.66]), or healthy aging ($t_{12=}$ 0.13, p= .90, Hedges' g= 0.03, 95% CI [-0.52, 0.58]) groups showed differences before and after intervention. The interactions reported were indicative that only experimental groups had significant differences before and after interventions, but only in Alzheimer's and MCI participants (see Figure 2).

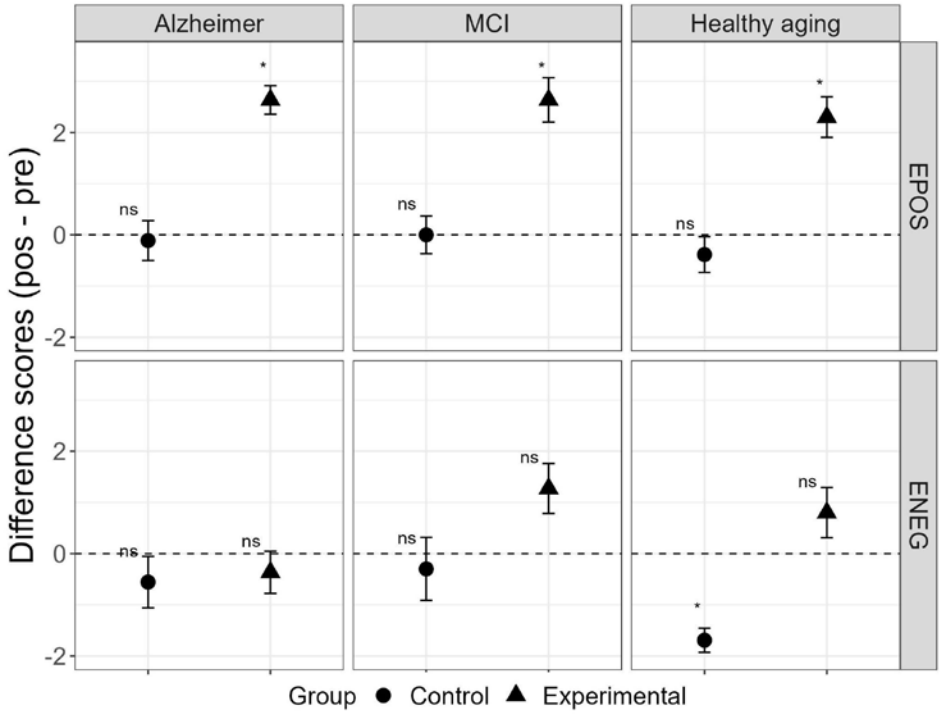
Figure 2
Differences in depression and life satisfaction before and after the intervention for the three types of aging, comparing the REMPOS program with standard cognitive stimulation



Notes: MCI= Mild cognitive impairment; GDS= Geriatric Depression Scale; LSI-A= Life Satisfaction Index for the Elderly. Error bars indicate standard errors. **p*< .05; ***p*< .01; ****p*< .001; ns= non-significant, testing a significant difference from zero.

For EPOS results, there was no significant two-way interaction ($F_{2,58=}$ 0.01, p= .99, η^2_G= 0.0004, 95% CI [.00, 0.12]) between type of intervention and type of aging. There was a significant main effect of type of intervention ($F_{1,58=}$ 77.81, p< .001, η^2_G= 0.57, 95% CI [.20, 0.58]), but not of type of aging ($F_{2,58=}$ 0.56, p= .57, η^2_G= 0.02, 95% CI [.00, 0.08]). *Post-hoc* analyses using Wilcoxon paired sample tests found significant differences between post and pre-intervention scores for the experimental groups of Alzheimer's patients (W= 66, p= .02), MCI (W= 45, p= .02) and in the healthy aging group (W= 45, p= .03). No significant differences were found in any of the control groups (*ps* > .80) (see Figure 3).

Figure 3
Differences in autobiographical memory before and after the intervention for the three types of aging, comparing the REMPOS program with standard cognitive stimulation



Notes: MCI= Mild cognitive impairment; ENEG= Specific negative memories; EPOS= Specific positive memories. Error bars indicate standard errors. *p< .05; **p< .01; ***p< .001; ns= non-significant, testing a significant difference from zero.

For ENEG results, there was a significant two-way interaction ($F_{2,58=}$ 3.20, p= .048, η^2_G= 0.099, 95% CI [.00, 0.18]) between type of intervention and type of aging. There was a significant main effect of type of intervention ($F_{1,58=}$ 14.48, p< .001, η^2_G= 0.20, 95% CI [.01, 0.29]), but not of type of aging ($F_{2,58=}$ 2.81 p= .07, η^2_G= 0.09, 95% CI [.00, 0.17]). *Post-hoc* analyses using Wilcoxon paired sample tests found a significant difference between post and pre-intervention scores only for the control group of healthy aging participants (W= 78, p= .01). No significant differences were found in any of the remaining groups (*ps* > .58) (see Figure 3).

The pattern of results for AMT scores showed that the REMPOS program mainly had effects on increasing only the specific positive memories in all three types of aging. This pattern relates to those reported for GDS and LSI-A scores, where all types of aging benefited from the REMPOS program compared to the control intervention, although the largest effects were found in the Alzheimer's and MCI groups.

Discussion

This study consisted in identifying the effectiveness of REMPOS therapy in general cognitive function (measured with the MEC and MoCA instruments), affective processes (*t*hrough LSI-A and GDS-30 instruments), and life satisfaction subjective (with the use of the AMT) in older people with healthy aging, MCI, and AD. The results in this study show that there were statistically significant improvements in most areas for all experimental aging groups (AD, MCI, and HA), and these data are comparable in previous and subsequent studies (Justo Henriques et al., 2022; Villasán et al., 2021)

All the experimental aging groups show significant improvement in general cognitive function as shown in MoCA and MEC results. It also shows that the AD experimental group had a bigger improvement relative to what the MCI and healthy aging experimental group scored. The more cognitively impaired a person is, the more improvement can be shown using this kind of techniques (Justo Henriques et al., 2022; Villasán et al., 2021).

There was a significant decrease in depressive symptoms in all experimental aging groups, but only a significant increase in life satisfaction for the AD and MCI experimental groups. Since depressive symptoms and life satisfaction seem to be related, one could expect that a significant decrease in depressive symptoms would show a significant increase in life satisfaction, previous investigations show results like those found in this study (Villasán et al., 2021). It could be argued that older people with healthy aging have less disorders and are more independent, therefore having greater life satisfaction and making it harder to perceive this improvement, but the LSI-A test results show that, not only the improvements were minimum, but the AD experimental group scored higher post-intervention than the healthy aging experimental group pre-intervention. It is unclear why the HA experimental group did not have relative significant improvements in life satisfaction, the environment in which their life unfolded could perhaps explain these results (Justo Henriques et al., 2022; Villasán et al., 2021).

With regards to autobiographical memory recall, it's worth mentioning that REMPOS therapy focuses on only increasing the recall of positive memories, not negative (Afonso & Bueno, 2011). As expected, all experimental groups (AD, MCI, and HA), show a significant increase in positive autobiographical memory recall. While reminiscence was considered as a possible sign of dysfunction and / or deterioration when it occurred at the end of life, it is currently considered to have adaptive functions, serving as a positive predictor of mental health in the elderly (Afonso et al., 2011; Afonso y Bueno, 2010; Bohlmeijer et al., 2003; Cappeliez y O'Rourke, 2006; Gil et al., 2022; Villasán, 2019; Villasán, 2020). An intervention based on reminiscence therapy is associated with a statistically significant increase in the general cognitive level, a decrease in depressive symptomatology, an increase in life satisfaction and a greater evocation of specific positive and negative memories, such as specifically developed.

It's also worth mentioning that any type of intervention that can decrease depressive symptoms in older people is of great value and necessary in the clinical field (Aparicio et al., 2022) primarily due to the increasing number of studies that

point out that depression is one of the most common disorders associated with aging. Thus, the results we found are consistent with the previous studies that suggest the important role reminiscence therapies have in older people's well-being due to its adaptive and therapeutic effects that positively influence their quality of life (Aparicio et al., 2022; González-Arévalo, 2015; Justo Henriques et al., 2022; Villasán et al., 2021).

The low count of specialized medical health professionals pertaining to the geriatric field in Mexico make it difficult to find patients with a reliable medical AD diagnosis, thus increasing the difficulty to do clinical interventions and research in this specialized field by having to rely on information provided by the centers and nursing homes. Overall, the results found are quite encouraging to continue to promote studies on this topic, as the use of positive reminiscence therapy has demonstrated a significant decrease in depressive symptomatology, an increase in cognitive level, life satisfaction, and recall of specific memories, all imperative factors in the psychological well-being and quality of life of the elderly. For future work, it would be interesting to compare these groups in different countries to verify the findings obtained here and explain some of the limitations found.

This study suggests that positive reminiscence therapy (REMPOS) can significantly improve general cognitive function, decrease depressive symptoms, increase the recall of positive specific memories, and increase life satisfaction in older people with Alzheimer's Disease, MCI and healthy aging, adding evidence to the effectiveness of REMPOS in older adults (Villasán, 2017; Villasán, 2020). Although there were improvements in life satisfaction, these were not statistically significant for the experimental healthy aging group. Nevertheless, this study demonstrates statistically significant benefits that older people with different types of aging can acquire by receiving REMPOS therapy.

In conclusion, this study shows evidence of the cross-cultural effectiveness of REMPOS therapy, since the results are similar to those found in previous research that had in Spanish samples of older adults with similar characteristics. And compared to the inconsistent results of other reminiscence interventions focused on single dimensions (such as forgiveness), the set of techniques that make up the REMPOS program may be the key to the results found in this study.

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RECEIVED: OCTOBER 30, 2021
ACCEPTED: MAY 14, 2022