Research Article
Volume 14:05, 2024

Journal of Clinical Case Reports

ISSN: 2165-7920 Open Access

Online Programme "Symparastasi": Psychoeducation and Multicomponent Exercise Programme to the Caregivers of Patients with MCI and Mild Dementia: An Original RCT

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Abstract

Objective: Symparastasi online programme was created because of the quarantines due to covid-19. The professional care centers were closed. After the quarantines there was a need of professional care for patients who live away from the big city centers. Symparastasi programme aimed to educate the informal dementia caregivers in order for them to be able to perform some non-pharmacological interventions to their patients effectively and safely. The programme offered psychoeducation and multicomponent training programme for the caregivers of patients with Mild Cognitive Impairment (MCI) and mild dementia. The aim of the programme was to examine which group had the best results in 3 domains: a) maintain or enhance cognitive abilities, b) Decrease Behavioural and Psychological Symptoms (BPSD) and c) improve the quality of life of patient and caregivers.

Methods/Design: This is randomized controlled trial with 426 participants of both genders. The participants were randomly assigned into 3 groups of 142 patients each. Group A received only the multicomponent training programme, group B received only the psychoeducation and group C received both interventions. The programme was online and the caregivers should have access to the internet. There were 11 multicomponent training videos with progressive difficulty of the exercises, and 11 psychoeducation videos that were referring to topics regard dementia, its progress, its prognosis, prevention, BPSD, non-pharmacological interventions etc. The 12th session was a private session of each patient and caregiver in order to ask questions and be supported emotionally. The measurements used were: the Timed Up and Go test (TUG), Berg Balance Scale (BBS) and 30second Sit to Stand Test for the physical tests. For the cognitive abilities used: Mini Mental State Examination (MMSE) and Addenbrooke's Cognitive Examination-Revised (ACE-R). For the neuropsychiatric problems used: Neuropsychiatric Inventory (NPI). For the caregivers the study used the following scales: State Trait Anxiety Inventory (STAI-S) in order to record the anxiety levels, Beck Depression Inventory (BDI) for the depression and NPI and Zarit Burden Interview (ZBI) in order to record caregivers' burden. The programme lasted for 24 weeks and there was three recordings of the results: at the beginning of the programme (T1), after 6 months of performing the interventions (T2), and 3 months after the end of the programme (T3), as a follow up.

Results: All groups had positive results in the three domains, but group C had the best results. In terms of cognitive abilities the interventions did not enhance the cognitive skills but tried to maintain the good results for a period of time. BPSD were reduced statistically significant and the caregivers' burden and anxiety and depression levels were also decreased. Some results maintained over time.

Conclusion: The combination of psychoeducation and multicomponent training programme has positive results in maintaining the cognitive abilities, decrease BPSD and improve the general quality of life of both patients and caregivers in patients with MCI and mild dementia.

Keywords: Dementia caregivers • Non-pharmacological interventions • Psychoeducation • Cognitive abilities

Abbreviations: ACE-R: Addenbrooke's Cognitive Examination (revised); AD: Alzheimer's Disease; BDI: Beck Depression Inventory; BPSD: Behavioural and Psychological Symptoms in Dementia; CDR_SB: Clinical Dementia Rating scale; CVD: Cardiovascular Dementia; DLB: Lewy Body Dementia; FTD: Frontotemporal Dementia; MCI: Mild Cognitive Impairment; MMSE: Mini Mental State Examination; NPI: Neuropsychiatric Inventory; PDD: Parkinson's Dementia; PwD: Patients with Dementia; RCT: Randomized Controlled Trial; STAI-S: State Trait Anxiety Inventory; ZBI: Zarit Burden Interview

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Received: 03 September, 2024, Manuscript No. jccr-24-147949; **Editor Assigned:** 05 September, 2024, PreQC No. P-147949; **Reviewed:** 17 September, 2024, QC No. Q-147949; **Revised:** 23 September, 2024, Manuscript No. R-147949; **Published:** 30 September, 2024, DOI: 10.37421/2165-7920.2024.14.1620

Introduction

Dementia is a syndrome and an umbrella term characterized by cognitive declines [1]. There are many diseases that may cause non-reversible dementia, but the most common disease is Alzheimer's Disease (AD), following by Cardiovascular disease (VaD), Lewy Body Dementia (DLB), Parkinson's dementia (PDD) and Frontotemporal Dementia (FTD) [2]. Dementia is the seventh leading cause of death and until now there is no cure [3]. It is a disease that mainly affects people aged over 60 years old [1]. Dementia affects all cognitive abilities including memory, learning, attention,

concentration, language, social recognition, executive function, and motor perception. Therefore, it affects the patient in his/ her daily activities [1]. There are nowadays 50 million people with dementia globally. The number is estimated to increase to 152 millions in the next 25 years [3]. Dementia affects not only the patients but their families and the economy, as well. The global costs of dementia are estimated at approximately 1 trillion US dollars annually [4].

Mild Cognitive Impairment (MCI) may lead to dementia and therefore because of its potentially progressive character it is called as a pathological condition [5]. The main difference between MCI stage and dementia is the daily functioning of the patient. Patients in MCI stage may live independently, although they have several cognitive problems, but dementia patients have such cognitive problems that are unable to live independently [5]. Disease progression has as a start MCI and spans in different stages to mild, middle and severe stages of dementia.

Behavioral and Psychological Symptoms of Dementia (BPSD) are among the earliest signs and symptoms of dementia. They affect approximately the 90-95% of the Patients with Dementia (PwD) [6]. Their severity increases over the course of the disease. BPSD also called as neuropsychiatric symptoms and are associated with many negative outcomes, such as functional impairment and faster cognitive decline. Furthermore, neuropsychiatric symptoms may increase risk for secondary complications, such as earlier institutionalization, falls and fractures [7]. The etiopathogenesis of BPSD remains complex and therefore their cure is difficult. It is probably a result of multiple factors, such as biological, psychological and social factors [8]. According to Cummings JL, et al. [9] there is 12 different BPSD: delusions, hallucinations, agitation/ aggressive behaviour, depression, anxiety, euphoria, apathy, disinhibition, irritability, wandering, sleeping problems and eating disorders. There are some pharmacological solutions, such as antipsychotics, antidepressants etc., that aim to decrease the frequency or the severity of the BPSD, but they have severe side effects such as confusion, hearth arrhythmia, constipation, dizziness, headaches, xerostomia, fatigue, and gastrointestinal problems [10].

As there is no cure for dementia nowadays and the medicine used for the treatment of BPSD have severe side effects it is crucial to mention the importance of non-pharmacological solutions. According to the literature so far there are numerous of studies that have examined the effect of several non-pharmacological interventions in BPSD and their outcomes were very promising [11-13]. Two beneficial non-pharmacological interventions are Psychoeducational programmes and Multi component physical exercise. Psychoeducational programmes either online or face to face have promising results in increasing the quality of life of the patients and their caregivers, as well [14]. These programmes aim to educate the informal caregivers in order to provide them with serious information about the progress of the disease, the possible problems that may occur and the optimal ways in order to manage some problems in dementia. Most of the informal caregivers find the programmes useful [14]. Sometimes informal caregivers do not know how to manage some problems and therefore this causes them stress and depression. Caregivers also called as “second patients” because their anxiety depression levels are higher than other people in their age that are not caregivers [15]. Dementia caregivers often say that they do not have personal time, they experience social isolation and have problems with their sleeping schedule [15]. Hence, it is very important to consider the quality of life of the caregivers, too. Although the programs may differ from one another their main goal is to educate the caregivers in order to make them more useful to their patients and themselves. On the other hand, physical exercise has been examined in numerous of studies which have underlined its importance in preventing dementia and managing some BPSD [16,17]. Multi Component physical exercise includes exercises for flexibility, strength, stamina and endurance. Individuals who consistently exercise have significantly benefits in mood improvement, reduction of depression symptoms, brain plasticity and neurotransmitters’ production [18]. According to recent literature studies multicomponent exercise combines physical components (resistance training and cardiovascular training) and motor components (balance, reaction time and dual exercises, co-ordination) and this is why it is very beneficial to the PwD [19,20]. In addition, multicomponent exercise has also been proven positive in enhancing the general mood and psychology of PwD and their caregivers, too [21].

The current study aims to find which group out of these three, a) participants who only receive multicomponent physical exercise, b) participants who only receive psychoeducational programme and c) participants who receive both interventions have better results in the following three domains: 1) maintaining or increasing the cognitive abilities, 2) decrease BPSD, and 3) increase the quality of life of the patient and the caregiver, as well.

Methods

Design

This is a randomized controlled trial. A total of 426 (N=426) PwD and their caregivers were randomly assigned into 3 different groups. Group A received only the multi component exercise program, Group be received only the psycho educational program, and group she received both interventions. Participants who had motor problems were automatically assigned to group B. Patient and participants have given written consent and all their data remained confidential. All patients were suffered from MCI or mild dementia.

They were recordings of the scales at the beginning of the programme, before any intervention occurred (T1). After six months of receiving the intervention the same scales were also applied and recorded (T2). Then all the interventions stopped and three months after we also applied and recorded the same scales (T3), in order to see if the results maintained over time.

Subjects

The study included participants of both genders and their participants who necessarily had access to the Internet and knew how to use a computer. In order to diagnose the participants some scales were used. For the cognitive abilities we used the Addenbrrokee’s Cognitive Examination Revised test (ACE-R), which includes Mini Mental State of Examination (MMSE) and for the daily functioning we used the CDR_SB scale.

Measurements

The following measurements were used in order to identify the cognitive abilities of the PwD: a) MMSE and b) ACE-R. These two scales are very accurate and higher scores indicate better performance. MMSE is included in ACE-R test. The scales aim to score the following cognitive abilities; memory, language, attention, concentration, fluency, and visuospatial ability of the PwD. For measuring the daily functioning of the PwD we used Clinical Dementia Rating–Sum of Boxes (CDR_SB) scale. For the BPSD we used Neuropsychiatric Inventory (NPI). For measuring the caregivers, we used several scales: State Trait Anxiety Inventory (STAI-S) in order to record the anxiety levels, Beck Depression Inventory (BDI) for the depression and NPI and Zarit Burden Interview (ZBI) in order to record caregivers’ burden. For the multicomponent exercise programme we used the following scales: Timed Up and Go test (TUG) was used to estimate functional mobility and fall risk. Participants were instructed to stand up from a chair, walk as fast as possible for 3 meters, then turn, walk back to the chair and sit down. Additionally, for assess balance ability; the Berg Balance Scale (BBS) was performed. The BBS is the best-known balance measurement tool and it consists of qualitative measures in several postural and every day movements. Each item is scored according to a 5-point scale, from 0 (which indicates the lowest level of function) up to 4 (which indicates the highest level of function). Nagging from 0 to 4 (in which 0 indicates the lowest level of function and 4 indicates the highest level of function). The total possible score is 56 points, and 41–56 suggests a low fall risk, 21–40 a medium fall risk and 0–20 a high fall risk. Muscle strength, measured by a 30 second Sit to Stand Test. The participants were asked to stand up and sit down for a high armless chair as many times as possible during a 30 sec phase.

Interventions

Programme “Symparastasi” was created during the quarantine due to COVID-19 in order to help the patient and the caregivers who then did not have

access to the third age centers. When the quarantine stopped the importance of a programme that could provide with knowledge and useful information the caregivers and offer them solutions in their daily problems remained. There are several patients who live away from the big city centers and therefore they do not have access to professional care. Hence, an online programme which could offer them knowledge, psychological support and accurate and safe solutions to their problems seemed to be a solution. First of all, we created a platform (https://symparastash.web.app/#/home). We included in the platform all the above mentioned scales. Then by advertising our programme over the social media and from mouth-to-mouth we collected the sample-participants.

The neuroscientist and the fitness specialist created 12 different videos each (total of 22 videos) for their lessons. The duration of each video was from 15 to 20 minutes. The lessons of the psychoeducational programme had the following structure: a) theoretical background and b) practical solutions. In the first part of theoretical background the neuroscientist talked about dementia, its prognosis, BPSD, other daily problems, prevention, nutrition and other aspects of the disease. In the second part of the practical solutions the neuroscientist offered non-pharmacological interventions for managing some BPSD and other daily problems. The neuroscientist taught the participants how to perform music therapy, aromatherapy, massage therapy, orientation therapy, validation therapy, reminiscence therapy, behavioural techniques and other non-pharmacological interventions that have been proven beneficial according to the literature so far. In particular, according to the literature so far, the music therapy was performed for 45' every day [22,23]. Aromatherapy in combination with massage therapy was applied in the arms, shoulders, back and wrists of the PwD for 10-20' and lemon oil and levander were used [24,25]. Orientation and validation therapy was used every day for 45' [26,27]. Reminiscence therapy was performed for 45' every day and photo albums and videos were used in order to help the patient recall past and positive memories [28]. Behavioural techniques included proper communication with the PwD, useful and meaningful activities such as gardening together, cooking together, watch a movie together, etc [29]. On the other hand, the fitness specialist started each video with a warm-up, then explained the main exercises by showing how to perform them safely and effectively, and at the end of each video the fitness specialist was showing exercises for cooling down in order to avoid any injury. There was a difficulty progression in the videos.

The caregivers had access to the data by using their username and password that the web developer gave them. A new video was released every two weeks. The participant could not see the next video unless the two weeks had passed. In the time of these two weeks the caregiver should apply to the PwD the interventions taught in the lesson. The 12th lesson was an online private session with the neuroscientist and the fitness specialist. In this session the caregiver and the patient could ask any question and be supported emotionally and independently. During the whole period of the interventions that lasted for 24 weeks (6 months) the participants and the patients could access the tutors by email, phone call, or video call. We had to ensure that the caregivers had understood how to perform the interventions and all the interventions were applied safely to the caregivers. The programme did not aim under any circumstance to replace the formal caregivers and the third age centers. However, it is critical to consider people who live away from the big city centers and do not have access to this kind of care. They should be also provided with the optimal services and they should be able to manage dementia and it's progression with safe solutions and effectively.

Results

A total of 426 PwD and their participants were included in the study. 142 participants in each of 3 groups. 221 participants were females (51.8%). Group A, which received only the multicomponent exercise programme had a mean score of 71.9 years old (SD 4.55), and 9.51 years of education (SD 3.78). Group B which received only the psychoeducation had a mean score of 71.5 years old (SD 4.64) and 9.42 years of education (SD 3.29), and group C which received both interventions had 73.8 years old (SD 3.79) and 7.78 years of education (SD 3.57). Table 1 shows the demographics of the sample. According to the results statistically significant changes were showed in MMSE in T3 test in all groups, which means that the interventions had a positive impact on the cognitive abilities over time. However, in ACE-R scale group C had statistically significant changes in T2 test, but could not maintain the good results in T3 test. All groups decreased the BPSD, according to the NPI scale. Group C had the best results of all other groups. The same result applied in NPI scale for the caregivers, as well. In particular, all groups decreased caregivers' burden, but only group C had the best results in T3, which means that they maintained the beneficial effects. Group A and group B could not maintain their good results in CDR_SB scale, but group C had a statistically significant difference. In BDI test only group C maintained the good results in T3 but all groups had statistically significant reductions. The same result applied in ZBI test, as well. Group A and C maintained the good results in T3, but group B also had a statistically significant reduction of ZBI test in T2. Lastly, group C had the best result in STAIS scale, but all groups reduced STAIS in T2, as well. Tables show all the scales and their results analytically (Tables 2-39 and Figures 1-8).

Discussion

According to the results group C, which received both the multicomponent training programme and the psychoeducation had the best results in three domains: a) increased the cognitive abilities, b) decreased BPSD, and c) enhanced the general quality of life of the PwD and the caregivers, too. It is important to mention that all groups had positive results in all scales, which means that both these non-pharmacological interventions have beneficial effects in PwD and their caregivers. However, the combination of multicomponent exercise and psychoeducation has better results in T2 and T3. This is crucial because it is important to find interventions that can last over time. Nevertheless, in some cases the good results did not maintain over time, which means that in order to have the best outcomes of the interventions it is recommended to be applied in a daily or weekly schedule.

Furthermore, group A and B did not show any statistically significant change in T2 period of ACE-R test. However, the result is not disappointing.

Table 1. Descriptives general [41-44].

Descriptives	Group	Gender	Age	Years of Education
N	a	142	142	142
	b	142	142	142
	c	142	142	142
Mean	a	1.51	71.9	9.51
	b	1.52	71.5	9.42
	c	1.52	73.8	7.78
Standard deviation	a	0.502	4.55	3.78
	b	0.501	4.64	3.29
	c	0.501	3.79	3.57

Table 2. Descriptives MMSE.

Descriptives	Group	MMSE T1	MMSE T2	MMSE T3
N	a	142	142	141
	b	142	142	139
	c	142	142	140
Mean	a	25.2	25.2	24
	b	25.2	24.9	24.4
	c	25.1	25.3	24.2
Standard deviation	a	1.25	1.11	1.42
	b	1.11	1.42	1.46
	c	1.08	0.918	0.946

Table 3. Repeated measures ANOVA.

		Sum of Squares	df	Mean Square	F	p	η^2
Within Subjects Effects	Time	243.9	2	121.967	266.2	<.001	0.118
	Time ✻ Group	22.6	4	5.645	12.3	<.001	0.011
	Residual	382.2	834	0.458	-	-	-
Between Subjects Effects	Group	2.21	2	1.11	0.325	0.722	0.001
	Residual	1417.96	417	3.4	-	-	-

Note: Type 3 sums of squares

Table 4. Assumptions.

Tests of Sphericity	Mauchly's W	p	Greenhouse-Geisser ε	Huynh-Feldt ε
Χρονική περίοδος	0.624	<.001	0.727	0.729

Table 5. Post hoc tests.

Post Hoc Comparisons-Time ✻ Group								
		Comparison						
Time	Group	Time	Group	Mean Difference	SE	df	t	ptukey
T1	a	T1	b	-0.08108	0.1357	417	-0.5977	1
		T1	c	-0.00811	0.1354	417	-0.0599	1
		T2	a	-0.07092	0.0553	417	-1.2815	0.936
		T2	b	0.21389	0.1372	417	1.5591	0.826
		T2	c	-0.17953	0.1369	417	-1.3111	0.928
		T3	a	1.11348	0.0804	417	13.844	<.001
		T3	b	0.68871	0.1457	417	4.7255	<.001
		T3	c	0.93475	0.1454	417	6.4269	<.001
	b	T1	c	0.07297	0.1359	417	0.537	1
		T2	a	0.01015	0.1372	417	0.074	1
		T2	b	0.29496	0.0557	417	5.2919	<.001
		T2	c	-0.09846	0.1374	417	-0.7165	0.999
		T3	a	1.19455	0.1456	417	8.2041	<.001
		T3	b	0.76978	0.081	417	9.5027	<.001
		T3	c	1.01583	0.1459	417	6.9627	<.001
	c	T2	a	-0.06282	0.1369	417	-0.4588	1
		T2	b	0.22199	0.1374	417	1.6154	0.796
		T2	c	-0.17143	0.0555	417	-3.0866	0.055
		T3	a	1.12158	0.1454	417	7.715	<.001
		T3	b	0.69681	0.146	417	4.7738	<.001
		T3	c	0.94286	0.0807	417	11.681	<.001
T2	a	T2	b	0.28481	0.1387	417	2.0538	0.507
		T2	c	-0.10861	0.1384	417	-0.7846	0.997
		T3	a	1.1844	0.0998	417	11.8635	<.001
		T3	b	0.75963	0.1471	417	5.1623	<.001
		T3	c	1.00567	0.1469	417	6.8481	<.001
	b	T2	c	-0.39342	0.1389	417	-2.8319	0.109
		T3	a	0.89959	0.147	417	6.1183	<.001
		T3	b	0.47482	0.1006	417	4.7222	<.001
		T3	c	0.72086	0.1473	417	4.8931	<.001
	c	T3	a	1.29301	0.1468	417	8.8082	<.001
		T3	b	0.86824	0.1474	417	5.8912	<.001
		T3	c	1.11429	0.1002	417	11.1216	<.001

T3	a	T3	b	-0.42477	0.155	417	-2.7396	0.137
		T3	c	-0.17872	0.1548	417	-1.1548	0.965
	b	T3	c	0.24604	0.1553	417	1.5841	0.813

Table 6. Post hoc comparisons-group.

Post Hoc Comparisons-Group						
Comparison						
Group	**Group**	**Mean Difference**	**SE**	**df**	**t**	**ptukey**
a	b	-0.0737	0.127	417	-0.579	0.831
	c	-0.0985	0.127	417	-0.775	0.718
b	c	-0.0248	0.127	417	-0.195	0.979

Table 7. Descriptives ACE-R.

Descriptives	Group	ACE T1	ACE-R T2	ACE-R T3
N	a	142	142	141
	b	142	142	139
	c	142	142	140
Mean	a	91.8	92	90.2
	b	91.8	91.9	90.3
	c	92	92.4	91.1
Standard deviation	a	2.01	1.92	2.43
	b	2.11	2.02	2.61
	c	2.45	1.87	2.32

Table 8. Repeated measures ANOVA.

		Sum of Squares	df	Mean Square	F	p	η^2
Within Subjects Effects	Time	623.5	2	311.75	562.8	<.001	0.094
	Time ✻ Group	19.6	4	4.903	8.85	<.001	0.003
	Residual	462	834	0.554	-	-	-
Between Subjects Effects	Group	61.6	2	30.8	2.34	0.098	0.009
	Residual	5491.1	417	13.2	-	-	-

Note: Type 3 sums of squares

Table 9. Assumptions.

Tests of Sphericity	Mauchly's W	p	Greenhouse-Geisser ε	Huynh-Feldt ε
Time	0.749	<.001	0.799	0.802

It is important to maintain the cognitive abilities of the PwD, when it is not possible to enhance them. Therefore, the result that group A and B in T2 period of ACE-R showed that the interventions maintained the good cognitive abilities of the participants. For the cognitive abilities it seems that if the interventions stop, then the cognitive declines are coming. None of the groups could maintain the good outcomes in T3 period, which means that we have to give feedback to our patients constantly. On the other hand, all groups decreased BPSD, according to the NPI scale. Group C had the best results, which means that the combination of the two non-pharmacological interventions had the best outcomes in decreasing some BPSD. According to our results, the total score of NPI was decreased in all groups, but only group C maintained the good results over time. Our results are in accordance with previous studies. Numerous studies have shown that physical exercise can effectively reduce some BPSD, such as wandering, depression, anxiety and agitation [16,30-33]. At the same time, several studies have shown that psychoeducation can provide the caregivers with useful knowledge in order for them to be able to manage BPSD [34]. Our programme aimed to give solutions to the daily behavioural problems of the PwD and also explain how to control all BPSD with non-pharmacological solutions, according to previous studies that have shown beneficial results [34]. Lastly, only group C maintained the good results in CDR_SB scale, which means that the daily functioning of the PwD could maintain over time if they had previously received both interventions. However, it is critical to mention that group A and B also helped the participants to enhance their daily functioning in T2 period.

In terms of the caregivers, the results are also interesting. BDI scale showed that all groups decreased the depression levels of the caregivers in T2 period, but only group A and especially group C maintained better the results. Caregivers experience levels of anxiety and depression, because of the caregiving [15,35]. Caring a PwD is sometimes a full time job, which requires of the caregiver to give most of his/ her time, money and personal well-being. According to the literature the caregivers often suffer from physical and emotional problems [36]. Therefore, it is important to find interventions that can effectively enhance the well-being of the caregivers. Moreover, ZBI test showed positive results in all groups, however only group A and C maintained the good results over time. This is crucial because it seems that physical exercise when applied daily for 6 months in a row can maintain a promising low level of burden in the caregivers. In addition, STAIS scale also pointed that all groups decreased the anxiety levels of the caregivers. Best results were

Table 10. Post hoc tests.

Post Hoc Comparisons-Time ✻ Group								
Comparison								
Time	Group	Time	Group	Mean Difference	SE	df	t	ptukey
T1	a	T1	b	0.0593	0.2582	417	0.23	1
		T1	c	-0.1634	0.2577	417	-0.634	0.999
		T2	a	-0.1348	0.0627	417	-2.151	0.44
		T2	b	-0.099	0.2427	417	-0.408	1
		T2	c	-0.5134	0.2423	417	-2.119	0.462
		T3	a	1.6454	0.0982	417	16.76	<.001
		T3	b	1.5773	0.2764	417	5.706	<.001
		T3	c	0.7937	0.2759	417	2.877	0.097
	b	T1	c	-0.2227	0.2586	417	-0.861	0.995
		T2	a	-0.194	0.2429	417	-0.799	0.997
		T2	b	-0.1583	0.0631	417	-2.508	0.231
		T2	c	-0.5727	0.2433	417	-2.354	0.312
		T3	a	1.5861	0.2762	417	5.743	<.001
		T3	b	1.518	0.0989	417	15.352	<.001
		T3	c	0.7344	0.2767	417	2.654	0.168
	c	T2	a	0.0287	0.2424	417	0.118	1
		T2	b	0.0644	0.2432	417	0.265	1
		T2	c	-0.35	0.0629	417	-5.566	<.001
		T3	a	1.8088	0.2757	417	6.56	<.001
		T3	b	1.7407	0.2769	417	6.287	<.001
		T3	c	0.9571	0.0985	417	9.715	<.001
T2	a	T2	b	0.0358	0.2264	417	0.158	1
		T2	c	-0.3787	0.226	417	-1.675	0.761
		T3	a	1.7801	0.1	417	17.795	<.001
		T3	b	1.712	0.2623	417	6.528	<.001
		T3	c	0.9285	0.2617	417	3.548	0.013
	b	T2	c	-0.4144	0.2268	417	-1.827	0.664
		T3	a	1.7444	0.2618	417	6.663	<.001
		T3	b	1.6763	0.1008	417	16.637	<.001
		T3	c	0.8927	0.2624	417	3.403	0.021
	c	T3	a	2.1588	0.2614	417	8.258	<.001
		T3	b	2.0907	0.2626	417	7.961	<.001
		T3	c	1.3071	0.1004	417	13.02	<.001
T3	a	T3	b	-0.0681	0.2933	417	-0.232	1
		T3	c	-0.8517	0.2928	417	-2.909	0.09
	b	T3	c	-0.7836	0.2939	417	-2.666	0.163

Table 11. Post hoc comparisons-group.

Post Hoc Comparisons-Group						
Comparison						
Group	Group	Mean Difference	SE	df	t	ptukey
a	b	0.00898	0.25	417	0.0359	0.999
	c	-0.46459	0.25	417	-1.8586	0.152
b	c	-0.47357	0.251	417	-1.8878	0.143

found in group C, which means that the combination of the interventions had the best outcomes for the caregivers.

Considering the fact that there is no cure for dementia and the current pharmacological solutions have severe side effects, as mentioned above, it

Table 12. Descriptives NPI.

Descriptives	Group	NPI Total	NPI Total T2	NPI Total T3
N	a	142	142	141
	b	142	142	139
	c	142	142	140
Mean	a	24.9	19.3	22.9
	b	25.4	16.9	21
	c	25.6	12.6	14.6
Standard deviation	a	3.2	4.44	3.68
	b	2.01	5.44	5.74
	c	2.12	4.62	4.96

Table 13. Repeated measures ANOVA.

		Sum of Squares	df	Mean Square	F	p	η^2
Within Subjects Effects	Time	17595	2	8797.47	1093	<.001	0.364
	Time ✻ Group	3424	4	856	106	<.001	0.071
	Residual	6715	834	8.05	-	-	-
Between Subjects Effects	Group	5149	2	2574.5	69.3	<.001	0.106
	Residual	15485	417	37.1	-	-	-

Note: Type 3 sums of squares

Table 14. Assumptions.

Tests of Sphericity	Mauchly's W	p	Greenhouse-Geisser ε	Huynh-Feldt ε
Time	0.516	<.001	0.674	0.675

Table 15. Post hoc tests.

Post Hoc Comparisons-Time ✻ Group								
Comparison								
Time	Group	Time	Group	Mean Difference	SE	df	t	ptukey
T1	a	T1	b	-0.467	0.299	417	-1.559	0.827
		T1	c	-0.671	0.299	417	-2.245	0.378
		T2	a	5.574	0.398	417	14.006	<.001
		T2	b	8.059	0.461	417	17.492	<.001
		T2	c	12.336	0.459	417	26.853	<.001
		T3	a	2.028	0.386	417	5.25	<.001
		T3	b	3.908	0.463	417	8.436	<.001
		T3	c	10.286	0.462	417	22.269	<.001
	b	T1	c	-0.204	0.3	417	-0.682	0.999
		T2	a	6.041	0.459	417	13.167	<.001
		T2	b	8.525	0.401	417	21.267	<.001
		T2	c	12.803	0.46	417	27.827	<.001
		T3	a	2.495	0.461	417	5.408	<.001
		T3	b	4.374	0.389	417	11.241	<.001
		T3	c	10.753	0.463	417	23.244	<.001
	c	T2	a	6.245	0.458	417	13.623	<.001
		T2	b	8.73	0.461	417	18.934	<.001
		T2	c	13.007	0.399	417	32.564	<.001
		T3	a	2.699	0.461	417	5.856	<.001
		T3	b	4.578	0.464	417	9.877	<.001
		T3	c	10.957	0.388	417	28.26	<.001

T2	a	T2	b	2.484	0.577	417	4.304	<.001
		T2	c	6.762	0.576	417	11.736	<.001
		T3	a	-3.546	0.187	417	-18.975	<.001
		T3	b	-1.667	0.579	417	-2.878	0.097
		T3	c	4.712	0.578	417	8.15	<.001
	b	T2	c	4.278	0.578	417	7.398	<.001
		T3	a	-6.03	0.579	417	-10.412	<.001
		T3	b	-4.151	0.188	417	-22.054	<.001
		T3	c	2.228	0.58	417	3.839	0.004
	c	T3	a	-10.308	0.578	417	-17.829	<.001
		T3	b	-8.429	0.58	417	-14.526	<.001
		T3	c	-2.05	0.188	417	-10.931	<.001
T3	a	T3	b	1.879	0.581	417	3.233	0.035
		T3	c	8.258	0.58	417	14.234	<.001
	b	T3	c	6.379	0.582	417	10.956	<.001

Table 16. Post hoc comparisons-group.

Post Hoc Comparisons-Group						
Comparison						
Group	Group	Mean Difference	SE	df	t	ptukey
a	b	1.3	0.421	417	3.09	0.006
	c	4.78	0.42	417	11.39	<.001
b	c	3.48	0.421	417	8.27	<.001

Table 17. Descriptives NPI car.

Descriptives	Group	NPI Caregiver Total	NPIC Total T2	NPIC Total T3
N	a	142	142	141
	b	142	142	139
	c	142	142	140
Mean	a	18.3	10.6	17.4
	b	18.4	9.99	14.9
	c	18.6	10.2	11.8
Standard deviation	a	2.01	1.71	2.44
	b	1.57	1.71	3.6
	c	1.92	2.66	2.05

Table 18. Repeated measures ANOVA.

		Sum of Squares	df	Mean Square	F	p
Within Subjects Effects	Time	14208	2	7103.79	2198	<.001
	Time ✻ Group	1494	4	373.48	116	<.001
	Residual	2695	834	3.23	-	-
Between Subjects Effects	Group	770	2	385.24	43.2	<.001
	Residual	3717	417	8.91	-	-

Note: Type 3 sums of squares

Table 19. Assumptions.

Tests of Sphericity	Mauchly's W	p	Greenhouse-Geisser ε	Huynh-Feldt ε
Time	0.983	0.029	0.983	0.988

Table 20. Post hoc tests.

Post Hoc Comparisons -Time ✻ Group								
Comparison								
Time	Group	Time	Group	Mean Difference	SE	df	t	ptukey
T1	a	T1	b	-0.0554	0.221	417	-0.25	1
		T1	c	-0.2882	0.221	417	-1.304	0.93
		T2	a	7.7589	0.218	417	35.512	<.001
		T2	b	8.3835	0.235	417	35.726	<.001
		T2	c	8.1618	0.234	417	34.851	<.001
		T3	a	0.9645	0.223	417	4.323	<.001
		T3	b	3.4051	0.282	417	12.074	<.001
		T3	c	6.5832	0.281	417	23.402	<.001
	b	T1	c	-0.2328	0.222	417	-1.05	0.981
		T2	a	7.8142	0.234	417	33.327	<.001
		T2	b	8.4388	0.22	417	38.35	<.001
		T2	c	8.2172	0.235	417	34.976	<.001
		T3	a	1.0199	0.281	417	3.626	0.01
		T3	b	3.4604	0.225	417	15.399	<.001
		T3	c	6.6386	0.282	417	23.547	<.001
	c	T2	a	8.0471	0.234	417	34.375	<.001
		T2	b	8.6717	0.235	417	36.896	<.001
		T2	c	8.45	0.219	417	38.538	<.001
		T3	a	1.2527	0.281	417	4.459	<.001
		T3	b	3.6933	0.282	417	13.082	<.001
		T3	c	6.8714	0.224	417	30.688	<.001
T2	a	T2	b	0.6246	0.247	417	2.528	0.222
		T2	c	0.4029	0.247	417	1.634	0.786
		T3	a	-6.7943	0.2	417	-33.97	<.001
		T3	b	-4.3538	0.292	417	-14.888	<.001
		T3	c	-1.1756	0.292	417	-4.029	0.002
	b	T2	c	-0.2217	0.248	417	-0.896	0.993
		T3	a	-7.4189	0.292	417	-25.421	<.001
		T3	b	-4.9784	0.201	417	-24.714	<.001
		T3	c	-1.8003	0.293	417	-6.155	<.001
	c	T3	a	-7.1973	0.291	417	-24.693	<.001
		T3	b	-4.7567	0.293	417	-16.245	<.001
		T3	c	-1.5786	0.201	417	-7.864	<.001
T3	a	T3	b	2.4405	0.331	417	7.371	<.001
		T3	c	5.6187	0.331	417	17	<.001
	b	T3	c	3.1782	0.332	417	9.581	<.001

Table 21. Post hoc comparisons-group.

Post Hoc Comparisons-Group						
Comparison						
Group	Group	Mean Difference	SE	df	t	ptukey
a	b	1.003	0.206	417	4.87	<.001
	c	1.911	0.206	417	9.29	<.001
b	c	0.908	0.206	417	4.4	<.001

is critical to find non-psychological interventions that can effectively maintain the cognitive abilities of the patient, decrease BPSD, and enhance the quality of life of the patient and the caregiver too. Therefore it is remarkable that we found combination of non-pharmacological solutions that can effectively be applied to the patient from the caregivers and also have a positive outcome in those three domains that are very essential in this disease.

Table 22. Descriptives CDR_SB.

Descriptives	Group	CDR_SB	CDR_SB T2	CDR_SB T3
N	a	142	142	141
	b	142	142	139
	c	142	142	140
Mean	a	0.768	0.599	0.759
	b	0.771	0.616	0.766
	c	0.637	0.546	0.546
Standard deviation	a	0.25	0.2	0.251
	b	0.25	0.212	0.25
	c	0.224	0.145	0.146

Table 23. Repeated measures ANOVA.

		Sum of Squares	df	Mean Square	F	p	η^2
Within Subjects Effects	Time	4.45	2	2.2266	113.2	<.001	0.063
	Time ✻ Group	1.13	4	0.2835	14.4	<.001	0.016
	Residual	16.41	834	0.0197	-	-	-
Between Subjects Effects	Group	5.22	2	2.61	25.2	<.001	0.074
	Residual	43.11	417	0.103	-	-	-

Note: Type 3 sums of squares

Table 24. Post hoc tests.

Post Hoc Comparisons-Time ✻ Group								
Comparison								
Time	**Group**	**Time**	**Group**	**Mean Difference**	**SE**	**df**	**t**	**ptukey**
T1	a	T1	b	-0.00388	0.0289	417	-0.134	1
		T1	c	0.13022	0.0289	417	4.512	<.001
		T2	a	0.17021	0.0188	417	9.066	<.001
		T2	b	0.1544	0.0259	417	5.969	<.001
		T2	c	0.22307	0.0258	417	8.637	<.001
		T3	a	0.01064	0.014	417	0.76	0.998
		T3	b	0.00332	0.0277	417	0.12	1
		T3	c	0.22307	0.0276	417	8.068	<.001
	b	T1	c	0.1341	0.029	417	4.629	<.001
		T2	a	0.17409	0.0259	417	6.719	<.001
		T2	b	0.15827	0.0189	417	8.37	<.001
		T2	c	0.22695	0.0259	417	8.748	<.001
		T3	a	0.01452	0.0277	417	0.524	1
		T3	b	0.00719	0.0141	417	0.51	1
		T3	c	0.22695	0.0278	417	8.176	<.001
	c	T2	a	0.03999	0.0259	417	1.547	0.832
		T2	b	0.02418	0.0259	417	0.933	0.991
		T2	c	0.09286	0.0188	417	4.928	<.001
		T3	a	-0.11958	0.0277	417	-4.323	<.001
		T3	b	-0.1269	0.0277	417	-4.573	<.001
		T3	c	0.09286	0.014	417	6.61	<.001

T2	a	T2	b	-0.01582	0.0225	417	-0.704	0.999
		T2	c	0.05286	0.0224	417	2.358	0.31
		T3	a	-0.15957	0.017	417	-9.388	<.001
		T3	b	-0.1669	0.0245	417	-6.801	<.001
		T3	c	0.05286	0.0245	417	2.159	0.435
	b	T2	c	0.06868	0.0225	417	3.053	0.06
		T3	a	-0.14376	0.0245	417	-5.865	<.001
		T3	b	-0.15108	0.0171	417	-8.825	<.001
		T3	c	0.06868	0.0246	417	2.796	0.12
	c	T3	a	-0.21244	0.0245	417	-8.68	<.001
		T3	b	-0.21976	0.0246	417	-8.942	<.001
		T3	c	-2.93e−16	0.0171	417	-1.72e−14	1
T3	a	T3	b	-0.00732	0.0264	417	-0.277	1
		T3	c	0.21244	0.0264	417	8.05	<.001
	b	T3	c	0.21976	0.0265	417	8.298	<.001

Table 25. Post hoc comparisons-group.

Post Hoc Comparisons-Group						
Comparison						
Group	Group	Mean Difference	SE	df	t	ptukey
a	b	-0.00901	0.0222	417	-0.406	0.913
	c	0.13184	0.0221	417	5.953	<.001
b	c	0.14084	0.0222	417	6.336	<.001

Table 26. Descriptives BDI.

Descriptives	Group	BDI	BDI T2	BDI T3
N	a	142	142	141
	b	142	142	139
	c	142	142	140
Mean	a	19.5	11.4	17.8
	b	18	10.6	16.7
	c	19.4	10.7	15.6
Standard deviation	a	3.15	2.61	3.35
	b	2.73	2.86	3.67
	c	3.38	3.29	4.58

Table 27. Repeated measures ANOVA.

		Sum of Squares	df	Mean Square	F	p	η^2
Within Subjects Effects	Time	14390	2	7194.94	2234.8	<.001	0.498
	Time ✻ Group	258	4	64.61	20.1	<.001	0.009
	Residual	2685	834	3.22			
Between Subjects Effects	Group	300	2	150	5.55	0.004	0.01
	Residual	11263	417	27			

Note: Type 3 sums of squares

Table 28. Assumptions.

Tests of Sphericity	Mauchly's W	p	Greenhouse-Geisser ε	Huynh-Feldt ε
Time	0.988	0.082	0.988	0.993

Table 29. Post hoc tests.

Post Hoc Comparisons-Time ✻ Group								
Comparison								
Time	Group	Time	Group	Mean Difference	SE	df	t	ptukey
T1	a	T1	b	1.4467	0.369	417	3.923	0.003
		T1	c	0.0396	0.368	417	0.108	1
		T2	a	8.0567	0.224	417	35.897	<.001
		T2	b	8.828	0.361	417	24.477	<.001
		T2	c	8.6968	0.36	417	24.155	<.001
		T3	a	1.695	0.212	417	8.014	<.001
		T3	b	2.7992	0.421	417	6.651	<.001
		T3	c	3.8325	0.42	417	9.127	<.001
	b	T1	c	-1.4071	0.369	417	-3.809	0.005
		T2	a	6.61	0.361	417	18.322	<.001
		T2	b	7.3813	0.226	417	32.653	<.001
		T2	c	7.2501	0.361	417	20.062	<.001
		T3	a	0.2483	0.42	417	0.591	1
		T3	b	1.3525	0.213	417	6.349	<.001
		T3	c	2.3858	0.421	417	5.666	<.001
	c	T2	a	8.0171	0.36	417	22.264	<.001
		T2	b	8.7884	0.361	417	24.322	<.001
		T2	c	8.6571	0.225	417	38.435	<.001
		T3	a	1.6554	0.42	417	3.946	0.003
		T3	b	2.7596	0.421	417	6.548	<.001
		T3	c	3.7929	0.212	417	17.868	<.001
T2	a	T2	b	0.7713	0.352	417	2.188	0.415
		T2	c	0.64	0.352	417	1.819	0.669
		T3	a	-6.3617	0.205	417	-31.084	<.001
		T3	b	-5.2575	0.414	417	-12.704	<.001
		T3	c	-4.2243	0.413	417	-10.231	<.001
	b	T2	c	-0.1312	0.353	417	-0.372	1
		T3	a	-7.133	0.413	417	-17.27	<.001
		T3	b	-6.0288	0.206	417	-29.247	<.001
		T3	c	-4.9955	0.414	417	-12.068	<.001
	c	T3	a	-7.0017	0.412	417	-16.974	<.001
		T3	b	-5.8975	0.414	417	-14.233	<.001
		T3	c	-4.8643	0.205	417	-23.683	<.001
T3	a	T3	b	1.1042	0.467	417	2.367	0.305
		T3	c	2.1374	0.466	417	4.59	<.001
	b	T3	c	1.0332	0.467	417	2.211	0.4

Table 30. Post hoc comparisons-group.

Post Hoc Comparisons-Group						
Comparison						
Group	Group	Mean Difference	SE	df	t	ptukey
a	b	1.107	0.359	417	3.088	0.006
	c	0.939	0.358	417	2.623	0.024
b	c	-0.168	0.359	417	-0.469	0.886

Table 31. Descriptives ZBI.

Descriptives	Group	ZBI	ZBI T2	ZBI T3
N	a	142	142	141
	b	142	142	140
	c	142	142	140
Mean	a	32.7	22.5	30.4
	b	29.8	18.7	27.4
	c	29.4	15.4	20.9
Standard deviation	a	4.19	5.8	4.38
	b	4.92	6.95	5.12
	c	5.4	6.19	9.3

Table 32. Repeated measures ANOVA.

		Sum of Squares	df	Mean Square	F	p	η^2
Within Subjects Effects	Time	29907	2	14953.6	1044.1	<.001	0.347
	Time ✻ Group	1764	4	441	30.8	<.001	0.02
	Residual	11973	836	14.3			
Between Subjects Effects	Group	9316	2	4657.8	58.8	<.001	0.108
	Residual	33106	418	79.2			

Note: Type 3 sums of squares

Table 33. Post hoc tests.

Post Hoc Comparisons-Time ✻ Group								
Comparison								
Time	Group	Time	Group	Mean Difference	SE	df	t	ptukey
T1	a	T1	b	2.959	0.582	418	5.087	<.001
		T1	c	3.352	0.582	418	5.762	<.001
		T2	a	10.241	0.532	418	19.249	<.001
		T2	b	14.095	0.675	418	20.881	<.001
		T2	c	17.359	0.675	418	25.717	<.001
		T3	a	2.333	0.435	418	5.359	<.001
		T3	b	5.388	0.694	418	7.76	<.001
		T3	c	11.809	0.694	418	17.008	<.001
	b	T1	c	0.393	0.583	418	0.674	0.999
		T2	a	7.282	0.674	418	10.798	<.001
		T2	b	11.136	0.534	418	20.856	<.001
		T2	c	14.4	0.676	418	21.305	<.001
		T3	a	-0.626	0.694	418	-0.902	0.993
		T3	b	2.429	0.437	418	5.558	<.001
		T3	c	8.85	0.695	418	12.731	<.001
	c	T2	a	6.889	0.674	418	10.216	<.001
		T2	b	10.743	0.676	418	15.894	<.001
		T2	c	14.007	0.534	418	26.234	<.001
		T3	a	-1.018	0.694	418	-1.468	0.87
		T3	b	2.036	0.695	418	2.928	0.085
		T3	c	8.457	0.437	418	19.354	<.001

T2	a	T2	b	3.854	0.756	418	5.095	<.001
		T2	c	7.118	0.756	418	9.411	<.001
		T3	a	-7.908	0.37	418	-21.382	<.001
		T3	b	-4.854	0.774	418	-6.274	<.001
		T3	c	1.568	0.774	418	2.027	0.526
	b	T2	c	3.264	0.758	418	4.308	<.001
		T3	a	-11.761	0.774	418	-15.205	<.001
		T3	b	-8.707	0.371	418	-23.46	<.001
		T3	c	-2.286	0.775	418	-2.95	0.08
	c	T3	a	-15.026	0.774	418	-19.425	<.001
		T3	b	-11.971	0.775	418	-15.448	<.001
		T3	c	-5.55	0.371	418	-14.953	<.001
T3	a	T3	b	3.054	0.79	418	3.864	0.004
		T3	c	9.476	0.79	418	11.988	<.001
	b	T3	c	6.421	0.792	418	8.11	<.001

Table 34. Post hoc comparisons-group.

Post Hoc Comparisons-Group						
Comparison						
Group	Group	Mean Difference	SE	df	t	ptukey
a	b	3.29	0.613	418	5.36	<.001
	c	6.65	0.613	418	10.85	<.001
b	c	3.36	0.614	418	5.47	<.001

Table 35. Descriptives STAIS.

Descriptives	Group	STAIS	STAIS T2	STAIS T3
N	a	142	142	141
	b	142	142	139
	c	142	142	140
Mean	a	62.1	50.7	59.8
	b	63.2	45.1	60.9
	c	61.8	40.6	45.4
Standard deviation	a	6.09	8.29	6.8
	b	4.09	11	4.54
	c	4.87	9.76	9.83

Table 36. Repeated measures ANOVA.

		Sum of Squares	df	Mean Square	F	p	η^2
Within Subjects Effects	Time	60664	2	30332	1513	<.001	0.374
	Time ✻ Group	11516	4	2879	144	<.001	0.071
	Residual	16724	834	20.1	-	-	-
Between Subjects Effects	Group	16817	2	8409	62.2	<.001	0.104
	Residual	56360	417	135	-	-	-

Note: Type 3 sums of squares

Table 37. Assumptions.

Tests of Sphericity	Mauchly's W	p	Greenhouse-Geisser ε	Huynh-Feldt ε
Time	0.695	<.001	0.766	0.768

Table 38. Post hoc tests.

Post Hoc Comparisons-Time ✻ Group								
Comparison								
Time	Group	Time	Group	Mean Difference	SE	df	t	ptukey
T1	a	T1	b	-1.116	0.607	417	-1.839	0.656
		T1	c	0.228	0.606	417	0.376	1
		T2	a	11.418	0.661	417	17.273	<.001
		T2	b	16.97	0.931	417	18.236	<.001
		T2	c	21.464	0.928	417	23.13	<.001
		T3	a	2.248	0.419	417	5.365	<.001
		T3	b	1.165	0.758	417	1.536	0.838
		T3	c	16.707	0.757	417	22.084	<.001
	b	T1	c	1.344	0.608	417	2.211	0.401
		T2	a	12.534	0.927	417	13.524	<.001
		T2	b	18.086	0.666	417	27.165	<.001
		T2	c	22.58	0.929	417	24.295	<.001
		T3	a	3.364	0.756	417	4.448	<.001
		T3	b	2.281	0.422	417	5.404	<.001
		T3	c	17.823	0.758	417	23.505	<.001
	c	T2	a	11.19	0.926	417	12.083	<.001
		T2	b	16.742	0.931	417	17.977	<.001
		T2	c	21.236	0.663	417	32.009	<.001
		T3	a	2.02	0.756	417	2.674	0.161
		T3	b	0.936	0.759	417	1.233	0.949
		T3	c	16.479	0.421	417	39.187	<.001
T2	a	T2	b	5.552	1.165	417	4.767	<.001
		T2	c	10.045	1.163	417	8.64	<.001
		T3	a	-9.17	0.491	417	-18.691	<.001
		T3	b	-10.254	1.032	417	-9.933	<.001
		T3	c	5.288	1.031	417	5.13	<.001
	b	T2	c	4.494	1.167	417	3.851	0.004
		T3	a	-14.722	1.034	417	-14.234	<.001
		T3	b	-15.806	0.494	417	-31.986	<.001
		T3	c	-0.264	1.036	417	-0.255	1
	c	T3	a	-19.216	1.032	417	-18.621	<.001
		T3	b	-20.299	1.035	417	-19.62	<.001
		T3	c	-4.757	0.492	417	-9.662	<.001
T3	a	T3	b	-1.084	0.883	417	-1.228	0.95
		T3	c	14.458	0.881	417	16.412	<.001
	b	T3	c	15.542	0.884	417	17.58	<.001

Table 39. Post hoc comparisons–group.

Post Hoc Comparisons-Group						
Comparison						
Group	Group	Mean Difference	SE	df	t	ptukey
a	b	1.12	0.802	417	1.39	0.346
	c	8.24	0.801	417	10.29	<.001
b	c	7.13	0.804	417	8.87	<.001

In addition, according to a recent review which included all the original studies that have combined the psychoeducation programme with a multicomponent training programme, our results seem to be in accordance with most of these results. The first trial of Skov SS, et al. [37] used an intervention with two weekly training sessions. Their intervention lasted for 15 weeks and the duration was three hours per session. The study had 7 -10 participants

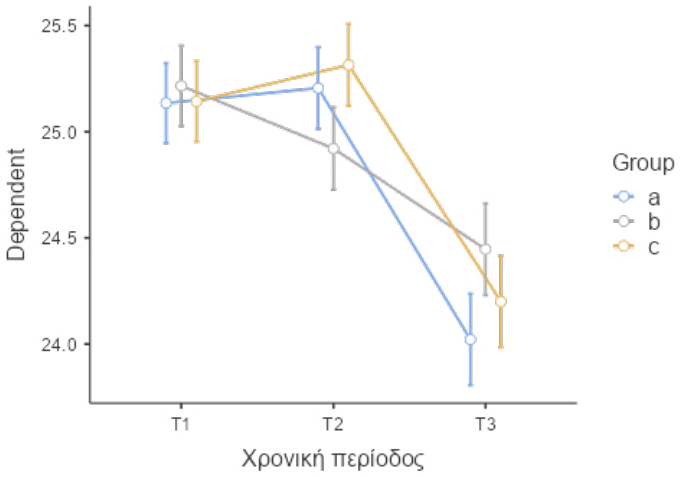

Figure 1. Estimated marginal means (Time ✻ Group) of descriptives MMSE.

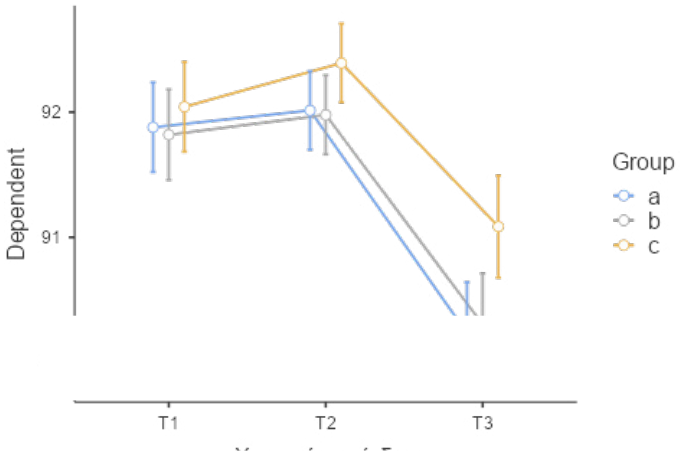

Figure 2. Estimated marginal means (Time ✻ Group) of descriptives ACE-R.

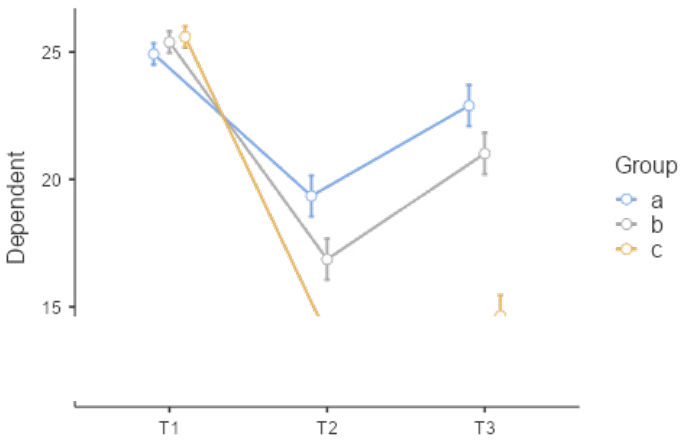

Figure 3. Estimated marginal means (Time ✻ Group) of descriptives NPI.

and the programme also included 1.5 hour physical exercise which was combined with either one hour of CST or either one hour of psychoeducation. This is a trial that took place in Copenhagen and the sample was consisted from 44 participants. The study used scales as; MMSE, and Quality of Life in Alzheimer's Disease (QoL-AD). The training session was applied by two psychotherapists in a workout room and they included warm-up, cycling, short breaks and strength exercises. On the other hand, the psychoeducational programme lasted for one hour and included themes about dementia. The trial concluded positive results of the combination of the psychoeducation and physical exercise.

Moreover another study with a follow-up test which included 57 patients and 54 participants in a comparison group took place in the Netherlands and included a personal trainer with eight sessions lasted one hour for three months and additionally the training program included exercise for balance flexibility strength and endurance [38]. Educational program aim to give the caregivers knowledge and encourage communication between them and their patients. The programme did not find significant differences in executive functions, but on the other hand it is important that the trial reported positive outcomes in terms of attention. In addition, according to the results of another

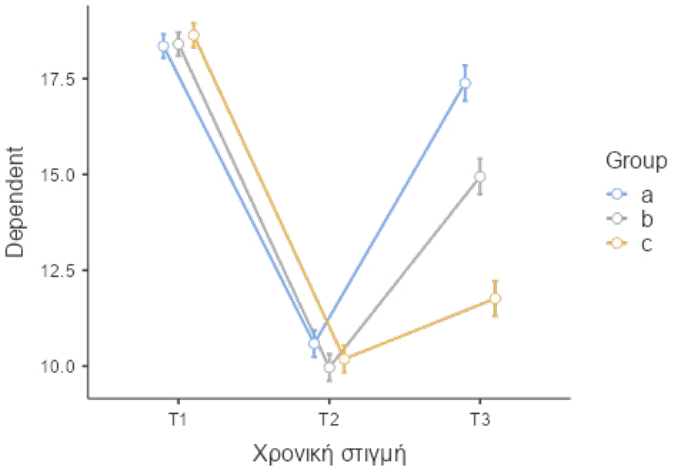

Figure 4. Estimated marginal means (Time ✻ Group) of descriptives NPI Car.

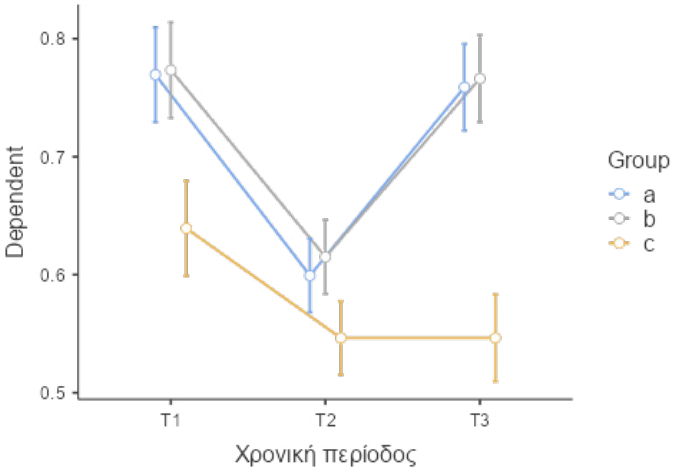

Figure 5. Estimated marginal means (Time ✻ Group) of descriptives CDR_SB.

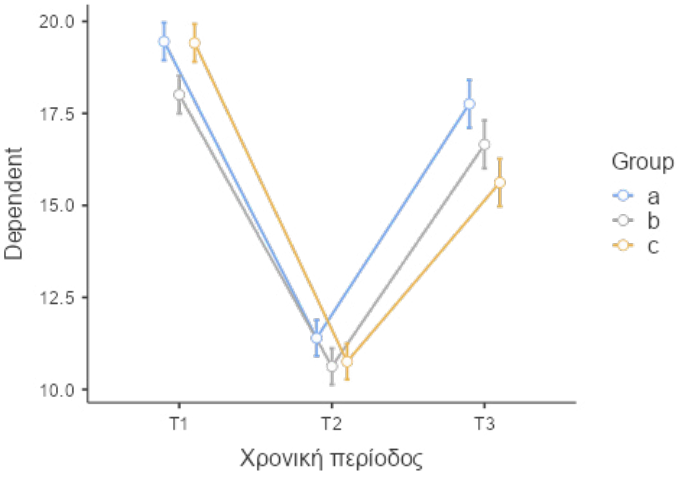

Figure 6. Estimated marginal means (Time ✻ Group) of descriptives BDI.

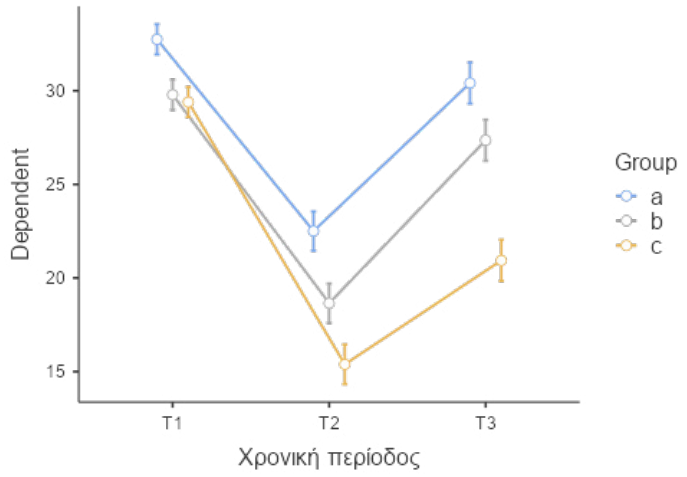

Figure 7. Estimated marginal means (Time ✻ Group) of descriptives ZBI.

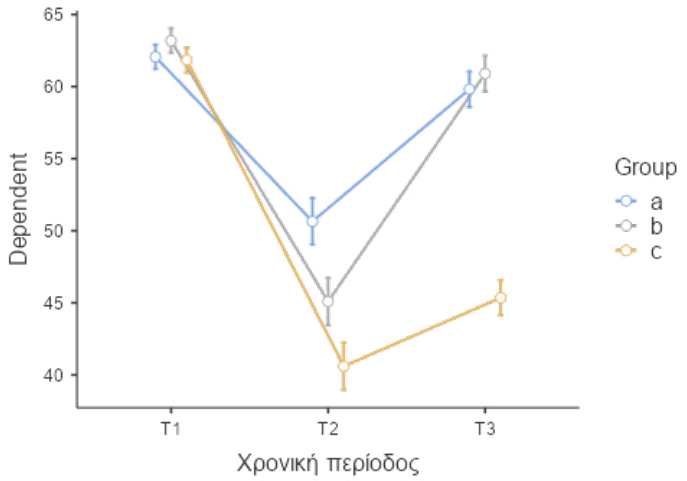

Figure 8. Estimated marginal means (Time ✻ Group) of descriptives STAIS.

study which examined the combination of education and multi component training program and had a large sample size of 255 participants, found promising results after the combination of the psychoeducation and the physical exercise. The psychoeducation programme included topics about dementia and the programme lasted for four months. It is very important that this trial underlined that the beneficial results maintained after 13 months after the end of the programme [39]. However, the trial does not mention which measurements used in order to identify its results. Additionally, the last study examined the combination of psychoeducation and physical exercise and took place in 2020 [40]. The sample size was consistent of 153 participants who received the psychoeducation programme for two hours, for six times, and there was another group received psychoeducation with exercise for a minimum of 30 minutes and there was also the attention control group focused on some aspects of dementia and also performed stretching exercises and flexibility. The trial used PROMIS emotional distress-depression instrument for measuring the depressive symptoms and also ZBI scale for the caregivers' burden. However, this study in contrary with our results did not mention significant differences in caregivers' distress.

Nevertheless, the previous studies have used (some of them) quiet large sample sizes, however they do not report which measurements scales used for the cognitive and physical tests of the sample. It is also not clear in some cases how frequently the interventions were taken place. On the other hand, none of the above-mentioned trials did not aimed to examine the effect of the combination in the three domains: a) cognitive abilities, b) BPSD and c) quality of life of both patient and caregiver.

Our study has some strengths. We have a large simple size, a strict methodology, we applied the psychoeducational programme as the literature has pointed, we performed the non-pharmacological interventions in a way that the literature so far has mentioned that is most beneficial, we had specialists to perform the videos, we used many scales in order to measure several aspects of the disease, we had quite large duration of our interventions and we had a follow up test. All groups received a very strict, analytical, and clear protocol of how to perform every intervention and at any time of the performing period the informal caregivers could speak with a specialist and be sure that they apply the interventions effectively and safely. The duration of our interventions were in accordance with previous studies and the frequency, as well. Future studies should focus on large samples, strong methodology, extend the duration of the interventions, examine all aspects of the disease, not only the cognitive abilities or the neuropsychiatric problems, include how to decrease caregivers' burden, and have follow up test, in order to identify if the good results can maintain over time [41-44].

Conclusion

It is very important to find a combination of non-pharmacological interventions that can effectively be performed by informal caregivers and help the patients maintain their cognitive abilities, decrease BPSD, and enhance the general quality of life of the patient and the caregiver, as well. Non-pharmacological interventions should be well researched, because the literature so far mentions promising results. Patients and caregivers who live away from the big city centers and they cannot have access to formal care, should not be ignored. Online programmes can effectively replace the face-to-face meetings and offer to the PwD and their caregivers a professional care, despite the distance. Informal caregivers should be well trained in order to be aware of the disease, know what to expect, have realistic expectations and help their patients and themselves in an effective and right way. Online programme "Symparastasi" gave the opportunity to the informal caregivers to be fully trained on dementia and multicomponent exercise, in order to be able to communicate better with their patients and be better caregivers. It is crucial that the participants mentioned that they enjoyed the programme, and we did not have dropouts, or any injury from the training programme, which means that if the caregivers listen carefully to the videos and perform strictly by the book all the advices, several interventions can be effectively be applied by them.

Acknowledgement

None.

Conflict of Interest

The authors declare no conflict of interest.

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How to cite this article: Dimitriou, Tatiana Danai and Evangelia Zacharia. "Online Programme "Symparastasi": Psychoeducation and Multicomponent Exercise Programme to the Caregivers of Patients with MCI and Mild Dementia: An Original RCT." *J Clin Case Rep* 14 (2024): 1620.