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Original Article

Cognitive training for elderly people without cognitive impairment: an occupational therapy Intervention during the COVID-19 pandemic[1]

Treino cognitivo para idosos sem déficit cognitivo: uma intervenção da terapia ocupacional durante a pandemia da COVID-19

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Abstract

Objective: In view of the cognitive changes resulting from the normal aging process, this study aimed to compare the performance of routine and cognitive activities, quality of life and depressive symptoms of healthy elderly participants and non-participants of cognitive training applied by occupational therapists. **Method:** non-randomized clinical trial, matched by allocation into groups, with a quantitative approach of analytical character, longitudinal measured through standardized assessments: Geriatric Depression Scale, Revised-Addenbrooke Cognitive Examination, the Routine Tasks Inventory-Extended, Quality Assessment of life of the World Health Organization WHOQOL (BREF and OLD), and Instrument for the Assessment of Attitudes towards Aging, applied pre and post-intervention. There were 24 sessions, twice a week, lasting 60 minutes each. The intervention was based on the natural cognitive decline of aging, and covered analyzed activities and games. **Results:** case group (n=10), aged between 62 and 74 years (M=67.50, SD= 3.95): control group (n=11), aged between 61 and 73 years (M=68, SD= 4.12). The effect size calculation (Cohen's d) revealed a training effect for the following variables: Depressive symptoms (1.12); Cognition: memory (0.82), visual-spatial function (0.55), fluency (0.56), MMSE (1.00) and ACE-R (0.98); Quality of life: sensory functioning (0.61); intimacy (0.51) and physical (0.50). No gain effects were observed for the other variables. **Conclusion:**

[1]Interventional research approved by the Ethics Committee for Research on Human Beings of UFPR, under opinion No. 3.756.734, and published in the Brazilian Registry of Clinical Trials (Registration number RBR-3bq3gq), resulting from the Course Completion Work (TCC) of the Occupational Therapy Course at the Federal University of Paraná.

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the cognitive training was accompanied by an improvement of the participants in part of the standardized assessments, suggesting that the intervention favors the improvement of cognitive functions and quality of life and reduction of depressive symptoms of elderly participants.

Keywords: Occupational Therapy, Cognition, Cognitive Aging, Elderly.

Resumo

Objetivo: Tendo em vista as alterações cognitivas decorrentes do processo normal de envelhecimento, esse estudo teve como objetivo comparar o desempenho de atividades rotineiras e cognitivas, qualidade de vida e sintomas depressivos de idosos saudáveis participantes e não participantes de treino cognitivo aplicado por terapeutas ocupacionais. **Método:** ensaio clínico não randomizado, equiparado por alocação em grupos, com abordagem quantitativa de caráter analítico, longitudinal mensurado por meio de avaliações padronizadas: Escala de Depressão Geriátrica, Exame Cognitivo de Addenbrooke-Revisado, Inventário das Tarefas Rotineiras-Estendido, Avaliação de qualidade de vida da Organização Mundial da Saúde WHOQOL (BREF e OLD), Instrumento de Avaliação das Atitudes em Relação ao Envelhecimento, aplicadas pré e pós-intervenção. Foram realizadas 24 sessões, duas vezes na semana, com duração de 60 minutos cada. A intervenção teve como base o declínio cognitivo natural do envelhecimento e abrangeu atividades e jogos analisados. **Resultados:** grupo caso (n=10), com idade entre 62 e 74 anos (M=67,50, DP= 3,95); grupo controle (n=11), com idade entre 61 e 73 anos (M=68, DP= 4,12). O cálculo do tamanho de efeito (Cohen d) revelou efeito de treino para as seguintes variáveis: Sintomas depressivos (1,12); Cognição: memória (0,82), função visual-espacial (0,55), fluência (0,56), MEEM (1,00) e ACE-R (0,98); Qualidade de vida: funcionamento do sensório (0,61); intimidade (0,51) e físico (0,50). Não foram observados efeitos de ganho para as demais variáveis. **Conclusão:** o treino cognitivo foi acompanhado de melhora dos participantes em parte das avaliações padronizadas, sugerindo que a intervenção favorece a melhora das funções cognitivas e a qualidade de vida e redução de sintomas depressivos de idosos participantes.

Palavras-chave: Terapia Ocupacional, Cognição, Envelhecimento Cognitivo, Idoso.

Introduction

It is believed that, by 2060, the elderly population in Brazil will exceed 25.5% of the total population, that is, one in four Brazilians will be elderly. The number of elderly people is expected to exceed that of children and adolescents up to 14 years old (Instituto Brasileiro de Geografia e Estatística, 2018). This is a global phenomenon that requires planning, implementation of public policies and production of activities aimed at this part of society so that aging is, in fact, valued, recognized and successful.

Considering the current phenomenon of population aging, more individuals reach ages in which cognitive alterations become more present, and it is evident that society is unprepared to accommodate demands arising from these alterations. Considering this reality, it is necessary to promote health care for the elderly, investing in the promotion

of skills, disease prevention, maintenance of residual skills and assistance, in order to strengthen them to remain socially and economically active. Considering that the relationship between the active and dependent population has been decreasing more and more, it is necessary to take a broader look at the factors that involve the health profile of the elderly (Miranda et al., 2016).

Allied to this, in December 2019, the disease COVID-19 caused by the Coronavirus, which may cause Severe Acute Respiratory Syndrome 2 (SARS-CoV-2) was identified. On March 11, 2020, the World Health Organization (WHO) declared it a pandemic and guided safety measures to prevent the spread of the virus. In view of this, physical distancing was adopted, avoiding agglomerations aimed at greater health preservation (Pereira et al., 2020).

The impacts of the pandemic on the elderly go far beyond the complications of the disease. The change in routine as a result of physical distancing and reduced activities has brought losses that include functional and cognitive decline in many elderly people. The main perceived effects are poor concentration, memory loss, stress, anxiety, depressed mood and sleeping problems (Barros et al., 2020; Lins et al., 2020). Therefore, it becomes especially important for the Occupational Therapist to understand the characteristics of cognitive functioning and the effects of physical distancing for the elderly, as they are directly related to occupational performance and can influence the quality of life of these individuals (Levy, 2018).

Among the components of cognition affected in the cognitive aging process, Levy (2018) highlights working memory and executive functions, in particular inhibitory control. Working memory makes it possible to combine information received with that retrieved from long-term memory (Levy, 2018). Its decline is gradual and accelerates during aging, contributing to the difficulty in handling new and complex information (reasoning and problem solving) (Hale et al., 2011; Hannon & Daneman, 2009; Salthouse, 2016).

Inhibitory control is linked to a person's ability to control attention, behavior and emotions, avoiding those that are not appropriate or necessary (Diamond & Ling, 2016). With cognitive aging, the elderly begin to experience difficulty in distinguishing relevant and irrelevant information, and have a reduced ability to inhibit automatic responses to everyday situations. Like working memory, inhibitory control is influenced by the amount of demand and complexity of the tasks performed (Levy, 2018).

Another function affected by the aging process that may be associated with deficits in inhibitory control is divided attention, which is related to the ability to process information received from two or more sources simultaneously (Chariglione et al., 2018; Levy, 2018). Difficulty dividing attention is more pronounced when it involves receiving new information than when it involves routine skills and tasks (Rubinstein et al., 2001). In order for a person to be able to perform two tasks simultaneously, for example, the brain needs to recruit the skills necessary to perform the new task while performing a task that it started previously. However, it is noted that when the elderly person has two sources of information, there is a tendency to select one source and exclude the other (Levy, 2018).

Finally, the speed of information processing, which is linked to the response time to received information, also changes. The reduction in response time is directly associated with a general deceleration of information transmission through neurons, which occurs

with the aging process. Cognitive aging causes information to be processed more slowly by working memory and, thus, the elderly person takes longer to process and retrieve information, which can compromise more complex functions, limiting, for example, the resources needed to provide divided attention, to make associations, to inhibit distractions, to shift the focus of attention from one task to another, among other processes (Levy, 2014). However, it is worth mentioning that, although information processing is slowed down, the elderly maintain their ability to learn new tasks and form new memories (Levy, 2018)

The brain is the system that governs the aforementioned functions, and is constantly modified by the body's relationship with the environment, through brain plasticity. This is present throughout life and implies the ability to reorganize, intensify and establish new neural connections according to the demands of life, including changes arising from the aging process (Rotta et al., 2018).

Taking into account all the changes that occur, to face the aging process, especially in the context of the physical distance imposed by the pandemic, and to deal with the presented implications that interfere with occupational performance and quality of life, cognitive training interventions are proposed, applied by Occupational Therapists (OT), to prevent, maintain or delay organic and functional changes, such as decline in working memory, attention and changes in other executive functions, which individuals commonly present during their aging (Levy, 2014).

Cognitive training is an intervention that can provide an improvement in the metabolic activity of the brain, favoring brain performance and function, as it contributes to the growth of dendritic branches, to an increase in synaptic density and neuronal plasticity, which consequently improve cognitive function (Ikeda et al., 2014).

When applied by occupational therapists, cognitive training is presented in a comprehensive way, since these professionals consider the physiological aspect, factors that contribute to cognitive decline and their impacts on occupations and quality of life. Based on their knowledge about the interaction between the person, the occupation and the environment and a comprehensive approach, this professional seeks to maintain or delay cognitive decline (Maeir et al., 2014).

Cognitive training interventions are of paramount importance, as they seek to promote health with the elderly, and aim to expand the field of action, performance, autonomy and participation of such individuals. In addition, these interventions are largely aimed at combating the slowing of cognitive decline, as they improve the functioning of a certain group of specific cognitive functions, such as, for example, attention and the decision-making process (Levy, 2014).

Thus, this study aims to analyze the effect of a cognitive training intervention, carried out by occupational therapists (students and teachers) during the COVID-19 pandemic, on occupational performance, cognition, quality of life and depressive symptoms of participating elderly.

Method

This is an interventional research of the non-randomized controlled clinical trial of prevention, equated by age, education and gender variables, with a quantitative approach of an analytical and longitudinal nature. The study, carried out from August

to December 2020, took place remotely (online-synchronous) through free videoconferencing platforms (Jitsi meet, Google meet), prepared and applied by five volunteer students and coordinated by a teacher, all from the Occupational Therapy course at a university in southern Brazil.

The research was approved by the Ethics Committee for Research on Human Beings, on 12/10/2019, under opinion No. 3,756,734, and published in the Brazilian Registry of Clinical Trials (registration number RBR-3bq3gq).

Participants

The research participants came from other extension projects at the same university aimed at the elderly public. The invitation to participate in the study and the selection took place electronically (email and Whatsapp). The initial number of elderly enrolled was 90.

This initial sample of elderly people was evaluated, prior to the pandemic, according to the following inclusion criteria: a) those who could read and write; b) those without extreme difficulty seeing and hearing even with the best correction; c) those with no indication of cognitive deficit by the Addenbrooke Cognitive Examination-Revised (ACE-R), with a cutoff score referred to age and schooling, according to normative data from the study by César et al. (2017); d) those who did not present depression or suspected depression according to the Geriatric Depression Scale, with a score lower than or equal to 5, according to the criteria for the Brazilian sample (Almeida & Almeida, 1999); e) those who had access to the internet and/or digital equipment with camera and voice output (smartphones or tablets); f) those who were able to use the digital tools after training was available; g) those who agreed and signed the Free and Informed Consent Term.

After applying the inclusion criteria, the final sample consisted of 21 elderly people, 10 of whom were allocated to the case group and 11 to the control group.

Instruments

In the study, instruments validated and adapted for the Brazilian elderly population were applied.

For the selection of participants, the following were used:

- Geriatric Depression Scale (GDS-15), which aims to identify and quantify depressive symptoms in the elderly population. The score can range from zero to fifteen points, with a cutoff score >5, indicating the presence of depressive symptoms, according to criteria for the Brazilian sample (Almeida & Almeida, 1999);
- Addenbrooke Cognitive Examination-Revised (ACE-R), used to track cognitive losses and estimate the severity of a dementia condition. The cut-off scores were stipulated according to normative data for the Brazilian population, defined according to age and schooling, according to César et al. (2017).

To characterize the selected sample, an on-line socioeconomic questionnaire (form) was prepared and applied, and it dealt with the identification of the participant (name, gender, date of birth, marital status, who they live with, level of education, family

income, work activity, medicines they take). Forms of contact with the participant were also obtained (telephone, emergency contact and home address); we sought to know their familiarity in handling digital technologies.

For pre and post-training results measures, the following instruments were used:

- The ACE-R and GDS-15 assessments were used respectively to assess cognitive performance and depressive symptoms before and after the training;
- Routine Tasks Inventory - Extended (RTI-E) to measure the level of independence in performing daily activities. The final score (from 1 to 6) represents the level of performance on the evaluated scale, with 1 being the level that represents greater dependence and 6 being complete independence (De Mello, 2018);
- Quality of life assessment by the World Health Organization WHOQOL (BREF and OLD versions). The scores of the evaluated domains are transformed into a scale between 0 and 100, with 0 representing the worst quality of life and 100 the best (Chachamovich, 2005; Fleck et al., 2000);
- Instrument for the Assessment of Attitudes towards Aging (AAQ) - answers are given on a 5-point scale, in which the score of the "Psychosocial Losses" domain is inverted, that is, the higher the score, the more negative is the perception in this domain, while in the rest of the domains, the higher the score, the more positive the evaluation; the score values range from 8 to 40 (Chachamovich et al., 2008).

Cognitive training

The intervention took place individually with each participant, applied and monitored by students of the Occupational Therapy course at a university in southern Brazil, following the pre-established schedule and taking into account the speed in carrying out and understanding the tasks and games. The time of each session varied according to individual performance and lasted an average of 60 minutes. However, the number of sessions did not change; it continued as planned: 24 meetings, twice a week.

The evaluations were applied by the researchers before (pre-training) and immediately after training (post-training), in the individual modality, with both groups, case and control, for data analysis and comparison. Each participant received an individual feedback and a written report on their performance in the study. At the end of the intervention with the case group, the control group started, using the same procedures already performed.

Activities

The activities and games applied aimed to train cognitive functions that naturally decline with aging, in addition to the domains evaluated by the ACE-R: spatial orientation, temporal orientation, attention, memory, praxis, planning, reasoning, language, categorization, cognitive flexibility, inhibitory control, decision making, monitoring, creativity and visual-motor construction.

Activities and games were analyzed based on the analysis methodology for activities and occupations by Crepeau & Schell (2011). This methodology makes it possible to

understand the various components that involve the activities, the resources required, which skills are needed and their possible meaning for clients, as well as their therapeutic potential.

Each session began with a didactic explanation about the highlighted function to be stimulated on the day, its concept, the neuroanatomical substrate related to the function and the possible impact of the dysfunction on daily life. Subsequently, the activities were explained and carried out, which were performed only during training hours, accompanied and supervised by the student in charge, and no exercise was applied outside the training.

At the end of each session, the student responsible for the participant scored their performance in each activity according to previously defined scores after the analysis of each one of them and wrote their perceptions and speeches of the participants in a field diary shared with the other researchers. Such monitoring was carried out in order to verify the evolution of the elderly and provide feedback to them.

When necessary, discussions were held with the other researchers with the purpose of dialoguing about the individual and collective process of the case group, in addition to aligning the cognitive training protocol with guidelines such as forms of punctuation and divergences in answers.

Data analysis

A private statistician guided data analysis. At first, a descriptive analysis was carried out in order to characterize the research participants. To describe the scores obtained by the application of the instruments, the mean and standard deviation were used. To assess the clinical impact of the intervention, the effect size was analyzed and was interpreted as: small (0.20 to 0.49), medium (0.50 to 0.79) and large (≥0.80) effect size (Cohen, 1988).

Subsequently, the paired Wilcoxon test was applied to compare the scores between the moments evaluated in each group separately, in addition to the Wilcoxon test to compare the scores between the groups at each moment separately.

In addition, with the aim of evaluating the effect of the group and the moment on the scores of the applied instruments, as well as the interaction effect of these two factors, analysis of variance (ANOVA test) of repeated measures was applied. The rank transformation (Wobbrock et al., 2011) was conducted for the scores whose normality hypothesis was rejected according to the results of the Shapiro-Wilk test (Shapiro & Wilk, 1965), thus carrying out a non-standard ANOVA approach of parametric of repeated measures. Finally, as an effect measure, the generalized eta-squared measure, proposed by Olejnik & Algina (2003), was calculated (Bakeman, 2005).

All analyzes were performed using the R statistical environment (R Development Core Team, 2016), version 3.6.2, and for all tests the significance level was set at 5%.

Results

Twenty-one elderly people participated in the final sample of the study, divided into two groups: case group (received training) and control group (not trained). The division was matched by age, education and sex. The case group consisted of 10 participants (N=10), five men and five women, aged between 62 and 74 years (M=67.50, SD= 3.95) and a mean of schooling of 13.6 years (SD=2.95). The control group was formed by 11 participants (N=11), five men and six women, aged between 61 and 73 years (M=68, SD= 4.12), and an average schooling of 12.73 years (SD=2.53). There were no dropouts during the cognitive training in both groups.

Table 1 presents the sociodemographic data of the sample regarding gender, age, education, marital status and monthly income.

Table 1. Demographic profile of the elderly participants. Curitiba, 2021.

Characteristics	Case group (n=10)				Control group (n=11)			
	Mean	**SD**	**Median**	**Min-Max**	**Mean**	**SD**	**Median**	**Min-Max**
Age	67	3.95	66	62-74	68.0	4.12	68	61-73
Sex								
	n		%		n		%	
Male	5		50		5		45.5	
Female	5		50		6		54.5	
Scholarity								
	n		%		n		%	
Complete high school	5		50		7		63.6	
University education	3		30		3		27.3	
Postgraduate	2		20		1		9.1	
Marital status								
	n		%		n		%	
Single	2		20		0		0	
Married	4		40		8		72.7	
Divorced	3		30		2		18.2	
Widower/widow	1		10		1		9.1	
Monthly income								
	n		%		n		%	
Up to a salary	0		0		2		18.2	
Two to three salaries	1		10		4		36.4	
Four to six salaries	6		60		4		36.4	
Above six minimum wages	3		30		1		9.1	

SD: Standard Deviation.

In Table 2, it is possible to observe that, for the participants of the case group, the average score of the GDS instrument went from 2.8 to 1.4 points, which points

to a significant difference between the moments for this group (0.02) and for great clinical impact (Cohen's d 1.12). On the other hand, there is no evidence that the score of the control group participants differs significantly between the moments (0.343), and, on average, it went from 2.55 to 3.18 points, representing a small effect size (Cohen's d 0.36).

At the pre-intervention moment, there were no significant differences between the groups (0.611), contrary to what was observed at the post-intervention moment (0.031). Regarding the ANOVA results, only the interaction effect between group and moment was significant (F = 8.43; p = 0.009 and η_G^2= 0.31), indicating a difference in the behavior of the score in the two evaluated moments between the groups, since the average score of the case group increased, while that of the control group decreased.

Table 2. Results of the GDS instrument, by group and moment. Curitiba, 2021.

Case	**Pre**	**GDS**	2.8 (DP 1.55)
	Post		1.4 (DP 0.84)
	Effect size (*Cohen's d*)		1.12[g]
Control	**Pre**		2.55 (DP 1.13)
	Post		3.18 (DP 2.14)
	Effect size (*Cohen's d*)		0.36[p]
Significance			0.02[a]; 0.343[b]; 0.611[c]; 0.031[d]
Group	**F**		1.65
	p		0.214
	η_G^2		0.08
Moment	**F**		1.68
	p		0.211
	η_G^2		0.08
Group x Moment	**F**		8.43
	p		0.009*
	η_G^2		0.31
SW (p)			0.004*

[a]Significant difference between moments for the case group by the paired Wilcoxon test. [b]Significant difference between moments for the control group by the paired Wilcoxon test. [c]Significant difference between groups for the pre-moment by the Wilcoxon test. [d]Significant difference between groups for the post moment by the Wilcoxon test. SW: Shapiro-Wilk. p: p-value. *p-value < 0.05. [p]Small effect size (Cohen's d 0.20 to 0.49). [g]Large effect size (Cohen's d ≥0.80).

Regarding the three domains evaluated by the RTI-E instrument, as shown in Table 3, there was little difference in the average score obtained by both groups at the pre-intervention moment, highlighting that, while for the BADL domain, the average scores were remained approximately constant over the periods, for the IADL and Communication domains (COM), the scores of the two groups approached at the post-intervention moment, not representing clinical impact of effect size and there were no significant differences.

Table 3. Results of the RTI-E instrument, by group and moment. Curitiba, 2021.

Domain			BADL	IADL	COM
Case	Pre	RTI-E	4.69 (DP 0.24)	5.56 (DP 0.56)	5.99 (DP 0.04)
	Post		4.67 (DP 0.26)	5.56 (DP 0.39)	5.99 (DP 0.04)
	Effect size (Cohen's d)		0.07	0	0
Control	Pre		4.61 (DP 0.04)	5.69 (DP 0.36)	5.99 (DP 0.04)
	Post		4.61 (DP 0.04)	5.56 (DP 0.52)	5.99 (DP 0.04)
	Effect size (Cohen's d)		0	0.29p	0
Significance				0.930-;	1.00-;
				0.352-;	1.00-;
				0.823-;	1.00-;
				0.882-	1.00-
Group	F		0.28	0.14	0
	p		0.604	0.713	1
			0.01	0.01	0
Moment	F		0.69	0.27	0
	p		0.417	0.612	1
			0.04	0.01	0
Group x Moment	F		0.43	0.02	0
	p		0.521	0.881	1
			0.02	0	0
SW (p)				<0.001*	<0.001*

-: No significant comparison. SW: Shapiro-Wilk; p: valor p; *valor p < 0,05.

It can be seen in Table 4 that a significant difference between the scores of the pre and post moments was only observed for the visual, MMSE and ACE-R domains, considering the case group, according to the results of the paired Wilcoxon test, highlighting that, in all cases, the average score after the intervention was higher.

Evaluating the results of the comparison between the groups, it can be seen that, in the moment before the intervention, a significant difference was observed only for the visual and ACE-R domains, while at the later moment, in addition to these two domains, the memory domains, language, and MMSE also showed significant differences between groups, considering the Wilcoxon test results.

In relation to the case group, the scores of the following domains increased and had a large effect size between the pre and post-intervention moments: memory (Cohen's d 0.82), visual-spatial (Cohen's d 0.55), MMSE (Cohen's d 1.00) and ACE-R (Cohen's d 0.98). The fluency domain (Cohen's d 0.56) had a medium effect and the others, attention, orientation and language had a small effect (Cohen's d <0.50). As for the control group, the reduction in the language mastery score had a large effect (Cohen's d 1.01) and the increase in visual-spatial was shown to be medium (Cohen's d 0.49).

The hypothesis of normality of scores was not rejected only for the ACE-R domain, which is the only domain for which the rank transformation approach was not applied in the analysis of repeated measures ANOVA. It is noteworthy that the isolated effect of the group (case and control) was significant for the domains of language (F = 13.65; p = 0.002 and η_G^2 = 0.42), visual-spatial (F = 13.79 ; p = 0.001 and η_G^2 = 0.42), MMSE (F = 5.70; p = 0.028 and η_G^2 = 0.23) and ACE-R (F = 14.07; p = 0.001 and η_G^2 = 0.31), while the isolated effect of the moment (pre and

post) was significant only for the language domain (F = 5.01; p = 0.037 and η_G^2 = 0.21), and the effect of group and moment interaction was not significant for any of the domains.

Table 4. Results of the ACE-R instrument, by group and moment. Curitiba, 2021.

Domain	Case			Control			Significance	Group			Moment			Group x Moment			SW (p)
	Pre	Post	Effect size (*Cohen's d*)	Pre	Post	Effect size (*Cohen's d*)		F	p	η_G^2	F	p	η_G^2	F	p	η_G^2	
ACE-R																	
Attention and Guidance	17.1 (SD 0.99)	17.4 (SD 0.7)	0.34[p]	16.55 (SD 1.04)	16.55 (SD 1.63)	0	0.299[-]; 1.00[-]; 0.191[-]; 0.261[-]	2.7	0.117	0.12	0.52	0.478	0.03	0.01	0.927	0	<0.001*
Memory	23.8 (SD 1.62)	25 (SD 1.25)	0.82[g]	22.55 (SD 2.98)	22.27 (SD 3.26)	0.08	0.065[-]; 0.859[-]; 0.413[-]; 0.043[d]	2.46	0.133	0.11	0.12	0.303	0.06	1.52	0.232	0.07	<0.001*
Fluency	11.1 (SD 1.6)	11.9 (SD 1.2)	0.56[m]	11 (SD 1.79)	10.91 (SD 2.07)	0.04	0.150[-]; 0.837[-]; 0.971[-]; 0.314[-]	0.43	0.52	0.02	0.11	0.746	0.01	0.61	0.445	0.03	0.032*
Language	25.6 (SD 0.7)	25.7 (SD 0.48)	0.16	25.18 (SD 0.6)	24.18 (SD 1.25)	1.01[g]	0.773[-]; 0.056[-]; 0.11[-]; 0.006[d]	13.65	0.002*	0.42	2.72	0.115	0.13	3.5	0.077	0.16	<0.001*
Visual-spatial	15 (SD 0.94)	15.5 (SD 0.85)	0.55[m]	13 (SD 2.05)	14 (SD 1.95)	0.49[p]	0.037[a]; 0.309[-]; 0.023[c]; 0.022[d]	13.79	0.001*	0.42	5.01	0.037*	0.21	0.83	0.374	0.04	<0.001*
MMSE	27.9 (SD 1.66)	29.2 (SD 0.79)	1.00[g]	27.55 (SD 1.51)	27.55 (SD 1.75)	0	0.041[a]; 1.00[-]; 0.536[-]; 0.012[d]	5.7	0.028*	0.23	0.66	0.425	0.03	1.77	0.199	0.09	<0.001*
ACE-R	92.6 (SD 2.84)	95.5 (SD 3.03)	0.98[g]	88.27 (SD 4.65)	87.91 (SD 6.3)	0.06	0.032[a]; 1.00[-]; 0.028[c]; 0.008[d]	14.07	0.001*	0.31	1.06	0.315	0.01	2	0.174	0.02	0.085

-: No significant comparison. [a]Significant difference between moments for the case group by the paired Wilcoxon test. [c]Significant difference between groups for the pre-moment by the Wilcoxon test; d: Significant difference between groups for the post-moment by the Wilcoxon test. SW: Shapiro-Wilk. p: p-value. *p-value < 0.05. [p]Small effect size (Cohen's d 0.20 to 0.49). [m]Average effect size (Cohen's d 0.50 to 0.79). [g]Large effect size (Cohen's d ≥0.80). Domains: Sensory Functioning (SF), Autonomy (AUT), Present, Past and Future Activities (PPF), Social Participation (PSO), Death and Dying (MEM), Intimacy (INT), Physical (FIS), Psychological (PSI)), Social Relationships (SOC), Environment (AMB), Psychological Losses (PPSI), Psychological Growth (CPSI) and Physical Changes (MFIS).

Regarding the WHOQOL-Old instrument, the average scores of the two groups for the Autonomy (AUT), Present, Past and Future Activities (PPF), Death and Dying (MEM) domains and for the WHOQOL-old instrument in its entirety remained close in the two moments evaluated, and for the AUT and PPF domains, the averages of the case group were slightly higher, contrary to what was observed for the MEM domain. Note that only the difference in scores in the AUT domain between the groups at the time before the intervention was shown to be significant (0.043), by the Wilcoxon test, with the mean score being higher for the case group. Regarding the effect size of the Sensory Functioning (SF) and Intimacy (INT) domains for the case group, the difference in scores had a medium intervention effect (Cohen's d 0.61; Cohen's d 0.51).

In the four domains evaluated by the WHOQOL-bref instrument, considering the two measurement moments, for the participants of the control group, the average score of the Physical domain (FIS) went from 75.65 to 69.81 points, and there was a significant difference between the moments for this group (0.035), according to the results of the paired Wilcoxon test, representing the average effect size of the intervention (Cohen's d 0.50). For the other domains and comparisons performed, there was no evidence of significant differences.

With the exception of the Psychological domain (PSI) of the WHOQOL-bref instrument, considering the results of the Shapiro-Wilk test, the results of the repeated measures ANOVA show that only the isolated moment effect was significant for the FIS domain (F = 4, 69; p = 0.043 and η_G^2 = 0.02).

In relation to the AAQ instrument, it is noted in Table 5 that, for the PPSI Psychological Losses domain, the average observed for the case group decreased over the intervention period, while for the control group the average, it increased. Also, significant differences were observed between the groups (0.028), considering the moment after the intervention, according to the results of the Wilcoxon test, only for the PPSI domain, The results of the repeated measures ANOVA, with rank transformation applied to the scores of the Psychological Growth (CPSI) and Physical Changes (MFIS) domains, were not significant for the four domains of the AAQ instrument.

Table 5. Results of the WHOQOL (Old and Bref) and AAQ instruments, by group and moment. Curitiba, 2021.

Domain	Case		Effect size (*Cohen's d*)	Control		Effect size (*Cohen's d*)	Significance	Group			Moment			Group x Moment			SW (p)
	Pre	Post		Pre	Post			F	p	η_G^2	F	p	η_G^2	F	p	η_G^2	
WHOQOL-Old																	
FS	74.38 (SD 20.72)	84.38 (SD 10.31)	0.61[m]	88.07 (SD 17.56)	84.66 (SD 20.8)	0.17	0.094[-]; 0.41[-]; 0.138[-]; 0.45[-]	1.43	0.246	0.07	0.79	0.386	0.04	2.9	0.105	0.13	<0.001*
AUT	73.75 (SD 14.67)	71.88 (SD 18.92)	0.11	59.66 (SD 14.35)	60.23 (SD 16.6)	0.03	0.565[-]; 0.85[-]; 0.043[c]; 0.19[-]	3.98	0.061	0.15	0.04	0.841	0	0.18	0.681	0	0.42
PPF	73.12 (SD 17.19)	71.88 (SD 17.98)	0.07	60.8 (SD 18.35)	63.64 (SD 22.85)	0.13	0.774[-]; 1.00[-]; 0.163[-]; 0.619[-]	1.23	0.282	0.06	0.2	0.659	0.01	0.04	0.842	0	0.021*
PSO	65.62 (SD 22.29)	71.25 (SD 17.97)	0.27[p]	64.77 (SD 12.27)	57.39 (SD 24.66)	0.37[p]	0.2; 0.351[-]; 0.642[-]; 0.272[-]	0.87	0.362	0.04	0.11	0.747	0	3.21	0.089	0.03	0.256
MEM	56.25 (SD 28.57)	58.12 (SD 24.83)	0.06	70.45 (SD 16.32)	76.14 (SD 16.73)	0.34[p]	0.605[-]; 0.341[-]; 0.108[-]; 0.056[-]	3.04	0.097	0.13	2.22	0.153	0.01	0.54	0.473	0	0.074
INT	61.25 (SD 28.53)	73.12 (SD 15.32)	0.51[m]	76.7 (SD 18.77)	75 (SD 18.11)	0.09	0.104[-]; 0.733[-]; 0.165[-]; 0.695[-]	0.96	0.34	0.05	1.43	0.246	0.07	1.97	0.177	0.09	0.006*
Total	67.4 (SD 19.21)	71.77 (SD 14.26)	0.25[p]	70.08 (SD 9.68)	69.51 (SD 14.93)	0.04	0.126[-]; 0.933[-]; 0.526[-]; 0.751[-]	0	0.973	0	0.58	0.456	0	1.11	0.305	0.01	0.155

Table 5. Continued....

Domain	Case		Effect size (*Cohen's d*)	Control		Effect size (*Cohen's d*)	Significance	Group			Moment			Group x Moment			SW (p)
	Pre	Post		Pre	Post			F	p	η^2_G	F	p	η^2_G	F	p	η^2_G	
WHOQOL-Bref																	
FIS	75 (SD 13.26)	75 (SD 12.6)	0	75.65 (SD 9.42)	69.81 (SD 13.21)	0.50[m]	1.00-; 0.035[b]; 0.776-; 0.357-	0.2	0.663	0.01	4.69	0.043*	0.02	4.26	0.053	0.02	0.114
PSI	75.42 (SD 14.76)	75.42 (SD 12.34)	0	71.97 (SD 8.14)	67.05 (SD 14.37)	0.42[p]	0.865-; 0.293-; 0.831-; 0.317-	0.55	0.469	0.03	0.36	0.555	0.02	0.53	0.477	0.03	0.032*
SOC	71.67 (SD 22.29)	72.5 (SD 18.86)	0.04	62.88 (SD 14.61)	59.85 (SD 16.59)	0.19	0.831-; 0.394-; 0.337-; 0.127-	2.08	0.165	0.09	0.18	0.677	0	0.47	0.501	0	0.157
AMB	74.69 (SD 13.3)	76.88 (SD 14.15)	0.15	70.17 (SD 9.41)	68.47 (SD 10.31)	0.17	0.319-; 0.17-; 0.571-; 0.179-	1.64	0.216	0.08	0.02	0.899	0	2.82	0.11	0.01	0.247
AAQ																	
PPSI	15.4 (SD 4.95)	14.7 (SD 4.6)	0.14	18.18 (SD 5.29)	19.27 (SD 4.73)	0.21[p]	0.401-; 0.497-; 0.156-; 0.028[d]	4.23	0.054	0.18	0.02	0.881	0	1.19	0.289	0.06	0.002*
CPSI	31.4 (SD 5.21)	30.2 (SD 5.92)	0.21[p]	29.55 (SD 3.47)	29.18 (SD 3.52)	0.1	0.169-; 0.684-; 0.189-; 0.355-	1.58	0.223	0.08	3.16	0.092	0.14	0.31	0.583	0.02	0.007*
MFIS	29.1 (SD 6.84)	28.8 (SD 6.51)	0.04	26.91 (SD 6.16)	25.82 (SD 5.4)	0.18	0.778-; 0.575-; 0.322-; 0.168-	1.04	0.321	0.05	0.53	0.474	0	0.16	0.691	0	0.107
Total	93.1 (SD 13.66)	92.3 (SD 13.19)	0.05	86.27 (SD 9.92)	83.73 (SD 10.7)	0.24[p]	0.72-; 0.207-; 0.192-; 0.097-	2.32	0.144	0.1	2.06	0.168	0.01	0.53	0.475	0	0.051

-: No significant comparison. [a]Significant difference between moments for the case group by the paired Wilcoxon test. [b]Significant difference between moments for the control group by the paired Wilcoxon test. [c]Significant difference between groups for the pre-moment by the Wilcoxon test. [d]Significant difference between groups for the post-moment by the Wilcoxon test. SW: Shapiro-Wilk. p: p-value. *p-value < 0.05. [p]Small effect size (Cohen's d 0.20 to 0.49). [m]Average effect size (Cohen's d 0.50 to 0.79). [g]Large effect size (Cohen's d ≥0.80). Domains: Sensory Functioning (SF), Autonomy (AUT), Present, Past and Future Activities (PPF), Social Participation (PSO), Death and Dying (MEM), Intimacy (INT), Physical (FIS), Psychological (PSI)), Social Relationships (SOC), Environment (AMB), Psychological Losses (PPSI), Psychological Growth (CPSI) and Physical Changes (MFIS).

Discussion

The literature points out that cognitive training improves plasticity, cognition and cognitive reserve capacity of the brain, especially in elderly people without dementia, as well as being a protective factor in maintaining the natural decline and functional capacity of the elderly (Cabras, 2012; Gomes et al., 2020). In recent years, the area of cognitive intervention has undergone notable improvements in terms of the design of techniques, strategies and formats. In the literature, it is possible to find studies that address cognitive rehabilitation, cognitive stimulation and cognitive training, in individual or group formats, stimulating one or more cognitive domains, using several structured and analyzed resources, which can be digital, through cognitive intervention

software of games and tasks, paper exercises and board games, and cognitive workshops involving the performance of daily activities. These interventions can be developed in multiple environments, such as the university, the community and home.

However, when comparing the amount of evidence accumulated in the international literature with the national context, it can be noted that studies on cognitive training in Brazil are still minimal, especially in relation to protocols developed for the Brazilian population (Gomes et al., 2020; Golino & Flores-Mendoza, 2016). Based on these findings, the present article sought to develop an online cognitive training program and report the preliminary results of its impact on performance in routine and cognitive activities, on the presence and frequency of depressive symptoms and on the quality of life of healthy elderly people.

Several cognitive tasks were designed, focusing on stimulation and targeted at orientation, attention, memory, executive functions and visual-motor construction. The tasks were distributed in 24 individual training sessions, with a frequency of twice a week and the duration of the meetings of 1 hour.

The study was applied to a group of 21 elderly people, divided into a case group, which received training, and a control group, which did not receive training before the end of the case group. Of the four instruments used, the ANOVA test revealed a training effect on those referring to the variables: depressive symptoms, cognition and quality of life. Significant effects were observed immediately after the intervention on depressive symptoms, as assessed by the Geriatric Depression Scale [F = 8.43; p = 0.009 and η_G^2 = 0.31]; for the cognition subtests: language [F = 13.65; p = 0.002 and η_G^2 = 0.42], visual-spatial function [F = 13.79; p = 0.001 and η_G^2 = 0.4)], MMSE [F = 5.70; p = 0.028 and η_G^2 = 0.23] and ACE-R [F = 14.07; p = 0.001 and η_G^2 = 0.31] and in the quality of life for the physical domain [F = 4.69; p = 0.043 and η_G^2 = 0.02]. No gain effects were observed for occupational performance assessed by the RTI-E (p-values < 0.001).

The findings of this research are in line with the results of the Advanced Cognitive Training for Independent and Vital Elderly (ACTIVE) longitudinal study, which demonstrated an increase in cognitive performance immediately after cognitive training for participants in the intervention groups compared to the control group (Levy, 2014).

Although encouraging, the results suggesting cognitive improvement should be observed with some parsimony, since the participants may have benefited from a certain learning effect, since the same measurement instruments were used before and after training. In addition, we must consider that the improvement in mood may also have brought some benefit to cognitive functioning.

Regarding the performance of routine activities, the results of the present research are also in agreement with the ACTIVE study, which did not show an immediate improvement in performance, and it was only possible to note that groups that received the intervention had less difficulty performing the activities daily, compared with the control group after five years of intervention (Rebok et al., 2014; Levy, 2014). In the present study, a possible hypothesis for not having found any effect on the performance of routine activities is due to the fact that, as they were healthy elderly people, in both groups, the instrument used to assess functionality was not adequate and sufficiently sensitive to investigate the impact of milder cognitive deficits in tasks of greater complexity, as they focus on basic activities of daily living.

The results obtained, regarding the geriatric depression scale, showed that the case group after the intervention had a reduction in the score and there was an increase in the score of the control group. This reduction in the score of the case group may have occurred due to social interaction, as well as the creation of a space for the elderly to feel valued and encouraged to acquire new information and expand knowledge, results that are also present in other studies (Maria Netto et al., 2012; Brum, 2012; Irigaray et al., 2012).

Regarding the improvement in the quality of life of the case group compared to the control group, it may have occurred due to the fact that the participants were involved in an activity (cognitive training sessions) during the period of physical distancing caused by the pandemic of COVID-19. According to Chen (2020) and Van Orden et al. (2020), carrying out activities during the pandemic is essential, since physical distancing and the reduction of practiced activities have several consequences, affecting the physical and mental health of the elderly and compromising their functional capacity. In addition, it can impair immune functioning, which is capable of triggering or worsening depressive symptoms, anxiety and occupational malfunction, while a preventive intervention can improve them.

Based on this study, it was possible to notice that the training applied based on the fundamentals of occupational therapy, using the activity analysis tool, contributes to good cognitive performance, quality of life and well-being. However, a possible limitation of the study was the application of training in the individual modality; it is assumed that the group approach could generate larger effect sizes, since, according to the study by Irigaray et al. (2012), group activities favor the participants' sense of belonging and this directly impacts the improvement of cognitive and psychic performance. Another limitation observed was the scarcity of national intervention studies of the clinical trial type for healthy elderly people applied by occupational therapists, which reduced the possibility of discussing the results of the present study.

Conclusion

The main objective of this study was to investigate the impact of cognitive training, presenting the cognitive effects, in the presence and frequency of depressive symptoms, in the quality of life and in the performance of routine activities in healthy elderly people. Despite the limitations, the study led to interesting insights, which allowed for some assertions.

Through the analysis and discussion of the results, the effects of cognitive training on improving cognitive functions, promoting quality of life and reducing depressive symptoms in the elderly were verified.

Regarding the limitations found, it is suggested the need for more investments in longitudinal, intervention studies, aimed at carrying out cognitive training programs in the elderly applied by occupational therapists, especially in the period of physical distance that imposes a reduction in activities practiced out of home. It is considered that these programs are capable of contributing to a better monitoring of functional capacity and to the prevention of cognitive decline and, thus, favoring the autonomy and independence of the elderly.

Future research may overcome the limitations presented in this study with the inclusion of more rigorous assessments and analysis of different variables, with the purpose of facilitating and improving performance in daily activities.

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Author's Contributions

Gabrieli Pereira da Cruz collaborated in the structuring and application of the cognitive training, analysis of activities, data collection and writing of the initial and final version of the manuscript. Laísa Souza Pereira collaborated in the structuring and application of the cognitive training, analysis of activities, and data collection. Taiuani Marquine Raymundo worked equally in the critical review of the manuscript and contributed to the approval of the final version to be published. All authors approved the final version of the text.

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