

ORIGINAL ARTICLE

Effect of progressive muscle relaxation on the caregiver burden and level of depression among caregivers of older patients with a stroke: A randomized controlled trial

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Abstract

Aim: This study aimed to investigate the effect of progressive muscle relaxation on the caregiver burden and level of depression among the caregivers of older patients with a stroke.

Methods: This randomized, controlled experimental study was conducted between December, 2015 and July, 2017 with the caregivers of older patients with a stroke who had been admitted to the home care unit of a state hospital. The caregivers were randomly assigned to intervention ($n = 23$) and control ($n = 21$) groups, based on the study's inclusion criteria. The caregivers in the intervention group practiced progressive muscle relaxation exercises at home 3 days per week for 8 weeks. The control group had no intervention.

Results: The mean age of the older patients with a stroke was 80.15 ± 9.86 years and the mean duration of the disease was 39.07 ± 44.69 months. The mean age of the caregivers was 50.29 ± 12.62 years, 84.1% of whom were female, 38.6% were elementary school graduates, and 86.4% were married. It was found that there was a statistically significant decrease in the mean Zarit Caregiver Burden Scale and Beck Depression Scale scores of the caregivers in the intervention group after practicing progressive muscle relaxation, but this decrease was not statistically significant when the intervention and control groups were compared.

Conclusion: This study showed that there was a statistically significant decrease in the caregiver burden and level of depression among the caregivers in the intervention group after progressive muscle relaxation exercises, but that there was no statistically significant difference when the intervention and control groups were compared.

Key words: caregiver burden, depression, elderly, progressive relaxation exercise, stroke.

INTRODUCTION

Stroke is a major cause of long-term disability (Pai & Tsai, 2016) and has an increasing incidence (Stroke Association, 2015). Due to the physical and functional losses that present after a stroke, patients need long-term care and it is the family members who generally provide the necessary care (Jaracz *et al.*, 2015; Pai &

Tsai). In this process, the caregivers end up supporting the simple daily life activities, such as hygiene, mobilization, feeding, and medication, of the older patients with a stroke (Camak, 2015; Ganapathy *et al.*, 2015). King and Semik (2006) reported that the first month after discharge is the most difficult for a caregiver because a stroke causes permanent or temporary changes in the life of a loved person and the caregiver undertakes new roles as a result of the changes. The studies by Cobley, Fisher, Chouliara, Kerr, and Walker (2013) and Creasy, Lutz, Young, Ford, and Martz (2013) reported that healthcare providers ignore caregivers while deciding

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and planning discharge and do not give adequate information before discharge. Caregivers might experience many problems if they undertake the caregiving role without any plan after a stroke and lack caregiving information and skills (Bakas, Austin, Okonkwo, Lewis, & Chadwick, 2002). Such problems include stress, caregiver burden, anxiety, and depression (Denno *et al.*, 2013; Peyrovi, Mohammad-Saeid, Farahani-Nia, & Hoseini, 2012). Peyrovi *et al.* reported that 40% of caregivers for patients with a stroke had depression and that the caregiver burden facilitated the development of depression. Denno *et al.* showed that caregivers are more likely to have depression as the caregiver burden increases. Based on several studies, it has been concluded that the incidence of depression increases in parallel with an increased caregiver burden (De Fazio *et al.*, 2015; Denno *et al.*; Dou, Huang, Dou, Wang, & Wang, 2017; Liang *et al.*, 2017).

Problems, such as the caregiver burden and depression experienced by the caregivers of older patients with a stroke, might negatively affect the quality of patient care that is provided. Non-pharmacological therapies have been reported to be effective in decreasing the caregiver burden. Wang, Liu, Lv, and Li (2015) reported that the level of depression decreased in the caregiving spouses of patients with a stroke who had received acupuncture and moxibustion. Kim *et al.* (2012) showed that the caregiver burden decreased when individual telcare was provided for caregivers. Yoo, Jeon, and Yang (2007) reported that support group intervention for the caregivers of patients with a stroke resulted in a lower caregiver burden. According to Mahoney, Tarlow, and Jones (2003), providing caregivers with counseling by using the computer and telephone system in their home decreased their levels of anxiety and depression.

The non-pharmacological methods that nurses can offer to caregivers include progressive muscle relaxation (PMR) exercises. Studies that have been conducted with different patient groups have shown that PMR exercises are effective in reducing blood pressure (Gupta, 2014), the duration of nausea and vomiting (Molassiotis, Yung, Yam, Chan, & Mok, 2002), levels of anxiety and depression (Lolak, Connors, Sheridan, & Wise, 2008), and the length of the hospital stay (Zhou *et al.*, 2015), as well as increasing the quality of life (Choi, 2010). There is no study in the literature, however, that has investigated the effect of PMR exercises on the caregiver burden. Therefore, the effect of PMR exercises on the caregiver burden and the level of depression among the caregivers of older patients with a stroke was determined.

METHODS

Study design

This randomized controlled experimental study was conducted with the caregivers of older patients with a stroke who applied to the home care unit of Aksaray University Training and Research Hospital, Aksaray, Turkey, between December, 2015 and July, 2017 and who consented to participate. As there is no registration center for randomized controlled studies in Turkey, no register number was given.

Participants

The following inclusion criteria were used for selecting the study sample of caregivers: ≥ 18 years of age; having provided care for an older patient with a stroke for at least 3 months; no psychiatric disease diagnosis; no visual, hearing, or speech impairment that prevented understanding the information that was provided; practicing PMR exercises; and had provided consent to participate in the study.

The study universe consisted of 120 caregivers of older patients with a stroke who received services from a home care unit of Aksaray University Training and Research Hospital. It was attempted to contact all individuals in the study universe, but the sample size was not calculated. While selecting the sample, a list of 120 older patients with a stroke was acquired from the home care unit and the designated odd-numbered patients with a stroke were assigned as the intervention group and the designated even-numbered patients with a stroke were assigned as the control group. Contact was made with all of the caregivers. Fifteen caregivers were excluded because they did not meet the study criteria and 40 caregivers were excluded because they did not consent to participate (Fig. 1). In addition, five caregivers could not be contacted during the study by using the communication information that they provided in the first interview, three caregivers did not practice PMR exercises regularly, three caregivers decided to discontinue participation in the study, the caregivers of two patients with a stroke changed, three patients were hospitalized, and five patients died. Therefore, the study was completed with 44 caregivers. The power analysis that was conducted at the end of the study was based on the extant literature, which indicated a power level of 80% and an error level of 5%, with a sample size of 32 (16 caregivers in the intervention and control groups each). During the actual study, 23 caregivers in the

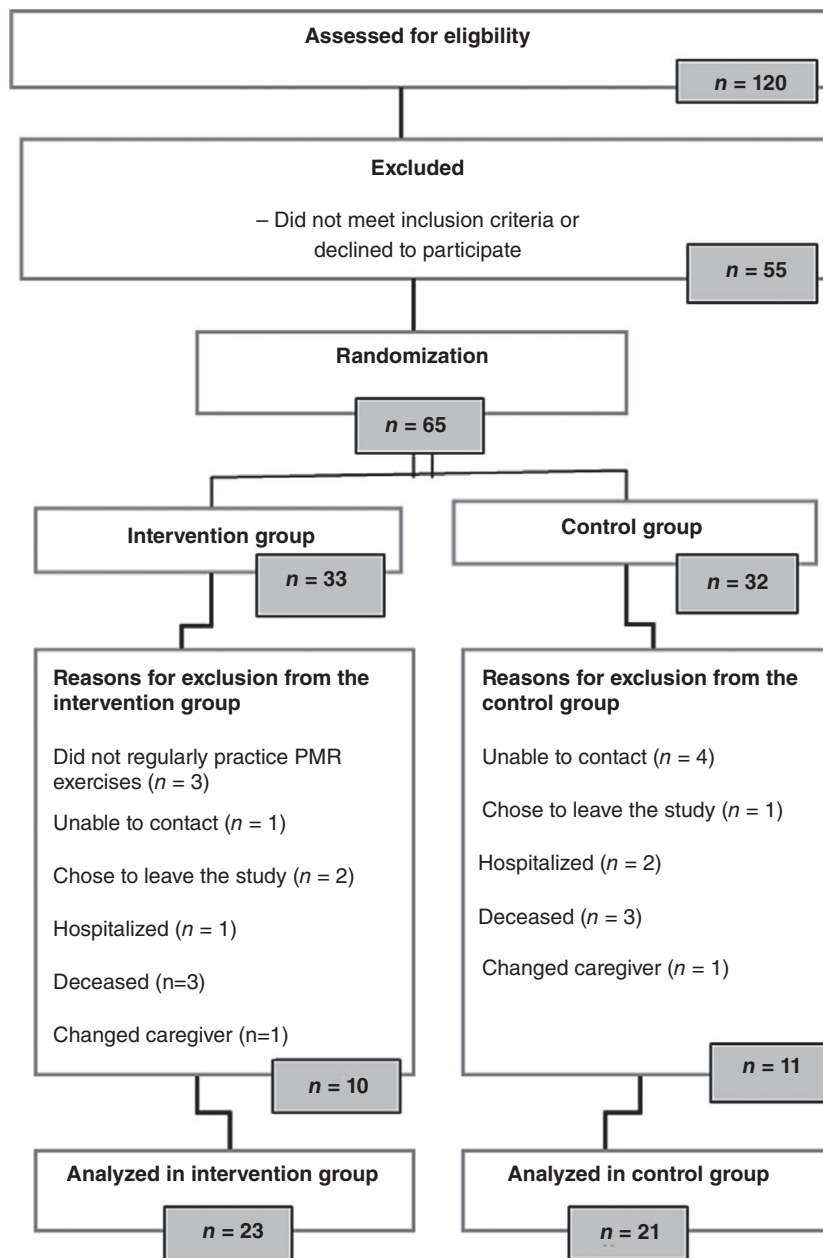


Figure 1 Flow chart of patient selection.

intervention group were evaluated and 21 caregivers in the control group, for a total of 44 caregivers.

Measures

The following instruments were administered to the study sample to collect the necessary data: an Introductory Information Form, which included questions on the patients and caregivers and was developed after a review of the literature; the Zarit Caregiver Burden Scale (ZCBS); and the Beck Depression Scale (BDS).

The Introductory Information Form consisted of 32 questions, including seven questions on the demographics and medical information of the older patients with a stroke, and 25 questions on the demographics and caregiving information of the caregivers.

The ZCBS was developed by Zarit, Ryeever, and Bach-Peterson (1980). The ZCBS includes 22 statements that measure the effect of caregiving on caregiver life by using a Likert scale from 0 to 4, as follows: 0, “never;” 1, “rarely;” 2, “sometimes;” 3, “quite frequently;” and

4, “nearly always.” The minimum score on the ZCBS is 0 and the maximum score is 88 (Zarit & Zarit, 1990). There are no data pertaining to a cut-off point for the ZCBS; however, a higher score indicates a higher caregiver burden. The validity of the ZCBS was studied by İnci and Erdem (2008), who found that the internal consistency coefficient was between 0.87 and 0.94 and the test–retest reliability was 0.71.

The BDS is a self-reporting questionnaire that consists of affective, cognitive, somatic, and motivational components. The BDS was developed by Beck *et al.* (1961) with the purpose of measuring the behavioral symptoms of depression in adolescents and adults. The BDS was revised in 1978 to eliminate the sections on severity. Each BDS item is rated on a 4-point Likert-type scale ranging from 0 to 3. Based on the total score of the scale, the severity of depression is as follows: 0–9, “minimal;” 10–16, “mild;” 17–29, “moderate;” and 30–63, “severe” (Kılınç & Torun, 2011). The Cronbach’s alpha value of the 1978 Turkish version of the BDS was reported to be 0.80 (Hisli, 1989).

Procedures

After identifying the caregivers, based on the study inclusion criteria, home visits were arranged. During the home visits, the caregivers were informed about the study and consent was obtained. Then, the Introductory Information Form, ZCBS, and BDS were administered to the caregivers. The data of the study were collected by the face-to-face interview method.

After distributing the data collection forms, the caregivers in the intervention group were verbally trained on how to practice the PMR exercises. As part of the training, the intervention material included a voice recording (~28 min in length) of the *Relaxation Exercises CD*, which was prepared by the Turkish Psychological Association (Boyacıoğlu & Kabakçı, 2015). The researchers instructed the caregivers to listen to the voice commands for the PMR exercises on a MP3 player in a quiet environment and guided the caregivers through the exercises to ensure the proper exercise technique. During the relaxation exercises, the individuals first deliberately tighten their muscle groups in the hands, arms, neck, shoulder, face, chest, abdomen, hip, feet, and fingers (muscle groups starting with the hands and ending with the feet), then relax the muscles according to the commands on the CD. The training period was ~60 min in length for each individual.

After completing the informative training, the individuals were asked to practice the exercises, which required ~28 min to complete, 3 days per week for 8 weeks.

The researchers contacted the caregivers twice per week to discuss the PMR exercises. In addition, the researchers provided the caregivers with their telephone numbers so that the caregivers could contact the researchers regarding any problem that was encountered in practicing the PMR exercises. There was no study in the literature that examined PMR exercises’ effect on the caregiver burden of caregivers. In the studies that examined PMR exercises’ effect on depression, the number of PMR exercises varied between two sessions and 24 sessions in 12 weeks (Lolak *et al.*, 2008; Zhao *et al.*, 2012; Zhou *et al.*, 2015). In this study, the number of PMR exercises was determined as a total of 24 sessions, with three sessions per week for 8 weeks, in line with the number of PMR exercises in the literature. After the study practice period was completed, the researchers made home visits and completed the Introductory Information Form, ZCBS, and BDS again.

The Introductory Information Form, ZCBS, and BDS were distributed to the caregivers in the control group during the first interview. Another home visit was made 8 weeks after the first visit and these forms were administered again.

Data analysis

The study data were evaluated by using IBM SPSS software (v. 23.0; IBM Corporation, Armonk, NY, USA). Descriptive statistics (number, percentile, mean, and standard deviation) were used to present the introductory information of the caregivers in the intervention and control groups. A chi-squared test was used to determine the difference between groups for the categorical data. The Shapiro–Wilk test was used to determine the normal distribution suitability of the quantitative variables. A *t*-test was used to determine the intergroup differences of the variables with a normal distribution and the Mann–Whitney U-test was used for the non-normally distributed data. Moreover, before and after PMR exercise comparisons within each group were made by using a paired *t*-test for the normally distributed data and the Wilcoxon’s test was used for the non-normally distributed data, $P < 0.05$ indicated statistically significant differences.

Ethical considerations

Official permission for the study was obtained from the Aksaray University Human Studies Ethics Committee (2015/22) and Aksaray University Training and Research Hospital, Aksaray, Turkey. Study approval was granted by the Turkish Psychological Association

for using the PMR exercise recordings. In addition, consent was received from the individuals who agreed to participate in the study.

RESULTS

The mean age of the older patients with a stroke who were included in this study was 80.15 ± 9.86 years; 70.5% were female and 61.4% were illiterate. The mean duration of the disease was 39.07 ± 44.69 months (minimum: 3–maximum: 180 months). The stroke-related problems included a loss of balance (97.7%), an inability to walk (88.6%), urinary (77.3%) and fecal (70.5%) incontinence, feeding (52.3%) and communication (40.9%) difficulties, and insomnia (13.6%). A comparison of the intervention and control groups revealed no statistically significant difference with respect to age, sex, marital status, co-existing chronic diseases, and stroke-related problems ($P > 0.05$; Table 1).

Table 2 presents the descriptive information of the caregivers. Their mean age was 50.29 ± 12.62 years; 84.1% were female and 52.3% had health problems. The caregivers provided care to the older patients with a stroke for feeding, ambulation, toileting needs, treatment, and running errands. A comparison of the intervention and control groups revealed that there was no statistically significant difference between the groups with respect to age, sex, education, scope of care, and assistance in patient care ($P > 0.05$).

The mean ZCBS scores of the caregivers in the intervention group before and after the PMR exercises were 49.66 ± 12.42 and 42.89 ± 10.86 , respectively; the difference between the mean ZCBS scores was statistically significant ($P < 0.05$). There was no statistically significant difference between the mean before and after ZCBS scores of the caregivers in the control group ($P > 0.05$). The comparison of the intervention and control groups revealed no statistically significant difference between the mean ZCBS scores after the PMR exercise intervention ($P > 0.05$; Table 3).

The mean BDS scores of the caregivers in the intervention group before and after the PMR exercises were 19.48 ± 12.20 and 10.83 ± 7.20 , respectively. The difference between the mean BDS scores of the caregivers in the intervention group before and after the PMR exercises was statistically significant ($P < 0.05$). There was no statistically significant difference between the mean BDS scores of the caregivers in the control group between the two evaluations ($P > 0.05$). A comparison

of the intervention and control groups revealed no statistically significant difference between the mean BDS scores after the PMR exercise intervention.

There was a positive linear and moderate relationship between the ZCBS scores and the duration of caregiving for the older patients with a stroke in the intervention and control groups ($r = 0.483$, $P < 0.05$ and $r = 0.487$, $P < 0.05$, respectively). The caregivers in both groups had higher ZCBS scores as the duration of caregiving increased ($P < 0.05$). During the study, the individuals who did PMR exercises did not report any adverse effects due to the PMR exercises.

DISCUSSION

In the literature, PMR exercises are defined as a technique of flexing and relaxing large muscle groups voluntarily and gradually in order to achieve deep relaxation (Mackereth & Tomlinson, 2010; McGuigan & Lehrer, 2007). The PMR exercises had positive effects both on the caregivers' physiological and psychological states. With the stimulation of the parasympathetic nerve system during and after the PMR exercises, the heart rate, respiratory rate, blood pressure, and physiological tension decrease, the focus moves away from problems, and a deep state of relaxation is achieved (McGuigan & Lehrer). The level of relaxation that is achieved with the PMR exercises decreases the tissues' need for oxygen and reduces the level of chemicals, such as lactic acid (McGuigan & Lehrer) and cortisol (Pawlow & Jones, 2005). The changes that are caused by the PMR exercises can have a positive effect on caregivers' stress management and thus on their depression. If caregivers' negative emotions due to caregiving shift to positive ones, caregivers' endurance will increase and the caregiver burden will relatively lighten.

This study investigated the effect of the PMR exercises on the caregiver burden and the level of depression among the caregivers of older patients with a stroke. The study's findings presented limited evidence regarding the effectiveness of the PMR exercises as applied to the caregivers of older patients with a stroke. Thus, the study's hypotheses were partially supported. After practicing the PMR exercises, the caregivers in the intervention group had lower mean ZCBS scores, but this difference was not statistically significant when compared to the control group (Table 3). The lack of a significant difference between groups might be related to the small sample sizes in both groups. Choi (2010) examined the effects of music and the PMR exercises on

Table 1 Introductory information on the older patients with a stroke

Variable	Intervention group (<i>n</i> = 23)		Control group (<i>n</i> = 21)		Statistical evaluation
	N	%	N	%	
Mean age (years) ± SD	80.09 ± 9.93		80.24 ± 10.04		0.241 [†]
<75	5	21.7	8	38.1	0.235
≥75	18	78.3	13	61.9	
Sex					
Female	18	78.3	13	61.9	0.235
Male	5	21.7	8	38.1	
Education					
Illiterate	17	73.9	10	47.6	–
Literate	4	17.4	3	14.3	
Elementary school	1	4.3	8	38.1	
University	1	4.3	0	0.0	
Marital status					
Married	18	78.3	18	85.7	–
Single	1	4.3	3	14.3	
Widowed/divorced	4	17.4	0	0.0	
CVA disease duration (months) Median (25th–75th percentile)	24.00 (6.00–48.00)		24.00 (7.00–48.00)		0.723 [‡]
<4 years	14	60.9	16	76.2	0.276
≥4 years	9	39.1	5	23.8	
Older persons's stroke-related problems [§]					
Communication	11	47.8	7	33.3	0.329
Feeding	11	47.8	12	57.1	0.537
Unable to walk	21	91.3	18	85.7	0.658
Balance loss	22	95.7	21	100.0	–
Urinary incontinence	19	82.6	15	71.4	0.481
Fecal incontinence	16	69.6	15	71.4	0.892
Visual disorders	1	4.3	3	14.3	0.335
Insomnia	3	13.0	3	14.3	–

[†] *t*-test was applied; [‡] Mann–Whitney U-test was applied; [§] Multiple answers were given to the question. Stroke; SD, standard deviation.

anxiety, fatigue, and quality of life in family hospice caregivers and found that the relaxation exercises were effective in increasing their quality of life and decreasing anxiety and fatigue, but reported no statistically significant difference between the intervention and the control groups. Hartke and King (2003) evaluated the effectiveness of a telephone group intervention on the caregiver burden among the caregivers of patients with a stroke and found that although the caregiver burden decreased in the intervention group, the difference between the intervention and control groups was not statistically significant. Eames, Hoffmann, Worrall, Read, and Wong (2013) used written materials and verbal reinforcement for patients with a stroke and caregivers as an intervention and found no significant difference between the intervention and control groups with respect to the caregiver burden. Similarly, Forster *et al.* (2013) reported no significant difference between the

intervention and control groups with respect to the caregiver burden after a training program of knowledge and skills that was structured for caregiver needs. Although the interventions in the aforementioned studies were not the same as the intervention used herein, the results were similar.

The literature includes studies with results that differ from the results of the current study (Kim *et al.*, 2012; Perrin *et al.*, 2010). Specifically, those studies reported that the caregiver burden decreased in the intervention group and that the difference between the mean caregiver burden scores in the intervention and control groups was statistically significant. These studies used different intervention methods, including an individual telecare intervention for stroke caregivers (Kim *et al.*), a supportive educative learning program (Oupra, Griffiths, Pryor, & Mott, 2010; Yoo *et al.*, 2007), and a video-based training program that consisted of skill

Table 2 Descriptive statistics of the caregivers of older patients with a stroke

Variable	Intervention group (<i>n</i> = 23)		Control group (<i>n</i> = 21)		Statistical value
	N	%	N	%	
Mean age (years) ± SD	47.43 ± 11.29		53.43 ± 13.51		0.117 [†]
<50	12	52.2	8	38.1	0.349
≥50	11	47.8	13	61.9	
Sex					
Female	21	91.3	16	76.2	0.232
Male	2	8.7	5	23.8	
Caregiving duration (months) Median (25th–75th percentile)	48.00 (12.00–120.00)		24.00 (14.00–54.00)		0.123 [‡]
<6 years	13	56.5	18	85.7	0.034
≥6 years	10	43.5	3	14.3	
Scope of care provided by caregiver [§]					
Feeding	22	91.3	21	100.0	–
Moving	21	91.3	21	100.0	–
Toileting	22	95.7	21	100.0	–
Treatment	19	82.6	19	90.5	0.666
Running economic errands	17	79.5	19	90.5	0.245

[†] *t*-test was applied; [‡] Mann–Whitney U-test was applied; [§] Multiple answers were given to the question. SD, standard deviation.

development, education, and supportive problem-solving (Perrin *et al.*). The difference between the results of the previous studies and the current study can be attributed to factors, such as the small sample size or the differences in interventions, cultural characteristics of the study participants, and the delivery of social support and healthcare services.

After practicing the PMR exercises, the mean BDS scores of the caregivers in the intervention group decreased, but the difference in the mean BDS scores was not statistically significant when compared to the control group (Table 3). Similarly, Choi (2010) examined the caregivers of hospice patients and found that although the PMR exercises decreased the anxiety levels of the caregivers, there was no statistically significant

difference between groups. Mahoney *et al.* (2003) provided caregivers with counseling through computer and telephone systems that were placed in their house. The depression and anxiety levels of the caregivers in the intervention group decreased, but the difference between the intervention and control groups was not significant. Wang *et al.* (2015) reported that the caregiving spouses of patients with a stroke who were provided with acupuncture and moxibustion had a statistically significant decrease in the level of depression in both intervention groups. Smith, Egbert, Dellman-Jenkins, Nanna, and Palmieri (2012) conducted a Web-based intervention to alleviate depression in patients with a stroke and their informal caregivers and showed that the caregivers in the intervention group had significantly lower

Table 3 Mean caregiver burden and Beck Depression Scale (BDS) scores for the caregivers of the older patients with a stroke before and after the PMR exercises

Scale	Intervention group Mean ± SD	Control group Mean ± SD	<i>P</i> -value
Mean ZCBS score			
Preliminary evaluation	49.66 ± 12.42	43.52 ± 18.79	0.211 [‡]
Final evaluation	42.89 ± 10.86	41.33 ± 15.24	0.705 ^{‡‡}
Statistical evaluation	0.001 [†]	0.092 [†]	–
Mean BDS score			
Preliminary evaluation	19.48 ± 12.20	15.81 ± 8.39	0.256 ^{‡‡}
Final evaluation	10.83 ± 7.20	14.86 ± 7.92	0.084 ^{‡‡}
Statistical evaluation	0.001 [†]	0.059 [†]	–

[†] Paired *t*-test was applied; [‡] Wilcoxon's test was applied. ZCBS, Zarit Caregiver Burden Scale.

depression than the caregivers in the control group. Although the interventions in the studies differed, the findings were similar to the findings in the current study.

In the current study, a positive linear and moderate relationship between the ZCBS scores and the duration of caregiving rendered to older patients with a stroke in the intervention and control groups has been demonstrated ($r = 0.483$, $P < 0.05$ and $r = 0.487$, $P < 0.05$, respectively). Greenwood, Mackenzie, Cloud, and Wilson (2008) examined the factors that influence the burden of the caregivers of patients with a stroke and found that the interpersonal relationships of the caregivers deteriorated and that the caregiver burden increased as the duration of caregiving increased. The meta-analysis that was conducted by Pinquart and Sorensen (2007) focused on the caregivers of patients with a stroke and reported that the duration of caregiving was important and that the caregiving burden increased as the duration of caregiving increased. McCullagh, Brigstocke, Donaldson, and Kalra (2005) examined the quality of life and burnout level of the caregivers of patients with a stroke and reported that the increase in the duration of caregiving affected the life space of the caregivers and increased the caregiver burden. The results of this study are similar to the results of the aforementioned studies.

Limitations of the study

The most important limitation of the current study was the small sample size. The results that were obtained from this study are limited to the individuals who care for elderly patients with a stroke in a state hospital's home care unit.

CONCLUSION

In the current study, the effect of PMR exercises on the caregiver burden and level of depression among the caregivers of older patients with a stroke was examined and it was found that the caregivers in the intervention group had lower mean ZCBS and BDS scores after practicing the PMR exercises. The comparison of the caregiver burden and mean BDS scores of the caregivers in the intervention and control groups, however, revealed no statistically significant difference. In addition, it was found that the caregiver burden increased as the duration of caregiving increased.

Based on this study's findings, it is recommended to conduct studies with larger sample groups, carry out interventions more frequently (in the form of controlled

interventions), and apply the PMR exercise intervention by targeting caregivers, along with different interventions. Another recommendation is to plan the interventions to decrease the caregiver burden as soon as caregiving commences.

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DISCLOSURE

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

C. K. Y., F. Ç., and G. D. A. were responsible for the study design; C. K. Y. and G. O. carried out the data collection and conducted the data analyses; C. K. Y., F. Ç., G. D. A., and S. K. were responsible for drafting the manuscript and made critical revisions to the manuscript for important intellectual content. All the authors approved the final version of the manuscript.

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