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The Effect of Progressive Muscle Relaxation Exercises Applied to Caregivers of Palliative Care Patients on Stress Coping Styles and Anxiety Levels: A Randomised Controlled Trial

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ABSTRACT

Objective: This study aimed to investigate the effect of progressive muscle relaxation exercises on the ability to cope with stress and anxiety level in caregivers of palliative care patients.

Design: The study was conducted as a single-blind study with pretest–posttest randomised control group.

Method: The study was conducted between May 11 and July 22, 2021. The caregivers in the experimental group were asked to perform a total of 28 sessions of progressive muscle relaxation exercise for 30 min a day for 4 weeks. No interventions were made in the control group during the study. Data were collected using the 'Caregiver Information Form,' 'State-Trait Anxiety Inventory (STAI)' and 'Stress Coping Styles Scale (SCSS).' Number and percentage, mean, standard deviation, Chi-Square Test, independent groups *t*-test, dependent groups *t*-test, Mann–Whitney *U* Test, Wilcoxon Signed Rank Test and simple linear regression analysis were used to summarise the data obtained from the study.

Results: A total of 66 caregiver patient relatives, 33 in the experimental group and 33 in the control group, were included in the study. When the posttest mean scores of caregivers in the experimental and control groups were compared, it was found that the experimental group's STAI and negative SCSS subscale mean scores decreased compared to the control group's mean scores, while the positive SCSS subscale mean scores increased, and the difference was statistically significant ($p < 0.05$). It was found that the variable of progressive muscle relaxation exercise had a negative effect on anxiety ($\beta = -0.962$), helpless approach ($\beta = -0.535$) and submissive approach ($\beta = -0.643$), while it had a positive and significant effect on seeking social support ($\beta = 0.765$), self-confident approach ($\beta = 0.832$) and optimistic approach ($\beta = 0.493$) ($p < 0.001$).

Conclusion: It was found that after progressive muscle relaxation exercises, the anxiety of caregivers of palliative care patients decreased, the use of positive stress coping methods increased and the use of negative stress coping techniques decreased.

Patient or Public Contribution: It is not necessary.

Trial Registration: ClinicalTrials.gov identifier: NCT04880941

1 | Introduction

Palliative care is defined as an approach that enhances the quality of life of the patient and the family who are facing a severe and life-threatening illness through early recognition, evaluation and treatment of other physical, psychosocial and spiritual problems, especially pain. Palliative care is needed for patients with chronic diseases such as cancer, cardiovascular disease, chronic respiratory disease and kidney failure (World Health Organisation 2018). The need for palliative care has been increasing as the number of patients suffering from non-transmissible and cancerous terminal illnesses increases with the increase in older population (Connor and Sepulveda Bermedo 2018). Individuals who care for these patients are an essential and integral part of the treatment and care process in the palliative care process (World Health Organisation 2018).

Palliative care patients' physical, mental and cognitive symptoms worsen or increase as the disease progresses, causing caregiver anxiety and stress and highlighting the need for support (Yıldız et al. 2016). In caregiver family members, the process of palliative care causes emotional problems, such as the extended stay in the hospital environment, role shifts and challenges in adapting to the changing roles, anxiety, depression, grief, sorrow, burnout, helplessness and social isolation (Turgut and Soylu 2020).

Caregivers have been reported to have higher levels of anxiety than the general population (Leongnarktongdee and Laurujisawat 2021). It was found that in this case, caregivers adopted negative coping strategies such as denial, substance use, behavioural detachment, self-accusation and anger release (Antony et al. 2018). Without mental health, one cannot hope to function properly (in this case, to care for the patient). Therefore, the mental well-being of caregivers is an issue related to palliative care (Leongnarktongdee and Laurujisawat 2021). Mostly due to time constraints, health professionals often focus on the patient and may not do a comprehensive screening of carer problems. This makes caregivers' need for support less visible. Furthermore, caregivers are often reluctant to express their needs (Duran et al. 2019).

Relatives providing primary care form an important part of the care and treatment of palliative patients. The main aim of palliative care is to alleviate the suffering of patients and their families in relation to the disease process (Kılıç et al. 2024). Particularly, anxiety and stress management initiatives for caregivers of palliative care patients can have positive outcomes for both patients and caregivers. Caregiver support is also found to improve patient care outcomes, enhance well-being, ensure home care success and make a significant economic contribution to the health care system (Hudson and Payne 2011).

In recent years, it can be seen that supportive practices such as mind–body exercises including breathing exerises, yoga, meditation and music therapy and progressive muscle relaxation (PMR) exercises are used in improving stress coping styles and helping to decrease stress and anxiety (Martin and Keats 2014; Ozgundondu and Metin 2019; Steinberg et al. 2017; Yilmaz et al. 2019). One of the most common methods performed by nurses is PMR exercise (Yilmaz et al. 2019). The most important advantage of using PMR exercise in anxiety and stress management is that the method is an easy-to-learn, no-cost, practical method with no side effects (McCallie et al. 2006; Yilmaz et al. 2019). The simple structure and economic efficiency of this technique make it an excellent complementary treatment that can be applied by nurses trained in PMR methods (Baykal and Bilgic 2024). Nurses can provide counselling to palliative caregivers to offer emotional support for the difficulties they face and to help them cope with stress. In this way, they can support the well-being of caregivers by contributing to the reduction of their anxiety levels (Baykal and Bilgic 2024; Hudson and Payne 2011).

While it is stated in literature that PMR exercises decrease the care burden, stress, fatigue and depression of caregivers (Choi 2010; O'Donnell 2017; Yilmaz et al. 2019), no studies were found which examined its effect on coping with stress and anxiety. As a result, the study was carried out to examine the effect of PMR exercise on coping with stress and anxiety levels among caregivers of palliative care patients.

1.1 | Research Hypotheses

H1. *PMR exercise reduces the anxiety of caregivers of palliative care patients.*

H2. *PMR exercise enhances the positive stress coping styles of caregivers of palliative care patients.*

H3. *PMR exercise reduces the way caregivers of palliative care patients cope with negative stress.*

2 | Methods

2.1 | Study Design

This study is a single-blind study with a pretest–posttest randomised control group. Blinding was performed in the analysis of the data and interpretation of the results (Hróbjartsson et al. 2013).

2.2 | Sample and Participants

Population of the study consists of 100 caregivers of patients hospitalised in the palliative care service of Fırat University Hospital between May 11 and July 22, 2021. There were a total of 100 caregivers in the two clinics at the time of the study. 14 of the caregives were not included in the study since they did not want to participate, while 20 were not included since they did not meet the study criteria. As a result, the sample consisted of 66 (80% participation) caregivers, who met the research criteria (being an informal caregiver, individuals older than 18 years of age, those who can communicate sufficiently, those who have been approved by the physician that they do not have a physical obstacle to exercise, those who have cared for their patient for at least 4 weeks and those who have a phone that can download whatsapp) and who agreed to participate (Figure 1). The study was conducted with 66 caregivers who met the inclusion criteria. The adequacy of the sample was determined by post hoc power

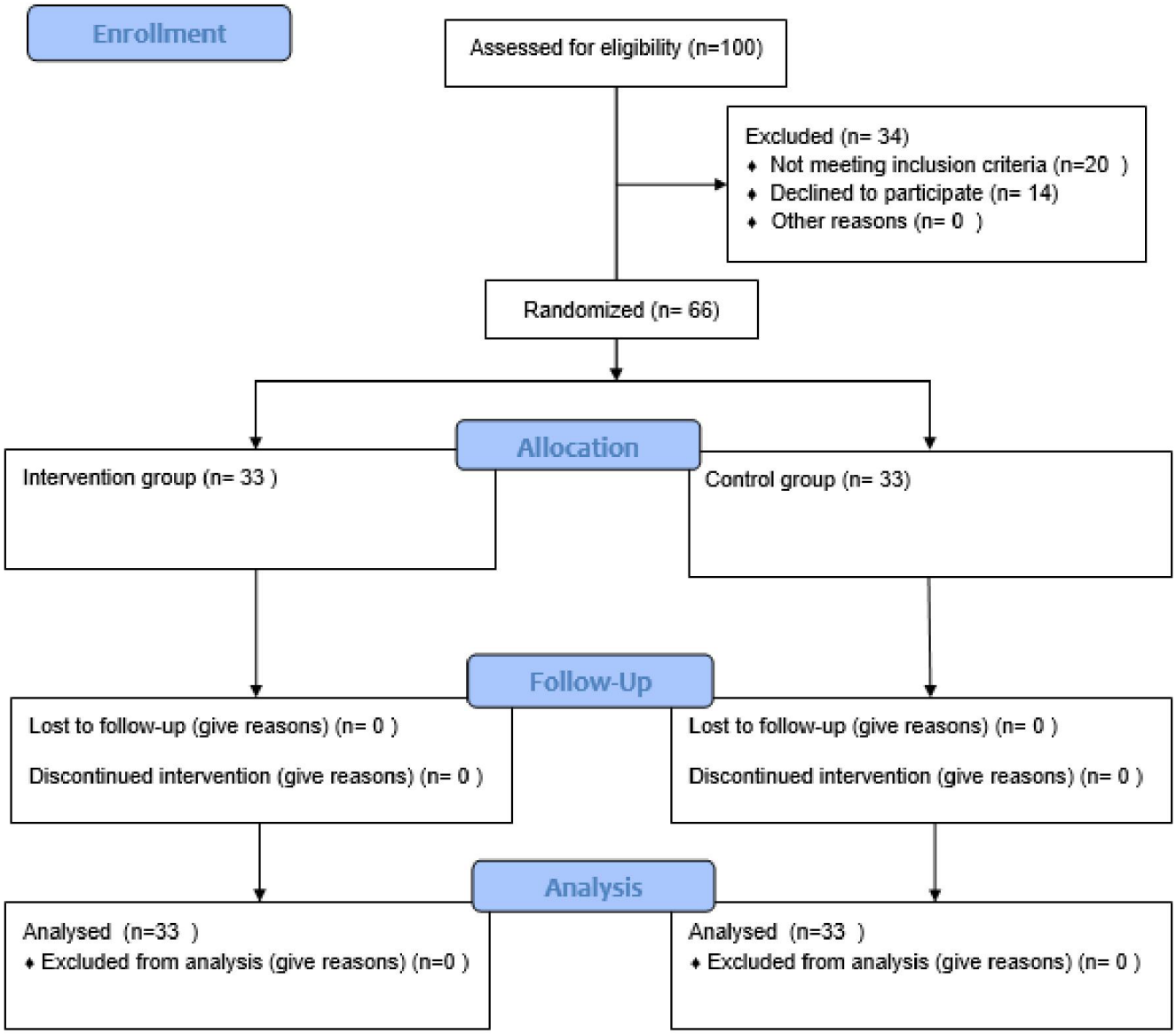

FIGURE 1 | CONSORT 2010 flow diagram.

analysis. In order to determine whether the sample size was sufficient, posthoc power analysis was performed by using G-Power 3.1.9.4 program. Considering the study design, Optimistic Approach with the smallest R^2 value (0.243) was taken into account for regression analysis. According to this analysis, it was found that effect size was 0.312 (moderate) and effect power was 0.95 with a confidence interval of 99% and significance level of 0.05. These values show that the sample size is at the desired level (Çapık 2014).

2.3 | Randomisation

There are two corridors (corridor 1 and corridor 2) in the palliative care unit. The rooms in which the groups would stay in the corridor were determined by an independent researcher by drawing lots. As a result of the draw, the experimental group was assigned to corridor 2 and the control group was assigned to corridor 1. The Random Integer Generator method in the Numbers subheading of the random.org website was used to assign the caregivers to the groups randomly. In the single-column list generated between 1 and 66, caregivers were randomly assigned to numbers 1 or 2. According to the result of the draw, number 1 represented the control group and number 2 represented the experimental group (Figure 1) (Appendices S1 and S2).

2.4 | Data Collection Tools

Data were collected by using the 'Caregiver Information Form,' 'State-Trait Anxiety Inventory (STAI)' and 'Stress Coping Style Scales (SCSS).'

2.4.1 | Caregiver Information Form

It is a questionnaire developed by the researcher that includes the individual characteristics (age, sex, educational status,

marital status, employment status, place of residence, income status, disease of the patient who was being cared for, degree of relation to the patient who was being cared for, duration of care, the state of having someone to help in the care, the state of delaying treatment or check-up due to COVID-19, the state of thinking that care load is increased during the pandemic period and the state of thinking that the pandemic period affected the patient negatively) of caregivers of palliative care patients who agreed to participate in the study.

2.4.2 | STAI

Spielger et al. (1970) developed the STAI. Oner and Le Compte conducted the scale's validity and reliability in Turkey (1983) (Öner and Le Compte 1983). The scale consists of two parts, the State Anxiety Inventory and the Trait Anxiety Inventory. STAI was developed to determine how a person feels at a particular time and under particular conditions. STAI's emotions and behaviours are responded to by selecting one of the alternatives, (1) none, (2) a little, (3) a lot and (4) completely, depending on their experience level. Each scale contains two types of statements with 20 items. These are direct and reversed statements. Negative emotions are expressed through direct statements, while positive emotions are expressed through reversed statements. Items 1, 2, 5, 8, 10, 11, 15, 16, 19 and 20 on the State Anxiety Scale are reversed statements. The scale yields a total score that ranges from 20 to 80. A score of 0–19 indicates no anxiety, 20–39 indicates mild anxiety, 40–59 indicates moderate anxiety and 60–79 indicates severe anxiety, with a score of 60 or higher indicating the need for professional help (Öner and Le Compte 1983; Spielger et al. 1970). In this study, the Cronbach alpha value of STAI was found to be 0.90.

2.4.3 | SCSS

This scale was developed by Folkman and Lazarus (1980). There are 30 items on the scale, which were adapted into Turkish and abbreviated by Şahin and Durak (1995). It consists of 5 domains: self-confident approach (7 items), optimistic approach (5 items), helpless approach (8 items), submissive approach (6 items) and approach to seeking social support (4 items). The scale is scored on a four-point scale ranging from '0—Not at all appropriate' to '3—Very acceptable.' The 1st and 9th elements on the scale, on the other hand, are scored reversely. Individuals with high domain scores are more likely to use this approach (Şahin and Durak 1995). In this study, Cronbach alpha values of SCSS and its domains were found to vary between 0.702 and 0.764.

2.5 | Data Collection

In the first interview, both the experimental group and the control group subjects were informed about the objective and content of the study before the research nurse filled out the forms and scales, and written consent was obtained for their participation. Data were collected with the Caregiver Information Form, the STAIS and SCSS. After 4 weeks, the caregivers in the experimental and control groups filled in the STAIS and SCSS again by the researcher.

2.6 | Intervention

Considering the studies conducted, the use of PMR exercise was performed every day for 4 weeks, for a total of 28 sessions (Choi 2010; Ozgundondu and Metin 2019; Yilmaz et al. 2019, 2015). 'Relaxation CD' prepared by Turkish Psychologists Association was used for the application. A 30-min part of this CD in which relaxation exercises are explained is accompanied by verbal instructions, and the sound of river was used. The researcher nurse first of all explained the caregivers in the experimental group the definition, purpose, uses and application techniques of PMR exercises. The researcher nurse then showed the steps of PMR exercises in practice. The steps were next performed with the caregivers. Finally, the researcher checked whether the application was performed correctly by the caregivers. The required explanations were made again in cases when caregivers did not understand.

A whatsapp group was formed for the caregivers in the experimental group by the researcher and caregivers were contacted via this group. After the 'Relaxation Exercises CD' prepared by Turkish Psychologists Association was turned into a format that can be used on whatsapp, it was shared in this group as a voice recording. The caregivers were asked to perform PMR exercise in accordance with the instructions in the voice recording. They were told that they had to perform the application regulary for 30 min in the morning hours for 4 weeks. In order for caregivers to apply the sessions regularly and not to miss their sessions, PMR exercise was reminded every day at 08:00 from the whataspp group. The caregivers were asked to share the messages stating that they performed the muscle relaxation exercise daily for 4 weeks in the whatsapp group. Once a week, the caregivers were called by the researcher and asked whether there were any problems about the practices.

During the study, no intervention was made in the control group. However, at the end of the study, the individuals in the control group were informed that progressive relaxation exercise was performed within the scope of the study and progressive relaxation exercise was applied to three patient relatives who were interested.

2.7 | Steps of PME

After the procedures were explained to the participants and their consent was obtained for participation, PMR exercises were performed in the hospital or at home according to the protocol described below.

Implementation environment: The temperature of the application room for PMR exercises should be between 24°C and 26°C. The room should be quiet, clean and well lit with soothing light. The room should be relaxing, soothing and spacious.

Implementation position: Caregivers should sit in a comfortable armchair with their hands on their legs during PMR exercise sessions.

Timing: Exercises can be performed 1 h after breakfast, lunch or dinner.

2.8 | Evaluation of Data

The data obtained in the study were analysed by using SPSS (Statistical Package for Social Sciences) 25.0 program. In the analysis of data, in addition to numbers, percentages, means and standard deviations, Chi-square analysis was used to compare the demographic characteristics between the intervention group and the control group (categorical measurements), independent groups t-test and Mann–Whitney U test were used to compare the factors of STAI and SCSS between the intervention and control group, dependent groups t-test and Wilcoxon test were used for intragroup comparisons, Kurtosis and Skewness coefficients were used to analyse the normality distribution of data and Cronbach α coefficient was used to find out internal consistency. In order to determine that the number of patients included was sufficient, the effect size of the study was determined by posthoc power analysis by using G-Power 3.1.9.4 software. According to Cohen's (1988) classification, $0.02 \leq f^2 < 0.15$ indicates a small effect, $0.15 \leq f^2 < 0.35$ indicates a moderate effect and $0.35 \leq f^2 f2$ indicates a large effect (Cohen 1988). Simple linear regression analysis was performed to find out the effects of PMR exercise on STAI and SCSS factors. The significance level in statistical analyses was considered as 0.05 (p-value).

2.9 | Ethical Principles for Research

The study was approved by the Ethics Committee of Fırat University (REDACTED dated and REDACTED numbered). The research was conducted following the principles of the Declaration of Helsinki. In addition, after the study's objective was explained, written consent was obtained from the participants. Clinical trial registration was done. The CONSORT checklist for randomised controlled trials was used in this study.

3 | Results

A total of 66 caregiver patient relatives, 33 in the experimental group and 33 in the control group, were included in the study. As can be seen in Table 1, it was found that of the caregivers in the experimental group, mean age was 36.73 ± 8.30, 54.5% were male, 51.5% were high school graduates, 78.8% were married, 54.5% were employed, 54% had moderate income, 42.4% were living in a town, 45.5% provided care to cancer patients, 39.4% provided care to their grandparents, 54.5% had provided care for 5–10 years and another person helped 51.5% of the caregivers in providing care to a palliative patient.

It was found that of the caregivers in the control group, mean age was 37.36 ± 7.27, 57.6% were male, 51.5% were high school graduates, 84.8% were married, 66.7% were employed, 45.5% had poor income, 51.5% were living in a town, 48.5% provided care to cancer patients, 39.4% provided care to their grandparents, 66.7% had provided care for 5–10 years and another person helped 54.5% of the caregivers in providing care to a palliative patient. The intervention and control groups were found to be homogeneous, as shown in Table 1.

The difference between the pretest and posttest mean scores of the STAI and SCSS sub-dimensions was statistically significant in experimental group comparison. In the control group, there was no statistically significant difference between the pretest and posttest mean scores of the STAI and SCSS sub-dimensions (Table 2; $p < 0.05$). In comparing the groups, no statistically significant difference was found between the pretest mean scores of the STAI and SCSS sub-dimensions (Table 2; $p > 0.05$). There was a statistically significant difference between the experimental and control groups' posttest mean scores on the STAI and SCSS sub-dimensions.

Table 3 includes the simple linear regression analysis results performed to find out the effects of PMR exercise on dependent variables. When the regression coefficients were examined, it was found that the variable of PMR exercise had a negative effect on anxiety ($\beta = -0.962$, $p < 0.001$), helpless approach ($\beta = -0.535$, $p < 0.001$) and submissive approach ($\beta = -0.643$, $p < 0.001$), while it had a positive and significant effect on seeking social support ($\beta = 0.765$, $p < 0.001$), self-confident approach ($\beta = 0.832$, $p < 0.001$) and optimistic approach ($\beta = 0.493$, $p < 0.001$) (Table 3).

4 | Discussion

There are various non-pharmacological approaches aiming to reduce the problems of caregivers arising from caregiving. PMR exercise is one of these approaches (Kırca and Kutlutürkan 2020). No studies were found in literature examining the effects of progressive relaxation exercise applied to caregivers of palliative care patients on coping with stress and levels of anxiety. The present study is the first one evaluating the effects of PMR exercise applied to caregivers of palliative care patients on coping with stress and levels of anxiety.

Nurses should provide holistic care about caregivers' awareness and recognition of their own anxiety and on methods of coping with this anxiety (Kurt and Kapucu 2018). After the application of PMR exercise, it was found that the anxiety of caregivers of palliative care patients decreased, the use of positive stress coping methods increased and the use of negative stress coping methods decreased.

Today, PMR exercise is defined as a technique that causes a feeling of calmness within the individual. The main purpose of PMR excercise is to enable individuals to feel the difference between tension and relaxation in the muscle and to learn to self-relax in case of tension. These exercises involve voluntary systematic stretching and relaxation of major muscle groups in the human body. PMR exercise is physiologically a decrease in the activity of sympathetic nervous system, an increase in parasympathetic nervous system activity, voluntary active contraction and passive relaxation of major muscle groups (Kırca and Kutlutürkan 2020). PMR exercise can decrease epinephrine norepinephrine in blood and increase endorphin release (Gangenahalli et al. 2024; Kurt and Kapucu 2018). This way, individuals have decreased muscle tension and restlessness, and they avoid unpleasant stimuli such as anxiety (Gangenahalli et al. 2024; Kurt and Kapucu 2018). This study discovered that caregivers of palliative care patients in the experimental group had significantly lower anxiety levels, following the application than the patients in the control group. PMR exercise was found

TABLE 1 | Descriptive characteristics of caregivers ($n = 66$).

Variables	Groups		Test value and significance
	Control	Experimental	
	n (%)	*n* (%)	
Sex			
Female	14 (42.4%)	15 (45.5%)	$\chi^2 = 0.062$* $p = 0.804$
Male	19 (57.6%)	18 (55.5%)	
Educational level			
Primary education	3 (9.1%)	4 (12.1%)	$\chi^2 = 0.320$* $p = 0.956$
Secondary education	9 (27.3%)	10 (30.3%)	
High school	17 (51.5%)	15 (45.5%)	
University	4 (12.1%)	4 (12.1%)	
Marital status			
Married	26 (78.8%)	28 (84.8%)	$\chi^2 = 0.407$* $p = 0.523$
Single	7 (21.2%)	5 (15.2%)	
Employment status			
Yes	18 (54.5%)	22 (66.7%)	$\chi^2 = 1.015$* $p = 0.314$
No	15 (45.5%)	11 (33.3%)	
Place of residence			
Province	10 (30.3%)	12 (36.4%)	$\chi^2 = 0.549$* $p = 0.760$
District	17 (51.5%)	14 (42.4%)	
Village	6 (18.2%)	7 (21.2%)	
Income status			
Good	8 (24.2%)	5 (15.2%)	$\chi^2 = 3.978$* $p = 0.137$
Moderate	10 (30.3%)	18 (54.5%)	
Poor	15 (45.5%)	10 (30.3%)	
Disease of the patient given care			
Cancer	16 (48.5%)	15 (45.5%)	$\chi^2 = 1.993$* $p = 0.850$
COPD	4 (12.1%)	4 (12.1%)	
Heart failure	4 (12.1%)	4 (12.1%)	
DM	4 (12.1%)	7 (21.1%)	
Chronic kidney failure	4 (12.1%)	3 (9.1%)	
Alzheimer	1 (3%)	—	
Degree of intimacy with the patient being cared for			
Parents	6 (18.2%)	10 (53.3%)	$\chi^2 = 1.889$* $p = 0.596$
Spouse	3 (9.1%)	3 (9.1%)	
Child	11 (33.3%)	7 (21.2%)	
Grandparents	13 (39.4%)	13 (39.4%)	
Care giving duration			

(Continues)

TABLE 1 | (Continued)

Variables	Groups		Test value and significance
	Control	Experimental	
	n (%)	*n* (%)	
1–5 years	4 (12.1%)	7 (21.1%)	$\chi^2 = 1.285$* $p = 0.526$
5–10 years	22 (66.7%)	18 (54.5%)	
10 years and above	7 (21.1%)	8 (24.2%)	
Assistance of someone else in care			
Yes	18 (54.5%)	17 (51.5%)	$\chi^2 = 0.061$* $p = 0.805$
No	15 (45.5%)	16 (48.5%)	
	X ± SD	**X ± SD**	
Age	37.36 ± 7.27	36.73 ± 8.30	$t = 0.331$* $p = 0.742$

Abbreviations: SD, standard deviation; X, mean.
*Chi-square test.

to be effective in decreasing anxiety in caregivers. When we examined studies on other patients due to limited literature, they were found to conclude that PMR exercise can increase stress and anxiety tolerance and level of compliance in patients with PMR exercise (Essa et al. 2017; Hasanpour-Dehkordi et al. 2019). It was found that PMR exercise administered to caregiver family members of almshouse patients reduced the anxiety levels of caregivers significantly (Choi 2010).

In a study conducted by Pifarre et al. (2015), the effects of a single dose of diazem (5 mg) and a single session relaxation exercise on the use of brain glucose in stressed conditions were examined, and it was stated that the obtained results can be as effective as anxiolytic in decreasing brain activity with a physical/psychological procedural relaxation (Pifarre et al. 2015).

A long-term care process may cause stress by creating a burden on the caregiver and have a negative effect on their physical and psychological health (Amankwaa 2017). Long-term stress causes a sustained release of stress hormones that deregulate the biological pathways in the brain and other systems, particularly affecting the neurological, metabolic, cardiac and immune systems. Increased amygdala activity during stress stimulates the hypothalamic–pituitary–adrenal axis (HPA axis) and sympathetic nervous system through ventromedial hypothalamus and paraventricular nucleus and causes the release of glucocorticoids, including cortisol. The sympathetic nervous system responds by increasing blood pressure, heart rate and respiratory rate. Therefore, interventions are required to reduce stress (Reive 2019).

In this study, it was found that when compared with the individuals in the control group, the caregivers in the experimental group had increased use of stress coping styles (self-confident approach, optimistic approach and seeking social support) and decreased use of positive stress coping styles (helplessness approach and submissive approach) in the post-PMR exercise period. It was found that PMR exercise was effective in post-PMR exercise for caregivers in fighting stressful situations, believing in oneself and feeling strong, controlling oneself with the situation causing stress and approaching events through logic and increasing their behaviour of showing the causes of a stressful condition and seeking help from others to cope with it. It was also found to be effective in accepting to experience stress-induced negations by showing a fatalistic attitude, in losing the faith about being able to manage the process in a stressful situation and decreasing the belief that the individual is the cause of negations experienced. PMR exercise, which is one of the methods frequently used in coping with stress, is effective in decreasing anxiety by decreasing cortisol known as stress hormone (Chellew et al. 2015; Kerman and Bahar 2019). The main aim of this application is to enable individuals to feel the difference between tension in the muscles and relaxation and to learn how to relax in case of tension (Kurt and Kapucu 2018; Norelli et al. 2018). This method helps caregivers in decreasing the effects of muscle tension, fatigue and stress and gives them the strength to cope and to maintain self-control skills (Norelli et al. 2018; Song et al. 2013; Turgay et al. 2020). As a result of applying progressive relaxation exercise to nurses, a decrease was found in their stress levels (Akyürek et al. 2020; Patel 2014) and fatigue scores (Ozgundondu and Metin 2019), an increase was found in their stress coping skills (Akyürek et al. 2020; Ozgundondu and Metin 2019) and a significant decrease was found in their emotional exhaustion, depression and saliva corticol levels (Veiga et al. 2019). In a different study conducted with university students, a decrease was found in perceived stress and cortisol levels as a result of progressive relaxation exercise (Chellew et al. 2015). When compared with other non-pharmacological methods, PMR exercise, which can be administered by a large number of different disciplines, provides advantage with its aspects such as being less costly, being administered without the need for a special application tool and not being an interventional application (Norelli et al. 2018).

These findings suggest that PMR is a valuable intervention to improve psychological well-being and reduce the burden experienced by palliative caregivers. It also reiterates the key role that

TABLE 2 | Intragroup and intergroup SCSS and STAI sub-dimensions scores of caregivers.

	Groups		
	Experimental	Control	Intergroup test value and significance
	X ± SD	X ± SD	
STAI			
Pretest	60.90 ± 0.50	62.06 ± 3.54	$t = 0.985^{y}$ $p = 0.328$
Posttest	35.57 ± 3.40	61.12 ± 3.91	$t = 28.248^{y}$ $p \leq 0.001$*
Intragroup test value and significance	$t = 21.447^{x}$ $p \leq 0.001$*	$t = 1.147^{x}$ $p = 0.260$	
SCSS sub-dimensions			
Self-confident approach			
Pretest	5.96 ± 2.44	10.36 ± 1.83	$U = -5.859$ $p \leq 0.001$*
Posttest	16.33 ± 2.08	10.75 ± 1.65	$U = -6.808$ $p \leq 0.001$*
Intragroup test value and significance	$Z = -5.023$ $p \leq 0.001$*	$Z = -0.988$ $p = 0.323$	
Optimistic approach			
Pretest	6.87 ± 1.81	7.51 ± 1.73	$U = -0.999$ $p = 0.318$
Posttest	10.15 ± 1.71	7.87 ± 2.31	$U = -3.953$ $p \leq 0.001$*
Intragroup test value and significance	$Z = -4.661$ $p \leq 0.001$*	$Z = -0.726$ $p = 0.468$	
Helpless approach			
Pretest	13.93 ± 2.95	12.63 ± 3.15	$t = -1.732^{y}$ $p = 0.88$
Posttest	9.57 ± 3.04	12.93 ± 2.30	$t = 5.064^{y}$ $p \leq 0.001$*
Intragroup test value and significance	$t = 5.753^{x}$ $p \leq 0.001$*	$t = -.439^{x}$ $p = 0.664$	
Submissive approach			
Pretest	10.15 ± 3.03	9.60 ± 2.09	$U = -1.151$ $p = 0.250$
Posttest	6.39 ± 1.85	9.60 ± 2.17	$U = -5.145$ $p \leq 0.001$*
Intragroup test value and significance	$Z = -4.216$ $p \leq 0.001$*	$Z = -0.036$ $p = 0.971$	
Approach to applying for social support			
Pretest	4.63 ± 1.61	5.33 ± 1.63	$t = 1.742^{y}$ $p = 0.88$
Posttest	9.09 ± 1.18	5.36 ± 1.91	$t = -9.506^{y}$ $p \leq 0.001$*
Intragroup test value and significance	$t = -13{,}204^{x}$ $p \leq 0.001$*	$t = -.088^{x}$ $p = 0.930$	

Abbreviations: SCSS, Stress Coping Style Scale; STAI, State–Trait Anxiety Inventory; $t^{(x)}$, *t*-test in dependent groups; $t^{(y)}$, *t*-test on independent groups; U, Mann–Whitney *U* test; *Z*, Willcoxon test.
*$p \leq 0.001$.

TABLE 3 | The effect of progressive muscle relaxation exercise on anxiety and stress coping styles.

Dependent variable	Model	Variables	B	SE	β	t	p
Anxiety	1	Constant	61.121	0.639		95.585	0.001*
		Progressive Muscle Relaxation Exercise-Trial	−25.545	0.904	−0.962	−28.248	0.001*
			$R=0.962$, $R^2=0.926$				
			$F_{(1.64)}=797.978$, $p=0.001$*				
Self-confident Approach	1	Constant	10.758	0.328		32.785	0.001*
		Progressive Muscle Relaxation Exercise-Trial	5.576	0.464	0.832	12.016	0.001*
			$R=0.832$, $R^2=0.693$				
			$F_{(1.64)}=144.375$, $p=0.001$*				
Optimistic Approach	1	Constant	7.879	0.355		22.211	0.001*
		Progressive Muscle Relaxation Exercise-Trial	2.273	0.502	0.493	4.530	0.001*
			$R=0.493$, $R^2=0.243$				
			$F_{(1.64)}=20.525$, $p=0.001$*				
Helpless Approach	1	Constant	12.939	0.470		27.548	0.001*
		Progressive Muscle Relaxation Exercise-Trial	−3.364	0.664	−0.535	−5.064	0.001*
			$R=0.535$, $R^2=0.286$				
			$F_{(1.64)}=25.642$, $p=0.001$*				
Submissive Approach	1	Constant	8.333	0.300		27.815	0.001*
		Progressive Muscle Relaxation Exercise-Trial	−2.848	0.424	−0.643	−6.723	0.001*
			$R=0.643$, $R^2=0.414$				
			$F_{(1.64)}=45.197$, $p=0.001$*				
Seeking Social Support	1	Constant	5.364	0.277		19.345	0.001*
		Progressive Muscle Relaxation Exercise-Trial	3.727	0.392	0.765	9.506	0.001*
			$R=0.765$, $R^2=0.585$				
			$F_{(1.64)}=90.356$, $p=0.001$*				

Abbreviations: β, beta value; R^2, R squared; SE, standard error.
*$p<0.01$.

nurses play in psychosocial care by revealing the importance of practices to support the mental health of caregivers in the field of palliative care. In this context, nurses should not only be limited to patient care but also take an active role in supportive practices for caregivers.

4.1 | Limitations of the Study

The most important limitation of the study is the small sample size. The results obtained from this study are limited to primary caregivers caring for patients in a palliative care unit of a university hospital. These results cannot be generalised. Another limitation is that the application protocols are kept under control in PMR exercises performed at home.

5 | Conclusion

After using a PMR exercise, anxiety in caregivers of palliative care patients decreased, their use of positive stress coping styles increased, and their use of negative stress coping techniques decreased. It is recommended to include PMR exercise in undergraduate and graduate curricula in order to ensure that it takes place effectively in nursing care. It is also recommended to conduct randomised controlled studies examining

the effects of PMR exercise on longer term anxiety and stress with larger sample groups to better understand the effects of PMR exercise.

Author Contributions

Gülcan Bahcecioglu Turan: conceptualisation, methodology, investigation, writing – original draft, writing – review and editing and supervision. **Zülfinaz Özer:** conceptualisation, investigation, writing – original draft, writing – review and editing and supervision. **Cuma Demir:** conceptualisation, investigation, data curation and writing – review and editing.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section.