RESEARCH

The effect of resilience education on family caregivers' strain of older people with chronic diseases: a randomized clinical trial

Fatemeh Qasempoor Tonekaboni¹, Shahzad Pashaeypoor², Shima Haghani³ and Nasrin Nikpeyma^{2*}

Abstract

Background and purpose Long-term care comes with risks, including caregiver strain. The strain negatively affects caregivers and care quality for the elderly. Enhancing resilience through education can lead to improved health outcomes. This research aimed to evaluate the effect of resilience education on family caregivers' strain of older people with chronic diseases.

Methods This randomized clinical trial was conducted in Amol, Iran from August 2022 to May 2023. Participants were 84 family caregivers of elderly people with chronic diseases. They were selected based on inclusion and exclusion criteria through continuous sampling and randomly allocated to an intervention and a control group using block randomization. Data collected by demographic and Robinson's Caregiver Strain Index (13 items) questionnaire before, immediately after, and six weeks post-intervention. Resilience education consisted of six sessions delivered in person and electronically (via SMS) to the intervention group over three weeks, based on Henderson's resilience components training program. Statistical analysis was performed using various tests in SPSS software (v. 16.0) at a significance level of less than 0.05.

Results Analysis of variance with repeated measures by groups showed that caregiver strain in the control group did not have a statistically significant difference at any of the different times (p = 0.279). Two-by-two Bonferroni comparison showed that the caregiver strain immediately (18.11 ± 3.12) and six weeks after the intervention (18.78 ± 3.86) had a statistically significant difference compared to before the intervention (20.73 ± 3.51) (p < 0.001).

Conclusion The resilience education was found to be effective in significantly reducing family caregivers' strain of older people with chronic diseases. Therefore, health centers managers and providers can use resilience education to alleviate strain among family caregivers.

Trial registration The Thai Clinical Trials Registry TCTR20230424001 prospectively registered on 24 April 2023.

Keywords Education, Resilience, Family caregivers, Frail elderly, Chronic disease

*Correspondence:

Nasrin Nikpeyma

nikpeyma@yahoo.com

¹Master of Community Health Nursing, Tehran School of Nursing and Midwifery, Tehran University of Medical Sciences, Tehran, Iran ²Department of Community Health and Geriatric Nursing, School of Nursing & Midwifery, Tehran University of Medical Sciences, Tehran, Iran ³Master of Biostatistics, School of Nursing & Midwifery, Tehran University of Medical Sciences, Tehran, Iran



© The Author(s) 2025. **Open Access** This article is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License, which permits any non-commercial use, sharing, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if you modified the licensed material. You do not have permission under this licence to share adapted material derived from this article or parts of it. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit http://creativecommons.org/licenses/by-nc-nd/4.0/.





Introduction

Due to the increase in life expectancy and longevity, the aging of the population is on the rise. According to the World Health Organization's prediction, by 2050, 80% of the world's elderly population will reside in developing countries [1]. The Iranian Statistical Center projects a fourfold increase in the population aged 65 and older over the next 35 years, rising from 4.87 million in 2015 to 18.98 million in 2050 [2]. The growing elderly population with chronic diseases or disabilities, leading to complications is escalating the demand for care typically provided by caregivers [3]. Caregivers assist patients in adjusting to and coping with chronic diseases during periods of illness or disability [4]. Informal or family caregivers are unpaid and usually consist of family members, such as spouses, children, and relatives [5].

According to statistics, family caregivers spend an average of 20 h a week and at least 6 months providing care [3]. National Alliance for Caregiving and the American Association of Retired Persons (AARP) reported that 18.2% of the United States adult population provided unpaid care to a relative over 50 in 2015 [6]. Caregivers may suffer from depression, anxiety, reliance on psychoactive drugs, physical health decline, weakened immune system, difficulty in maintaining a healthy lifestyle, and an increased risk of premature death. Additionally, they encounter financial difficulties due to high healthcare expenses [3, 7]. Family caregivers may also experience caregiver strain when they find it challenging to meet their caregiving duties [8]. caregiver strain refers to the negative effect of providing care for chronically ill, disabled, or elderly individuals leading to physical, mental, or emotional distress [9].

Caregiver strain is influenced by factors such as the duration of care, the client's functional abilities, independence in daily activities, and the caregiver's resilience [10]. Resilience is the ability to bounce back from challenging experiences and adapt positively to stress [11, 12]. It includes self-confidence, trust in oneself, openness to change, and spiritual beliefs, enabling individuals to foster personal growth and well-being [13, 14]. Studies have shown that caregiver resilience is linked to better physical health, reduced depression and anxiety, positive coping strategies, access to resources, and self-efficacy [15–18]. Also, research suggests that caregiver strain and resilience are inversely related. Chan et al. (2019) in Malaysia and Sorayanejad et al. (2019) in Tehran found that family caregivers of elderly individuals with chronic diseases experienced less strain when they had higher levels of resilience [10, 19].

Enhancing caregivers' resilience through education can be a cost-effective intervention to improve their health. It is widely accepted that resilience is a learned set of behaviors and actions, not an inherent trait [20, 21]. Previous studies have examined the effects of resilience education programs on different outcomes in various populations, including caregivers, but have not specifically focused on caregiver strain [22–30]. Integrating traditional and digital teaching methods, like using audio (e.g., mindfulness recordings) and visual aids (e.g., animations, interactive videos) is an innovative approach to facilitate learning and acquire new knowledge. Most current resilience interventions focus on the personal level, however with the advancement of telecommunications, we can benefit from both face-to-face interactions and mobile devices such as smartphones for improved effectiveness [31].

The World Health Organization's Health 2020 policy framework emphasizes the importance of building resilience to maintain and promote health and well-being at both individual and societal levels [20]. The study was conducted to assess the effect of resilience education on family caregivers' strain of older people with chronic diseases, acknowledging the significance of elderly care and caregiver support in nursing education. The hypothesis of this study posits that resilience education is effective on reducing family caregivers' strain of elders.

Methods

Design

This randomized clinical trial study was conducted in Amol city, Mazandaran province, Iran from August 2022 to May 2023.

Participants and setting

The research population consisted of all family caregivers of the elderly with chronic diseases who were under the care of health centers in the urban community of Amol City, affiliated with Mazandaran University of Medical Sciences. The study focused on the Bolouri Comprehensive Urban Health Center as the research environment which has a team of healthcare professionals including doctors, midwives, environmental and occupational health specialists and health educators. The center's tasks are varied and diverse, with the main focus on vaccination, public health education, care for pregnant women, children, and the elderly, as well as referrals to higherlevel medical centers. The inclusion criteria for the research were caregivers of elderly individuals over 65 years old with chronic diseases (cardiovascular diseases, stroke, chronic obstructive pulmonary diseases, diabetes, arthritis, musculoskeletal problems, hearing and vision loss); family caregivers including spouses, children, and relatives; providing at least 20 h of care per week for 6 consecutive months, willingness to participate in research, absence of mental-cognitive disorder, no drug or alcohol addiction based on self-reports, and access to a smartphone with the ability to use it. Exclusion criteria

were missing two consecutive training sessions, prior participation in similar programs, significant health changes, or death of the elderly. A total of 84 eligible participants with electronic files were selected and randomly allocated to the intervention (42 individuals) and the control (42 individuals) group through block randomization. Sample size was calculated assuming a 3-unit difference between the intervention and control groups as statistically significant, with a confidence level of 95% and a test power of 80%. The sample size was determined to be 38 per group which was increased to 42 per group considering a potential attrition rate of 10%. The estimated standard deviation was taken from Lawler et al.'s (2019) article (Experiment = 4.8, control = 4.5) [32]. The sample size calculation formula was,

$$n = \frac{\left(z_{1-}\alpha_{/2} + z_{1-\beta}\right)^2 \times \left(s_1^2 + s_2^2\right)}{d^2}$$
$$z_{0.975} = 1.96$$
$$z_{0.8} = 0.84$$
$$3 = d$$
$$s_1 = 4.8 \quad s_2 = 4.5$$
$$n = \frac{\left(1.96 + 0.84\right)^2 \times \left(4.8^2 + 4.5^2\right)}{3^2} \approx 38$$

Randomization and blinding

In order to random allocation, we considered a block size of four and identified all possible combinations of blocks (six possible sequences: AABB, ABAB, ABBA, BAAB, BABA, BBAA) which were then randomized. Random allocation sequence was generated using the Randomization.com website. A computer-generated list of random numbers was used for allocating the participants. To minimize selection bias, an unaffiliated third party used computer-generated random numbers to create allocation cards, ensuring equal assignment of participants to blocks. The first researcher enrolled participants and assigned interventions based on the predetermined sequence. Blinding of participants was not feasible due to the nature of the behavioral intervention. However, individuals not involved in intervention delivery or outcome assessment managed data and randomization. The statistician remained blinded to treatment assignment and study hypotheses.

Data collection instruments

The data collection tool included demographic information questionnaires related to the caregiver (age, gender, education, marital status, employment status, relationship with elderly individuals, history of diseases, starting time, and hours of care), and the elderly (age, gender, marriage, type of illness, and duration of illness), as well as the Caregiver Strain Index by Robinson (1983). Robinson's Caregiver Strain tool, revised by Thornton and Travis (2003), measures the level of strain on the overall health of family caregivers. The tool consists of 13 items assessing physical health, employment and financial status, social interactions, and time. Responses are rated on a 3-point Likert scale (always = 2, almost = 1, never = 0), with scores from 0 to 26. Thornton and Travis (2003) evaluated the instrument for validity using the criterion validity method. Regarding predictive validity, caregiver strain is moderately correlated with mental capacity (r=0.34) and physical functioning (r=0.27) in the care recipient, with a combined correlation of 0.32. This suggests that as caregiver strain increases, the performance of the care recipient tends to decrease. Concurrent validity was confirmed by the relationship between the Caregiver Strain Index scores and The Family Caregiver Medication Administration Hassles Scale for family caregivers (r = 0.44, p = 0.001). Thornton and Travis (2003) confirmed the tool's reliability with a test-retest correlation coefficient of 0.88 [33]. The instrument was translated and evaluated in Iran by Ansari et al. (2015). 10 specialists and adjustments assessed face and content validity of the instrument were made accordingly. Reliability was tested using Cronbach's alpha coefficient, which was reported as 0.81 [34].

Intervention

At the beginning, the participants were given explanations about the research objectives and methodology. Informed consent was obtained, emphasizing the confidentiality of the information. In the pre-intervention phase, both groups completed a questionnaire on demographic characteristics and Robinson's caregiver strain. The intervention group was split into two groups of 21 people, with 6 sessions over three weeks. Each session included 45-minute resilience training through in-person lectures, group discussions, film screenings, audio and Q&A sessions. Key points were sent electronically via SMS to the intervention group between sessions. The resilience education booklet was based on Henderson and Milstein's (2003) resiliency training protocol [35]. It covers six chapters: the concept of resilience, self-awareness and values, effective communication and bonding, self-efficacy and problem-solving, control of emotions, and meaningfulness. The researcher developed resilience exercises, such as relationship repair, self-care improvement, strengthening of abilities, the STOP technique, and other meditation techniques based on reliable sources (See supplementary file). This booklet's content was validated by three academic experts and confirmed after necessary revisions. During the intervention, the control group did not receive any educational programs but participated in the center's regular activities. Research tools were completed by both groups immediately after

the intervention and again 6 weeks after the educational program [36]. Following the posttest to address ethical concerns, the control group received a training booklet on resilience. To prevent contamination, we instructed health service center staff not to incorporate the intervention into their usual care or disclose intervention details to the control arm. Participants were also advised not to share intervention information with others. Education sessions were scheduled at different times, and contamination was monitored through supervision (Fig. 1).

Data analysis

The data for both the primary and secondary outcomes of the study, caregiver strain scores and the effects of resilience training, were analyzed using SPSS software (v. 16.0). The measures of descriptive statistics (namely mean, standard deviation, absolute and relative frequency) were used to present the data. Statistical methods for data analysis were the Chi-square, independent-sample t, and Mann-Whitney U's tests (for primary outcome) as well as analysis of covariance and analysis of variance with repeated measures (for secondary outcome). The level of significance was set at less than 0.05.

Results

In total 84 participants completed the study, with the majority of caregivers being women. Most caregivers were married and had obtained a diploma or bachelor's degree. Over half of the control and intervention groups were housewives, and most were disease-free. The most common caregivers were wives, followed by female children. Elderly men and women had similar frequencies. The majority of elderly participants were married, and heart disease was the most prevalent among them in both groups. The groups did not significantly differ from each other respecting participants' demographic and clinical characteristics at baseline (P > 0.05; Table 1).

The Kolmogorov-Smirnov test results showed that caregiver strain in all three stages is normally distributed for both intervention and control groups. Figure 2 illustrates a significant decrease in the average scores of caregiver strain in the intervention group post-intervention



Table 1 Demographic characteristics of caregivers and elderly individuals

Characteristic	Intervention (42)	Control (42)	P value
Caregivers			
Age, year			0.781*
mean (SD)	54.83 (10.05)	55.42 (9.50)	
Care duration, year			0.508*
Mean (SD)	6.90 (4.85)	7.21 (4.79)	
Weekly care hours			0.542*
Mean (SD)	54.83 (10.05)	55.42 (9.50)	
Gender, n (%)			0.332**
Male	4 (9.5)	7 (16.7)	
Female	38 (90.5)	35 (83.3)	
Marital status, n (%)			0.713***
Single	5 (11.9)	2 (4.8)	
Married	36 (85.7)	39 (92.9)	
Divorced	1 (2.4)	1 (2.4)	
Highest level of education, n			0.214**
(%)	5 (11.9)	11 (26.2)	
High school and below	18 (42.9)	13 (31)	
Associate degree	19 (45.2)	18 (42.9)	
Bachelor's degree			
Occupation, n (%)			0.814***
Housekeeper	22 (52.4)	22 (52.4)	
Non-government job	5 (11.9)	3 (7.1)	
Government job	11 (26.2)	14 (33.3)	
Retired	4 (9.5)	3 (7.1)	
History of chronic diseases, n			0.872**
(%)	28 (66.7)	26 (61.9)	
Without any disease	9 (21.4)	11 (26.2)	
One chronic disease	5 (11.9)	5 (11.9)	
Multiple chronic disease			
Relationship to elderly, n (%)			0.706***
Spouse	19 (45.2)	19 (45.2)	
Daughter	15 (35.7)	13 (31)	
Son	4 (9.5)	7 (16.7)	
Daughter in law	3 (7.1)	1 (2.4)	
Sister	1 (2.4)	2 (4.8)	
Elderly individuals			
Age, year			0.643*
Mean (SD)	73.59 (6.62)	72.90 (6.96)	**
Gender, n (%)			0.653
Male	25 (59.5)	27 (64.3)	
Female	17 (40.5)	15 (35.7)	***
Marital status, n (%)			0.50
Single	0 (0.0)	1 (2.4)	
Married	30 (71.4)	28 (66.7)	
Divorced	3 (7.1)	1 (2.4)	
Widow/ widower	9 (21.4)	12 (28.6)	***
History of chronic diseases, n (%)			0.898
Heart disease	13 (31)	9 (21.4)	
	4 (9.5)	3 (/.l)	
Dishetes	I (2.4)	2 (/.l) 12 (21)	
	1 (2 0.2)	1 () () 1 () ()	
Atumus Other musculeskeletelissues	I (2.4)	I (2.4)	
Other Musculoskeletal Issues	4 (9.0)	4 (9.0)	

Table 1 (continued)

Characteristic	Intervention (42)	Control (42)	P value
Visual/ hearing impairment	1 (2.4)	3 (7.1)	
Multiple chronic disease	7 (16.7)	6 (14.3)	
The duration of the disease, year			0.356*
Mean (SD)	7.45 (4.87)	8.45 (5.00)	

*: The results of the independent-sample t test; **: The results of the Chi-square test; ***: The results of the Fisher's exact test



Before Immediately after six-week after

Fig. 2 Comparison of means between control and intervention groups

and after the intervention in two groups										
Group Caregiver strain	Intervention		Control		Independent t-test/	Two-way repeated measures analysis				
	Standard deviation	Mean	Standard deviation	Mean	Covariance analysis result	of variance				
Before the intervention	3.51	20.73	3.39	19.45	t = -1.706 df = 82 P = 0.092	Reciprocal effect	Time effect	Group effect		
Immediately after the intervention	12.3	11.18	58.3	54.19	F = 87.108 P < 0.001 $\eta^2 = 0.518$	F=34.137 P<0.001	F=27.342 P<0.001	F=0.22 P=0.636		
6 weeks after the intervention	86.3	78.18	40.3	69.19	F = 32.104 P < 0.001 $\eta^2 = 0.284$					
Results of analysis of variance with repeated sizes	F = 37.302 P < 0.001 $0.476 = \eta^{2}$		F = 1.297 P = 0.279 $0.031 = \eta^{2}$							

Table 2 Comparison of means and standard deviations of family caregivers' strain of elderly individuals with chronic diseases before and after the intervention in two groups

 η^{2} = Effect size: 01.0 small, 06.0 medium, 14.0 high

which continued during the follow-up period compared to the control group. The independent t-test results revealed no significant difference in caregiver strain scores before the intervention between the control and intervention groups (P=0.092). The analysis of covariance with the control of the pretest scores showed significant differences in caregiver strain scores immediately after the intervention and six weeks later between the control and intervention groups (p<0.001). The average caregiver strain score was lower in the intervention group compared to the control group. The analysis of variance with two-way repeated measures indicates that the group effect was insignificant, but the time and group-time interaction effects were significant. Therefore, the analysis of variance was repeated separately for each group. The caregiver strain in the control group did not significantly differ at any time points (p = 0.279). The intervention group was significantly different at least once compared to the other group (p < 0.001). Two-by-two Bonferroni comparisons revealed significant differences in caregiver strain immediately and six weeks after the intervention compared to before the intervention (p < 0.001; Table 2).

Discussion

This study evaluated the effect of resilience education on family caregivers' strain while caring for older people with chronic diseases. The research used a pre-test, a post-test with a control group, and a six-week follow-up. The statistical analysis revealed that resilience training in the intervention group had a significant impact on caregiver strain scores. The intervention effectively reduced caregiver strain in the target group.

The research findings align with Ghazlesflo et al. (2018), showing that resilience training can reduce stress and communication issues among primary caregivers of elderly individuals with Alzheimer's in Tehran. Participants underwent resilience training through group and face-to-face sessions, focusing on resilience concepts, characteristics of resilient individuals, coping with difficult situations, support systems, and enhancing adaptation and tolerance. Scores were measured at three stages, revealing a decrease in stress and communication problems in the intervention group compared to the control group during post-test and follow-up [30]. This is consistent with Latifian et al.'s (2022) findings, which also showed that resilience training can decrease the caregiving burden for families of schizophrenia patients in Tehran. By enhancing caregivers' resilience, they can cultivate qualities such as independence, optimism, perseverance, problem-solving abilities, and conflict resolution skills. Strengthening these characteristics through training can greatly benefit family caregivers in achieving their desired outcomes [37]. The results of Ghafari et al.'s research (2015) showed that resilience interventions improve various dimensions of mental health among family caregivers of the elderly with Alzheimer's disease [29]. Mahdavi et al. (2017) studied the effect of group spiritual care on family caregiver strain in elderly individuals with Alzheimer's disease. The study found a significant decrease in caregiver strain scores after the intervention period [38]. This study did not focus on resilience education but instead used Robinson's caregiver strain questionnaire to address caregiver strain through a different intervention, aligning with the current study.

Previous studies have shown a significant inverse relationship between caregiver strain and resilience. Sorianjad et al. (2019) conducted a study to determine the relationship between caregiver strain and resilience in caregivers of the elderly with chronic diseases in Tehran, Iran. Caregiver strain was found to be inversely related to resilience scores. The study measured resilience using a questionnaire developed by Connor and Davidson (2003), with five subscales: perception of competence, trust in instincts, tolerance of negative emotions, positive acceptance of change, safe relationships, and spiritual influences. The training program in the present study incorporates similar concepts and cores [19]. A study by Ling-Chan et al. (2018) determined that 77.7% of family caregivers of individuals with Alzheimer's disease in Malaysia experience high levels of stress. However, individuals with higher resilience reported less caregiver strain in the study [10]. This can be attributed to the skills and characteristics of resilient individuals that enable them to adapt to new circumstances, overcome challenges, and protect their mental and physical well-being. However, these assumptions require further study, as no study has ever examined the effect of resilience education on caregiver strain.

The results showed that resilience education in intervention group was effective so it can be concluded that caregivers with higher levels of resilience are better equipped to use adaptive mechanisms and provide superior care to the elderly. Resilience also enhances caregivers' self-care practices, leading to positive changes in their habits and lifestyles. This improves their ability to cope with the stress of caregiving, reducing the risk of physical and mental health issues. The aim of providing training sessions and resilience exercises is to empower family caregivers to manage high levels of strain and overcome the challenges associated with caregiving.

Limitation

Caregivers' motivation, intelligence, abilities, and social/ cultural differences influenced their response to the training provided by researchers. Researchers attempted to address these factors by providing additional explanations based on how caregivers responded to questions and adhere to teaching points. While this was a singlecenter study and the results may not be broadly applicable to all settings, the positive experiences of family caregivers during the intervention were evident.

Conclusion

This study concludes that resilience education is effective in significantly reducing strain among family caregivers of the elderly with chronic diseases. Therefore, health centers managers and providers can use resilience education as an effective method to provide quality education to caregivers to improve their health. Further research is recommended to explore different resilience education methods and their impact on family caregiver strain across diverse populations.

Supplementary Information

The online version contains supplementary material available at https://doi.or g/10.1186/s12912-025-03083-z.

Supplementary Material 1

Acknowledgements

Not applicable.

Author contributions

Research idea and study design: N.N; data acquisition and intervention process: F.Q; data analysis/interpretation: Sh.H; review and editing: N.N, Sh.P, F.Q, Sh.H. All authors reviewed, critically commented and approved the final version of the manuscript.

Funding

No funding.

Data availability

The datasets during and/or analyzed during the current study available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

We obtained informed consent to participate from all participants. Following a thorough review in accordance with the Declaration of Helsinki by the World Medical Association, the study protocol obtained Ethical approval from the Faculty of Nursing and Midwifery Joint Ethics Committee and the Rehabilitation Faculty at Tehran University of Medical Sciences under the Code of Ethics: IR.TUMS.FNM.REC.1401.063.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Received: 10 September 2024 / Accepted: 7 April 2025 Published online: 22 April 2025

References

- 1. World health organization. Aging and health. 2021. [Available from: https://w www.ho.int/news-room/fact-sheets/detail/ageing-and-health].
- Tail statistics. Interview with Dr. Javad Hosseinzadeh, Head of the Statistics Center of Iran. On the occasion of May 2, National Population Day. 1400. [Available from: https://www.amar.org.ir/news/ArticleType/ArticleView/Articl elD/15582].
- Prevention CfDCa. Caregiving for Family and Friends A Public Health Issue 2019 Centers for Disease Control and Prevention. [Available from: https://ww w.cdc.gov/aging/caregiving/caregiver-brief.html].
- Smith LN, Lawrence M, Kerr SM, Langhorne P, Lees KR. Informal carers, with experience of caring for stroke survivors. Journal of Advanced Nursing. 2004;46(3):235–44. https://doi.org/10.1111/j.1365-2648.2004.02983.x
- Harrington M. Health literacy in children with chronic kidney disease and their caregivers. Nephro Nurs J. 2015 Jan-Feb;42(1):53–6. 66; quiz 57.
- Schulz R, Beach SR, Czaja SJ, Martire LM, Monin JK. Family caregiving for older adults. Annu Rev Psychol. 2020;71:635–59. https://doi.org/10.1146/annurev-p sych-010419-050754.
- Prevention CfDCa. Caregiving Centers for Disease Control and Prevention. [Available from: https://www.cdc.gov/aging/caregiving/index.htm].
- Honea NJ, Brintnall R, Given B, Sherwood P, Colao DB, Somers SC, et al. Putting evidence into practice: nursing assessment and interventions to reduce family caregiver strain and burden. Clin J Oncol Nurs. 2008;12(3):507–16. http s://doi.org/10.1188/08.CJON.507-516.
- Bainbridge D, Krueger P, Lohfeld L, Brazil K. Stress processes in caring for an end-of-life family member: application of a theoretical model. Aging Ment Health. 2009;13(4):537–45. https://doi.org/10.1080/13607860802607322.
- Chan EWL, Yap PS, Fazli Khalaf Z. Factors associated with high strain in caregivers of Alzheimer's disease (AD) in Malaysia. Geriatr Nurs. 2019;40(4):380–5. https://doi.org/10.1016/j.gerinurse.2018.12.009.
- Southwick SM, Bonanno GA, Masten AS, Panter-Brick C, Yehuda R. Resilience definitions, theory, and challenges: interdisciplinary perspectives. Euro J Psychotraumatol. 2014;5. https://doi.org/10.3402/ejpt.

- 12. Hoegl M, Hartmann S. Bouncing back, if not beyond challenges for research on resilience. Asian Bus Manage. 2021;20:456–64.
- Tabatabaei SM, Chalabainloo G. The effectiveness of resilience training on positive and negative affect and reduction of psychological distress in mothers of children with attention deficit hyperactivity disorder. J Arak Uni Med Sci. 2020;23(4):438–49. https://doi.org/10.32598/jams.23.4.1224.5.
- Connor KM, Davidson JR. Development of a new resilience scale: the Connor-Davidson resilience scale (CD-RISC). Depress Anxiety. 21X3;182–76–82. https:/ /doi.org/10.1002/da.10113.
- Dias R, Santos RL, Sousa MF, Nogueira MM, Torres B, Belfort T, et al. Resilience of caregivers of people with dementia: a systematic review of biological and psychosocial determinants. Trends Psychiatry Psychother. 2015;37(1):12–9. htt ps://doi.org/10.1590/2237-6089-2014-0032.
- Li Y, Wang K, Yin Y, Li Y, Li S. Relationships between family resilience, breast cancer survivors' individual resilience, and caregiver burden: A cross-sectional study. Int J Nurs Stud. 2018;88:79–84. https://doi.org/10.1016/j.ijnurstu.2018.0 8.011.
- 17. Rosa R, Simoes-Neto JP, Santos RL, Torres B, Baptista MAT, Kimura NRS, et al. Caregivers' resilience in mild and moderate Alzheimer's disease. Aging Ment Health. 2020;24(2):250–8. https://doi.org/10.1080/13607863.2018.1533520.
- Palacio GC, Krikorian A, Gomez-Romero MJ, Limonero JT. Resilience in caregivers: A systematic review. Am J Hosp Palliat Care. 2020;37(8):648–58. https:/ /doi.org/10.1177/1049909119893977.
- Sorayanezhad A, Nikpeyma N, Nazari S, Sharifi F, Sarkhani N. The relationship of caregiver strain with resilience and hardiness in family caregivers of older adults with chronic disease: a cross-sectional study. BMC Nurs. 2022;21(1):184. https://doi.org/10.1186/s12912-022-00966-3.
- WHO. Regional Office for Europe. (2017). Strengthening resilience: a priority shared by Health 2020 and the Sustainable Development Goals. [Available from: https://iris.who.int/handle/10665/372345].
- Association AP. Building Your Resilience 2020, American Psychological Association. [Available from: https://www.apa.org/topics/resilience].
- 22. Momeni Kh, Jalili Z, Mohseni R, Karami J, Ahmadi SM. The effectiveness of resilience training on anxiety symptoms in adolescents with heart disease. Journal of Clinical Research in Paramedical Sciences. 2015; 3(4) t 34–24.
- Sadeghi M, Sepahvandi M, Rezaeifar N. The effect of family resilience training on the mental health of mothers with mentally retarded children. Family Couns Psychother. 2016;3(3):34–24.
- 24. Barghi Irani Z. The Effectiveness of Resilience Training Program on improving nurses' quality of life. Nursing Management J, 2017; 5 (3 and 4):9–18. [Available from: http://ijnv.ir/article-1-469-en.html].
- Naemi AM. The effect of resilience training on mental health, optimism and life satisfaction of women heads of households. Journal of Positive Psychology. 2015;3(3), 44–33. [Available from: https://sid.ir/paper/257781/en].
- Khodabakhshi Koolaee A, Falsafinejad M, Navidian A. Evaluation of the effectiveness of resilience training on psychological well-being of patients with type II diabetes. J Diabetes Nurs. 2016;4(3):30–40. [Available from: http://jdn.z bmu.ac.ir/article-1-202-en.html].
- Rabee Kenare F, Jadedyan A, Selgee M. The effectiveness of resilience training on reducing parenting stress of mothers with children with autism. J. Ilam Uni. Med. Sci. 2015;23(4), 105–95. [Available from: http://sjimu.medilam.ac.ir/ article-1-1945-en.htm].
- Momeni F. The effectiveness of resiliency training on life expectancy and psychological well-being of mothers with children with special learning disabilities. JNIP. 2020;4(8):1–14. [Available from: http://jnip.ir/article-1-264-en.ht m].
- 29. Ghaffari F, Fotokian Z, Rostami M, Maskini L. An Analysis of the impact of resilience interventions on the mental health of family caregivers of the elderly with Alzheimer's. Clin Exc. 2017;7(1):35–13. [Available from: http://ce.mazums .ac.ir/article-1-340-en.htm]].
- Ghezelsefloo M, Saadati N, Yousefi Z, Zamanpour M. Evaluation of the effectiveness of resilience training on stress reduction and communication problems in primary caregivers of the elderly with Alzheimer's disease in Tehran. Elderly: Iranian Journal of Ageing. 2019;14(3):297–284. [Available from: ht tp://salmandj.uswr.ac.ir/article-1-1503-en.html].
- Ang WHD, Chew HSJ, Dong J, Yi H, Mahendren R, Lau Y. Digital training for Building resilience: systematic review, meta-analysis, and meta-regression. Stress Health. 2022;38(5):848–69. https://doi.org/10.1002/smi.3154.
- Lawler K, Shields N, Taylor NF. Training family to assist with physiotherapy for older people transitioning from hospital to the community: a pilot randomized controlled trial. Clin Rehabil. 2019;33(10):1625–35. https://doi.org/10.117 7/0269215519853874.

- Thornton M, Travis SS. Analysis of the reliability of the modified caregiver strain index. J Gerontol B Psychol Sci Soc Sci. 2003;58(2):S127–32. https://doi. org/10.1093/geronb/58.2.s127.
- 34. Ansari F. The Relationship between burden of stroke and burden of caregiver with quality of life in survivors of stroke patients and their caregivers in clinics of Tabriz University of Medical Sciences 2016 (Doctoral dissertation, Tabriz University of Medical Sciences, School of Nursing and Midwifery).
- Henderson N, Milstein MM. Resiliency in schools: Making it happen for students and educators: Corwin press; 2003. [Available from: https://books.go ogle.com/books/about/Resiliency_in_Schools.html?id=F1y6Q-NTgpEC].
- Piantadosi S. Clinical trials: a methodologic perspective. Chichester, West Sussex: Wiley Blackwell; 2017.
- 37. Sirjani M, Javadi SMH, Baniasad A, Latifian M. The Effect of Resilience Training on Reducing the Care Burden of Families with Schizophrenic Patients.

Socialworkmag. 2022;11(2):13–20 [Available from: http://socialworkmag.ir/art icle-1-672-en.html].

 Mahdavi B, Khoshknab MF, Mohammadi F, Hosseini MA, Haghi M. Effects of spiritual group therapy on caregiver strain in home caregivers of the elderly with Alzheimer's disease. Arch Psychiatr Nurs. 2017;31(3):269–73. https://doi.o rg/10.1016/j.apnu.2016.12.003.

Publisher's note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.