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Original research

Structural Equation Modeling of the Mediating Role of Loneliness in the Relationship between Perceived Social Support and Self-Compassion with Prolonged Grief Disorder in Breast Cancer survivors

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Abstract

Introduction: The purpose of the present study was to investigate structural equation modeling of the mediating role of loneliness in the relationship between perceived social support and self-compassion with prolonged grief disorder in breast cancer survivors.

Methods: This was descriptive-correlation research. The statistical population of the study was breast cancer survivors (children and spouse) of Qom city in spring of year 2024. The sample size was selected based on Klein's model and with subjectivw sampling of 300 people. Data collection tools include the prolonged grief -13-revised (PG-13-R) scale of Prigerson and et al, multidimensional perceived social support scale (MSPSS) of Zimet and et al, self- compassion scale (SCS) of Neff and University of California, Los Angeles- loneliness scale, version 3 (UCLA LS3) of Russell. Data were analyzed using Pearson correlation and structural equations modeling.

Results: The results showed direct effect of perceived social support (β= -0.77 and sig=0.001) and self-compassion (β= -0.47 and sig=0.001) were significant on prolonged grief disorder. Also, the results showed that theory of mind had a mediating role in relationship between perceived social support (β= -0.65 and sig=0.001) and self-compassion (β= -0.62 and sig=0.001) with prolonged grief disorder. Also, the final research model had a good fit (RMSEA=0.06, p<0.05).

Conclusion: According to the findings of this research and the importance of the role of perceived social support and self-compassion in prolonged grief disorder, psychologists are suggested to use social support training and interventions based on self-compassion to reduce the prolonged grief disorder in breast cancer survivors.

Keywords: breast cancer, loneliness, perceived social support, prolonged grief disorder, self-compassion, structural equation modeling, survivors

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Introduction:

Breast cancer is one of the most prevalent diseases among women in most countries worldwide, accounting for 11.7% of all new cancer cases and cancer-related deaths globally in 2020 (1). According to a study, the incidence rate of breast cancer varies from 15 per 100,000 people in urban areas to 34.6 per 100,000 in metropolitan areas. Additionally, this rate ranges from approximately 18.1%, 19.1%, and 19.7% in the west, north, and east of Iran, respectively, to about 29.3% and 29.7% in the south and center (2). Furthermore, breast cancer has surpassed lung cancer to become the most common malignancy worldwide, with the incidence and mortality rates of breast cancer continuing to rise, imposing a significant burden on public health (3, 4).

In addition to patient mortality, the number of survivors among cancer victims is significantly increasing, and cancer survivors typically experience a wide range of issues (5), including cancer bereavement (6). Grief resulting from the death of a significant person is one of the most common and distressing life events (7). Grief is associated with an increased risk of physical problems, emotional and cognitive issues, behavioral issues, and social functioning impairments (8, 9, 10). While most individuals adapt to loss (grief and bereavement) over time, a small subset of grieving individuals experience persistent and intense sorrow that may develop into prolonged grief disorder (11). In the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, Text Revision (DSM-5-TR), Prolonged Grief Disorder is distinguished by persistent and intense longing for the deceased, with clinical features distinct from those seen in Major Depression and Post-Traumatic Stress Disorder. (12, 13, 14).

Although Prolonged Grief Disorder was temporarily included in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), it has been formally added to the International Classification of Diseases and related health problems, Eleventh Revision (ICD-11). Debates about its clinical symptoms and diagnostic criteria continue (15). According to the DSM-5-TR criteria for Prolonged Grief Disorder, 12 months must have passed since the individual's death, and the survivor must have a strong longing for the deceased and continuously think about them (12). Research indicates that cancer care is a distressing experience, and the loss of a family member can lead to intense grief and other adverse effects. Given the significant prevalence of grief-related disorders, particularly those associated with cancer, palliative care is important to reduce the caregiving burden (16). One predictor of Prolonged Grief Disorder is perceived social support (17 and 18), with studies showing that perceived social support from family can explain Prolonged Grief Disorder (19).

Social support is identified as the most potent coping factor for successfully and easily handling stressful situations and enduring challenging conditions (20), which enhances well-being and health in many individuals (21). Conversely, weak social support and loneliness are social determinants of adverse health outcomes and can negatively impact physical, emotional, and psychological health (22). Social support is especially important in traumatic grief. However, the ways in which bereaved individuals interpret and define social support are not well understood, and there is limited information on what specific behaviors are deemed helpful (23).

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Another significant predictor for PGD is self-compassion (24). Self-compassion is defined as a kind and caring attitude toward oneself during times of suffering (25). According to Neff's conceptualization, each component of self-compassion comprises two parts (26, 27), with a negative aspect corresponding to each positive one (28). Thus, self-kindness is contrasted with self-judgment (self-criticism), common humanity with isolation, and mindfulness with over-identification (29).

Bereaved individuals with high self-compassion experience normal levels of grief and better mental health for themselves and their families (30). Research also shows a statistically significant relationship between low self-compassion and the severity of complicated grief symptoms (25). Additionally, lower levels of self-compassion predict higher levels of shame and PGD, while higher levels of self-compassion predict higher levels of pride, which subsequently help reduce prolonged grief (24).

Based on what has been discussed, both perceived social support (17, 18, 19, 23) and self-compassion (24, 25, 30) can predict prolonged grief disorder (PGD). However, a potential research issue that has not been addressed in previous studies is the mediating role of loneliness in these relationships. This study aims to address this research gap, as loneliness is influenced by the antecedents of this study—perceived or imagined social support (31, 32, 33, 34) and self-compassion (35, 36, 37)—and also affects the outcomes of this study, namely PGD (38, 39). Therefore, based on empirical and research foundations, loneliness can serve as a suitable mediating variable in the relationships between perceived social support and self-compassion with PGD. Loneliness is a painful, subjective, and emotional experience characterized by a perceived discrepancy between actual and desired social interactions (40). It is a sign of incomplete relationships and a potential indicator of interpersonal problems and weak social relationships, which disrupt an individual's sense of belonging (32).

Loneliness is moderately to weakly related to the size of one's social network. According to Weiss's typology (1973; as cited in 41), loneliness is a multidimensional phenomenon categorized into various forms of loneliness experiences, such as emotional loneliness and social loneliness. Emotional loneliness arises from the lack of close and intimate emotional attachments, while social loneliness occurs when there is a lack or limitation of a social network (42). Regarding the importance and necessity of this research, breast cancer, as one of the leading causes of mortality worldwide, is estimated to have resulted in 19.3 million new cancer cases and approximately 10 million cancer-related deaths globally in 2020. The incidence of cancer worldwide is projected to exceed 28.4 million by 2040 (43). Many patients diagnosed with cancer die due to the lack of definitive treatment, leading to the bereavement of their survivors. Another significant issue is that the survivors of these deceased patients, for various reasons, continue to experience grief long after the death of their loved ones. However, about 10% of the bereaved experience a persistent and debilitating reaction, known as PGD (25).

Therefore, research that can identify the factors influencing PGD in survivors of breast cancer patients is of great research importance and necessity. Understanding the factors influencing PGD in survivors of breast cancer patients can help prevent further potential problems for the

survivors (especially children and spouses) and aid them in returning to their normal lives. Thus, conducting this research is of significant importance and necessity. Psychologists and counselors in counseling centers and psychological services can use the results of this research to reduce problems associated with PGD in survivors of breast cancer patients. Therefore, this study addresses the question: Does loneliness mediate the relationship between perceived social support and self-compassion with PGD in breast cancer survivors?

Research Method:

This research is descriptive and correlational, conducted using structural equation mode (SEM). The statistical population consisted of survivors (children and spouses) of breast cancer patients in Qom city in April and May 2024. Although there is no general consensus on the sample size required for factor analysis and SEM, many researchers suggest a minimum sample size of 200. Kline (44) also believes that 20 samples are needed for each variable. Therefore, in this study, based on Klein's suggestion and accounting for potential dropouts, a sample size of 300 was selected. Respondents were chosen using purposive sampling. The researcher visited breast cancer treatment centers and provided online questionnaire links, asking the center officials to send these links to the families of deceased breast cancer patients, so that children (aged 15 and above) and spouses of the deceased could respond to the questionnaires. Eligibility criteria included a period of 6 months to 1 year since the death of the individual and obtaining informed consent to answer the questionnaires, while incomplete responses led to exclusion from the study.

After providing information about the research objectives, the implementation process, the principle of confidentiality, the right to choose to participate, and the right to withdraw while answering the questionnaire items, the participants were given the option to respond. Additionally, explaining the research objectives and assuring participants that their responses would be analyzed in aggregate were among the ethical principles adhered to in this study.

Descriptive and inferential statistics were used to analyze the data. At the descriptive level, means and standard deviations were used to measure the research variables. At the inferential level, Pearson correlation coefficients and structural equation modeling were used to examine the relationships between variables. The data analysis software used was SPSS and AMOS version 28. The following tools were used for data collection.

Prolonged Grief -13-Revised (PG-13-R) scale: This scale was developed by Prigerson and colleagues (45) to address the criteria for Prolonged Grief Disorder as outlined in the Diagnostic and Statistical Manual of Mental Disorders. The scale consists of 13 items and is based on a single factor. Item 1 asks, "Have you lost someone who was important to you?" which relates to the experience of grief. Item 2 asks, "How many months has it been since the death of this important person?" which relates to the duration of grief. Items 3 to 12 assess Criteria B and C of Prolonged Grief Disorder according to the DSM-5-TR, including yearning, preoccupation, identity disturbance, disbelief, avoidance, intense emotional pain, difficulty in resuming normal life, emotional numbness, a sense of meaninglessness in life, and severe loneliness. Finally, Item 13 asks, "Have the above symptoms caused significant impairment in social, occupational, or

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other important areas of functioning?" which relates to the level of functional impairment. Responses to Items 1 and 13 are categorical (Yes or No), Item 2 responses are based on months, and Items 3 to 12 are rated on a 5-point Likert scale (1 = Not at all, 2 = A little bit, 3 = Somewhat, 4 = Quite a bit, 5 = Very much). The total score ranges from 10 to 50, with higher scores indicating more prolonged grief. The developers of the scale used Cronbach's alpha to determine internal consistency, reporting coefficients ranging from 0.83 to 0.93. Test-retest reliability was assessed using the intraclass correlation coefficient, which was 0.86 and significant at the 0.001 level. Additionally Cohen's kappa coefficient for agreement between the items and DSM-5-TR symptoms ranged from 0.70 to 0.89 (45). The scale has been translated and standardized in Iran. For reliability assessment, Cronbach's alpha, Guttman split-half coefficient, and Spearman-Brown coefficient were used, resulting in a Cronbach's alpha of 0.89, a Guttman coefficient of 0.88, and a Spearman-Brown coefficient of 0.88. To assess the model fit for Prolonged Grief Disorder with the research data, the Root Mean Square Error of Approximation (RMSEA) was 0.08, and the Comparative Fit Index (CFI), Normed Fit Index (NFI), Non-Normed Fit Index (NNFI), Incremental Fit Index (IFI), and Relative Fit Index (RFI) were 0.94, 0.93, 0.91, 0.94, and 0.89, respectively (Yousefi & Hagh Nazari Esfahlan, 2024). Additionally, concurrent validity with the Grief Experience Questionnaire (GEQ) by Barrett & Scott (46) was examined, yielding Pearson correlation coefficients ranging from 0.22 to 0.57, significant at the 0.01 level (47). Another study reported an internal consistency (Omega coefficient) of 0.93 and test-retest reliability over six weeks of 0.89 (48). In the current study, Cronbach's alpha was used to assess reliability, with an overall Cronbach's alpha of 0.94 for all items.

Multidimensional Perceived Social Support Scale (MSPSS): This scale was developed by Zimet and colleagues (49) and includes 12 items, divided into three subscales: support received from family (items 3, 4, 8, and 11); support received from friends (items 6, 7, 9, and 12); and social support received from significant other's (items 1, 2, 5, and 10). The items are rated on a 5-point Likert scale: 1 = Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly agree. Scores range from 12 to 60, with higher scores indicating greater perceived social support. The scale's psychometric properties have been thoroughly examined. The Cronbach's alpha for the full scale was reported as 0.88, with subscale alphas of 0.87 for family support, 0.85 for friend support, and 0.91 for support from others. The test-retest reliability was examined, and the correlation coefficient for the entire scale was 0.85. The correlation coefficients for the subscales were 0.85 for family, 0.75 for friends, and 0.72 for others, all significant at the 0.01 level. Concurrent validity was assessed using the Hopkins Symptom Checklist (HSCL) by Derogatis and colleagues (50), with Pearson correlation coefficients revealing significant negative correlations for depression (-0.24) and anxiety (-0.18) at the 0.01 level (49). In Iran, the scale has been translated and standardized. Reliability was assessed using Cronbach's alpha, yielding coefficients of 0.91 for family support, 0.83 for friend support, 0.87 for others, and 0.89 for the overall scale. Convergent validity was evaluated with the Mental Health Inventory-28 (MHI-28) by Besharat (51), showing significant Pearson correlation

coefficients of 0.57 for psychological well-being and -0.51 for psychological distress at the 0.01 level (52). In this study, Cronbach's alpha was used to assess reliability, with coefficients of 0.88 for family support, 0.90 for friend support, 0.92 for others, and 0.96 for the overall scale.

Self-Compassion Scale (SCS): This scale, developed by Neff (53), consists of 26 items across six subscales: self-kindness (items 5, 12, 19, 23, and 26); self-judgment (self-criticism) (items 1, 8, 11, 16, and 21); common humanity (items 3, 7, 10, and 15); isolation (items 4, 13, 18, and 25); mindfulness (items 9, 14, 17, and 22); and over-identification (items 2, 6, 20, and 24). Responses are rated on a 5-point scale: 1 = Almost never, 2 = Rarely, 3 = Sometimes, 4 = Often, and 5 = Almost always. Items 1, 2, 4, 6, 8, 11, 13, 16, 18, 20, 21, 24, and 25 are reverse-scored. The scale's reliability was assessed through test-retest and Cronbach's alpha methods. The test-retest reliability coefficient was 0.93, significant at the 0.001 level, while Cronbach's alpha for the overall scale was reported as 0.92, with subscale alphas ranging from 0.75 to 0.81. Concurrent validity was evaluated using the Rosenberg Self-Esteem Scale (RSEs)by Rosenberg (54), yielding a Pearson correlation coefficient of 0.59, significant at the 0.01 level (53). In Iran, the scale has been translated and standardized. Reliability coefficients were calculated using Cronbach's alpha, with values of 0.81 for Self-Kindness, 0.79 for Self-Judgment (self-criticism), 0.84 for Common Humanity, 0.85 for Isolation, 0.80 for Mindfulness, 0.83 for Over-Identification, and 0.76 for the overall scale. Construct validity was assessed by calculating Pearson correlations between subscales and the total score, with coefficients ranging from 0.19 to 0.43, significant at the 0.01 level (55). In the current study, Cronbach's alpha coefficients were 0.71 for Self-Kindness, 0.86 for Self-Judgment (self-criticism), 0.90 for Common Humanity, 0.80 for Isolation, 0.70 for Mindfulness, 0.90 for Over-Identification, and 0.91 for the overall scale.

UCLA Loneliness Scale - Version 3 (UCLALS3): This scale, developed by Russell (56), is scored on a 4-point Likert scale: 1 = Never, 2 = Rarely, 3 = Sometimes, and 4 = Always. Items 1, 4, 5, 6, 9, 10, 15, 16, 19, and 20 are reverse-scored. The total score ranges from 20 to 80, with a mean score of 50. A higher score indicates greater loneliness. Russell evaluated the psychometric properties of the scale. Reliability was assessed using Cronbach's alpha, which ranged from 0.89 to 0.94. Convergent validity was established by correlating the UCLA Loneliness Scale with the Differential Loneliness Scale (DLS) by Schmidt and Sermat (57), yielding a Pearson correlation coefficient of 0.72, significant at the 0.01 level (Russell, 1966). In the standardized version of this questionnaire, Cronbach's alpha was 0.89. The correlation between individuals' self-reported persistence of loneliness and their scores on the UCLA Loneliness Scale was 0.55, significant at the 0.01 level, which was used as a measure of convergent validity (58). Other studies have also assessed internal consistency using Cronbach's alpha, which yielded a coefficient of 0.84 (59). Criterion validity was examined using the Depression Anxiety Stress Scale (DASS-21) by Lovibond and Lovibond (60). Pearson correlation coefficients for loneliness with anxiety, depression, and stress were 0.39, 0.59, and 0.44, respectively, all significant at the 0.01 level (61). In the present study, Cronbach's alpha for the entire set of questions was 0.91.

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Findings

The number of respondents was 300, and no outliers were identified in this study. Among the survivors, 129 people (43%) were children of the deceased and 171 people (57%) were spouses. In terms of education, 48 people (16 percent) had a diploma, 459 people (53 percent) had a post-graduate degree, 71 people (23.7 percent) had a B.Sc degree, and 22 people (7.3 percent) had a M.Sc degree. The mean and standard deviation of the age of the survivors were 38.20 and 12.47, respectively. Table 1 shows the descriptive indices (mean and standard deviation) and univariate and multivariate normality of the research variables.

Table 1: Mean and standard deviation of and normality and variables Research

Variables	mean	standard deviation	skewness	kurtosis
prolonged grief	15.82	4.83	0.61	-1.11
family	8.77	4.93	0.65	-1.15
friends	8.86	4.92	0.81	-0.92
significant other's	9.16	5.37	0.92	-1.17
total perceived social support	26.79	15.11	0.93	-0.95
self-kindness	12.97	7.52	1.09	-1.07
self-judgment	12.32	7.05	0.70	-0.26
common humanity	10.33	6.30	1.33	-0.56
isolation	10.20	5.83	1.16	0.50
mindfulness	9.85	5.01	1.11	0.42
over-identification	9.72	4.94	1.25	-0.26
total self-compassion	65.39	36.24	-0.79	1.18
loneliness	43.04	16.47		-0.76
normality multivariate	**Mardia's normalized multivariate kurtosis value: 2/51**			

Table 1 shows the mean, standard deviation and normality of the research variables. To measure the univariate normality of the data, skewness and kurtosis values are used, the values of which should be in the range of -2 to +2, which indicates the univariate normality of the distribution of scores (44 and 62), and in this research, the skewness values And elongation was in the range of -2 to +2. Also, to check the multivariate normality of the data, "mardia's normalized multivariate kurtosis value" is used, and the value obtained for the Merdia coefficient must be less than 4 (44 and 62), which based on the results listed in Table 1, the value of the Merdia coefficient is 2. 51 were obtained, which indicates the multivariate normality of the distribution of scores. Another assumption of structural equation modeling is the assumption of independence of errors. The value of durbin-watson statistic was between 1.5 and 2.5, so the independence of errors can be accepted. The assumption of multiple collinearity was also checked and none of the values of the tolerance statistic was smaller than the permissible limit of 0.1 and none of the values of the variance inflation factor were larger than the permissible limit of 10. Therefore, there was no multiple collinearity. Table 2 shows the correlation matrix between research variables.

Table 2: Correlation matrix variables Research

variables	1	2	3	4
prolonged grief	1			
perceived social support	-0.63**	1		
self-compassion	-0.61**	0.51**	1	
loneliness	0.69**	-0.54**	-0.60**	1

Table 2 shows the correlation matrix between research variables. There is a negative and significant correlation between perceived social support (r=- 0.63, p<0.01) and self-compassion (r=- 0.61, p<0.01) with prolonged grief. There is a positive and significant correlation between loneliness (p<0.01, r=0.69) and prolonged grief. Table 3 shows the fit indices of the research model.

Table 3: fit indicators of the research model

measure	threshold	acceptable value
CMIN	93.07	-
DF	41	-
CMIN/DF	2.27	<3
Sig	0/001	-
RMSEA	0.06	<0.08
PCLOSE	0.001	>0.90
CFI	0.93	>0.90
AGFI	0.91	>0.90
PCFI	0.65	>0.60
PNFI	0.71	>0.60
IFI	0.94	>0.90
TLI	0.93	>0.90
GFI	0.95	>0.90
NFI	0.97	>0.90

In this research, the parameter estimation method was the maximum likelihood method (MLE). Based on the results of the final model in Table 3, as can be seen, these indicators are all favorable. Also, the root mean square approximation index (RMSEA) should be below 0.08. In this research, the RMSEA index is equal to 0.04, which indicates the fit of the model based on Klein's model (44). The RMSEA test, which is very important in the field of model fit indicators and criteria, is suggested for three reasons. 1) it is sufficiently sensitive to the incorrect model, 2) the interpretation guidelines used in it usually provide a suitable conclusion about the quality of the model, and 3) it may lead to the creation of a confidence interval around the RMSEA. The RMSEA index analyzes the amount of possible error in the population and raises the question of how a model with unknown parameters and the optimal values chosen for it is determined to be optimal and is consistent with the covariance matrix of the population - if any - Therefore, to make it sensitive to the numbers of estimated parameters in a complete model, values less than 0.05 indicate good fit and values higher than 0.05 indicate possible errors in population

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estimation. According to Table 3, the amount of RMSEA index is equal to 0.06; Therefore, it can be concluded that the model has a very good fit with the data

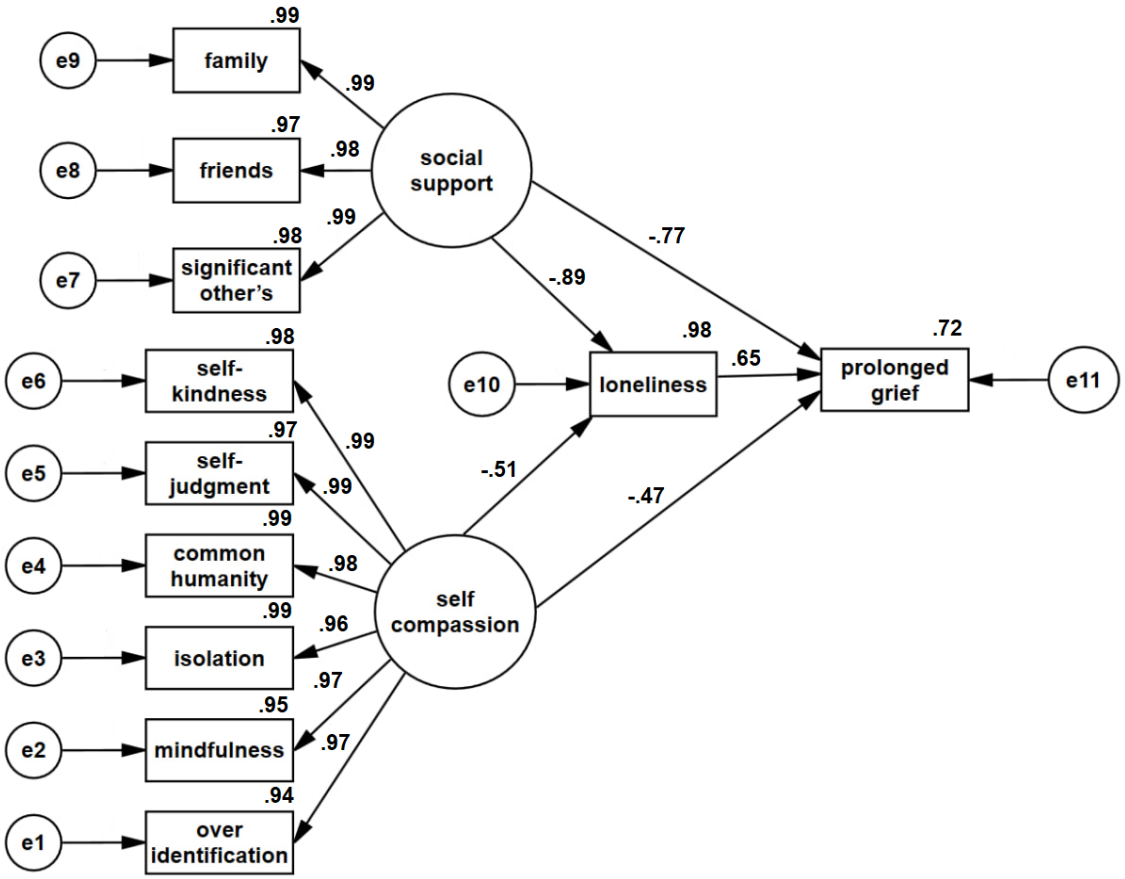

Figure 1. The obtained fit model

Figure 1 shows the **obtained model** and final model of the research, based on which 72% of prolonged grief disorder is explained. In other words, perceived social support and self-compassion can explain 72% of the variance of prolonged grief disorder in breast cancer survivors with the mediator role of loneliness. In Table 4, the standard and direct coefficients are listed below.

Table 4. The standard and direct coefficients

predictor variable	criterion variable	Beta	b	SE	CR	p
perceived social support	prolonged grief	-0.77	-0.65	0.23	-6.30	0.001
self-compassion	prolonged grief	-0.47	-0.59	0.10	-4.63	0.001
loneliness	prolonged grief	0.65	0.80	0.09	8.34	0.001

Based on what is stated in Table 4, the direct paths of perceived social support (β = -0.77 and sig=0.001), self-compassion (β = -0.47 and sig=0.001) and loneliness (β=0.65 and sig=0.001) is

significant on prolonged grief. Table 5 shows the bootstrap results of perceived social support and self-compassion with the mediating role of loneliness on prolonged grief.

Table 5. indirect paths (bounds bootstrap)

indirect paths	Indirect effects	bounds bootstrap		sig
		lower	Upper	
perceived social support- loneliness- prolonged grief	-0.65	-0.59	-0.74	0.001
self-compassion- loneliness- prolonged grief	-0.62	-0.61	-0.97	0.008

To test the significance of the mediating role of loneliness in the relationship between perceived social support and self-compassion with prolonged grief disorder, the Bootstrap method with 1000 resampling at a confidence interval of 0.95 was used. The higher the number of samplings, the higher the prediction accuracy (44 and 62). Also, based on the opinion of Klein (44), who states that if the range of estimates of the lower limit and upper limit does not cross zero, the indirect effect is considered. Based on this, the results of Table 5 showed that loneliness plays a mediating role in the relationship between perceived social support and self-compassion with prolonged grief disorder in breast cancer survivors.

Discussion and Conclusion:

The goal of the present study was to investigate the mediating role of loneliness in the relationship between perceived social support and self-compassion with prolonged grief disorder among survivors of deceased breast cancer patients. The results revealed a direct relationship between perceived social support and prolonged grief disorder in these survivors. This finding aligns with research conducted by Skalski et al. (17), Lip and O'Brien (18), Koko-Koppolu et al. (19), and Cacciatore et al. (23). No conflicting findings were identified for this result. It can be explained that individuals with robust social support systems tend to be more optimistic about their lives (63). These individuals are generally more successful in overcoming depression (64) and adaptability (65), maintaining self-esteem (66), and overcoming loneliness (32, 33, and 34). Consequently, they adapt more quickly to new circumstances and the loss of a loved one, leading to a reduced incidence of prolonged grief disorder. In asymmetrical and discordant families, attention, respect, commitment, and awareness are often neglected, leading to a lack of understanding of an individual's needs and desires.The absence of social support can lead to an unsatisfactory quality of life after the death of a loved one and a diminished sense of life’s value, ultimately contributing to prolonged grief disorder. Therefore, the greater the support individuals perceive from family members, friends, and others, the more empowered they feel to handle challenges and adjust to grief. When individuals receive perceived social support from family, friends, and others, they are better equipped to address life’s difficulties, including the loss of a significant person, which prevents unresolved issues from developing into prolonged grief disorder. Thus, it is logical to assert that perceived social support is directly related to prolonged grief disorder among survivors of deceased breast cancer patients.

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The results showed that self-compassion is directly related to prolonged grief disorder in survivors of deceased breast cancer patients. This finding is consistent with the results of research by Szötcs et al. (24), Zhang et al. (30), and Vara & Thimm (25). No contradictory findings were found for this result. In explaining this result, it can be said that grief is a natural and normal reaction to the loss of a loved one, characterized by a wide range of emotional, behavioral, cognitive, and physiological symptoms. For most survivors of a deceased person, these symptoms decrease over time as the individual copes with the loss (25). Survivors of deceased breast cancer patients experience many negative emotions such as sadness, distress, frustration, and a sense of failure in their lives due to the loss of their loved one. To cope with such negative emotions, they need to soothe and alleviate their pain, and most importantly, they need to overcome their grief. These individuals must increase their self-compassion in relation to these types of negative emotions.

In other words, self-compassion is a possible response to suffering, failure, and loss and can generally be defined as a form of self-protection, understanding one's attitudes toward oneself, and accepting limitations as a natural part of the human experience. It is not far-fetched that individuals with higher self-compassion, when faced with thoughts related to mortality and the acceptance of this inevitability (death), are kinder to themselves, see themselves as connected with others in a shared human experience, and, instead of ruminating and drowning in these thoughts, approach this phenomenon with more mindfulness and awareness, thus exhibiting less prolonged grief disorder.

Therefore, individuals with self-compassion generate fewer negative emotions within themselves. They are less affected by their emotions and try to realistically connect with their environment, accept the death of their loved one, and understand that as long as they are alive, they should live happily. From this perspective, they have a more realistic perception of themselves, others, and the circumstances of their lives and the death of their loved one, leading to experiencing less prolonged grief disorder and moving through grief more quickly. Hence, it is logical to say that self-compassion is directly related to prolonged grief disorder in survivors of deceased breast cancer patients.

The results also showed a direct relationship between loneliness and prolonged grief disorder among survivors of deceased breast cancer patients. This finding aligns with research by Reiland et al. (38) and Eisma&-Buyukcan-Tetik (39). No conflicting findings were identified for this result. Loneliness can be described as an unpleasant experience associated with the perception that one’s social needs are unmet through interpersonal relationships (67). The literature offers a range of theoretical approaches to explain loneliness, including the classical attachment theory expanded by Weiss (1973; as cited in 41), the cognitive dissonance approach by Perlman and Peplau (1981; as cited in 68), and the evolutionary perspective by Cacioppo et al. (69). Research has confirmed that loneliness is often a primary challenge experienced after a loss (70). There is evidence suggesting that loneliness may play a key role in post-loss depression, serving as a significant indicator that could lead from grief to other depressive symptoms (71). Loneliness is also associated with grief-related complications, including post-traumatic stress disorder,

depression, and other mental and physical health issues (72). Therefore, it can be said that grief is associated with increased emotional loneliness, and these findings are supported by attachment theory, which posits that the loss of a family member represents the loss of a key attachment figure, and support from family and friends cannot fully compensate for this impact. Thus, it is logical to assert that loneliness is directly related to prolonged grief disorder among survivors of deceased breast cancer patients.The results indicated that loneliness mediates the relationship between perceived social support and prolonged grief disorder among survivors of deceased breast cancer patients. There is no existing research showing that loneliness mediates this relationship, so the alignment and misalignment of this result with previous findings remain unclear. In explaining this result, it can be said that social support refers to the amount of help, guidance, comfort, and information received from an individual's social relationships. (73). Social support distinguishes between received social support and perceived social support. While received social support refers to the actual support an individual receives (74), perceived social support refers to the adequacy and availability of social support (32). Social connection and obtaining social support are fundamental human needs, and when this need for belonging is unmet, loneliness can occur. Evolutionary theory of loneliness predicts that loneliness has long-term implications for mental and physical health (75). According to this theory, perceived social isolation (i.e., loneliness) functions similarly to physical pain (69). If an individual is socially isolated, they are deprived of social support. To promote self-preservation, loneliness increases vigilance against social threats (76 and 77). This attentional bias toward social threats can perpetuate loneliness and lead individuals to have more negative social expectations, resulting in destructive social behaviors (76). It has been argued that this self-reinforcing cycle of loneliness increases the risk of long-term physical and mental health issues (75 and 76), leading to individuals who experience more loneliness having less perceived social support and thus experiencing more prolonged grief disorder. Therefore, it is logical to assert that loneliness mediates the relationship between perceived social support and prolonged grief disorder among survivors of deceased breast cancer patients.

The results also showed that loneliness mediates the relationship between self-compassion and prolonged grief disorder among survivors of deceased breast cancer patients. There is no existing research indicating that loneliness mediates this relationship, so the alignment and misalignment of this result with previous findings remain unclear. It can be explained that self-compassion involves supporting oneself in the experience of suffering or pain, whether due to personal mistakes or external life challenges (Neff, 2023). Those who practice self-compassion, particularly when grieving the death of a loved one, are less likely to feel lonely and are more likely to engage in social relationships. Since loneliness is an unpleasant experience of lacking desirable interpersonal relationships (78), self-compassion has a direct effect on loneliness (32, 33, and 34). Individuals who score high in self-criticism, isolation, and excessive self-identification are lonelier than those who exhibit self-kindness, human connection, and mindfulness. Consequently, when individuals are unkind to themselves and engage in more self-criticism, they experience greater loneliness, which contributes to prolonged grief. Therefore, it

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is logical to assert that loneliness mediates the relationship between self-compassion and prolonged grief disorder among survivors of deceased breast cancer patients.

Final Conclusion: The aim of the present study was to examine the structural equation modeling of the mediating role of loneliness in the relationship between perceived social support and self-compassion with prolonged grief disorder in survivors of deceased breast cancer patients. The findings demonstrated that the direct effects of perceived social support and self-compassion on prolonged grief disorder were significant. Additionally, the results indicated that loneliness has a significant mediating role in the relationship between perceived social support, self-compassion, and prolonged grief disorder. Given the findings of this research and the importance of perceived social support and self-compassion in prolonged grief disorder, it is recommended that psychologists implement training in social support and self-compassion interventions to reduce prolonged grief disorder among survivors of deceased breast cancer patients.

Limitations of the research: This study has several limitations that should be acknowledged. Firstly, the research employed a cross-sectional design; therefore, future studies could adopt experimental or longitudinal designs to explore the relationships between variables more comprehensively. Data were collected solely using self-report questionnaires. Although the validity and reliability of these questionnaires are well-established, response bias or socially desirable responses may have influenced the current study. The participants were survivors of deceased breast cancer patients from the city of Qom, thus limiting the cross-cultural applicability of the results. To address this limitation, future studies could gather data from multiple informants (such as peers, friends, and relatives) to increase measurement accuracy and replicate our findings. Considering that this research was conducted among survivors of deceased breast cancer patients, future studies could collect data from various groups, such as survivors of individuals deceased due to traffic accidents, suicide, and other chronic illnesses, to gain a broader understanding of the factors influencing prolonged grief disorder in survivors.

Application of research: The findings of this study hold substantial theoretical and practical significance. Theoretically, this study, by using a mediation model, may help in understanding the mechanisms involved in and influencing prolonged grief disorder. It also showed that perceived social support and self-compassion are key factors in predicting prolonged grief disorder. From a practical standpoint, the results help in strengthening and intervening in prolonged grief disorder among these survivors. Therefore, given the findings of this research and the importance of the role of perceived social support and self-compassion in prolonged grief disorder, it is recommended that psychologists implement training in social support and self-compassion interventions to reduce prolonged grief disorder among survivors of deceased breast cancer patients.

The ethical considerations: In the present study, the ethical principles of research, including secrecy, confidentiality and privacy of individuals, were observed, and participating in the study did not cause any possible harm to the participants.

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