Original Article Open Access

Archives Of Breast Cancer

DOI: 10.32768/abc.2023102138-147

A Structural Model Explaining the Effect of Cognitive Emotion Regulation on Fear of Cancer Recurrence in Breast Cancer Survivors: the Mediating Roles of Illness Perception and Psychological Well-being

Sedigheh Hosseini[a], Mahdiee Salehi*[a], Mohsen Jadidi[b], Mahdi Aghili[c]

[a]*Department of Clinical Psychology, Central Tehran Branch, Islamic Azad University, Tehran, Iran*

[b]*Department of Psychology, Guds City Branch, Islamic Azad University, Guds City, Iran*

[c]*Department of Radiation Oncology, Cancer Research Institute, Imam Khomeini Hospital Complex, Tehran University of Medical Science, Tehran, Iran*

ARTICLE INFO

Received:
11 January 2023
Revised:
6 April 2023
Accepted:
6 April 2023

Keywords:
Fear of cancer recurrence, emotion regulation, Illness perception, Psychological well-being, Breast cancer

ABSTRACT

Background: Fear of cancer recurrence (FCR) in cancer patients, including those with breast cancer is a special and highly conscious experience affecting emotional, cognitive and behavioral domains. This study examines the effect of cognitive emotion regulation on FCR with the mediation of illness perception and psychological well-being in breast cancer survivors in a structural model.

Methods: The population of this study included all women with breast cancer who were referred to Cancer Institute for their regular checkups in 2022. Overall, 300 patients were recruited based on convenience sampling. They completed the validated questionnaires online for FCR, cognitive emotion regulation, illness perception and psychological well-being. The proposed model was evaluated using structural equation modeling.

Results: The findings indicated the model did fit the data. In addition to the direct effect of adaptive and maladaptive strategies of cognitive emotion regulation on FCR, the indirect effect of adaptive strategies on FCR through psychological well-being (β=0.148, p=0.001) and illness perception (β=0.233, p=0.001) was negative and significant. Furthermore, the indirect effect of maladaptive strategies on FCR through psychological well-being (β=0.109, p=0.001) and illness perception (β=0.212, p=0.001) was positive and significant. Therefore, psychological well-being and illness perception negatively and significantly mediated the effect of adaptive strategies on FCR and positively and significantly mediated the effect of maladaptive strategies on FCR.

Conclusion: Patients who possessed adaptive strategies of cognitive emotion regulation, less-threatening perception of illness and higher psychological well-being were exposed less to FCR. Psychological interventions for strengthening these factors in breast cancer survivors are suggested.

INTRODUCTION

Accounting for 2.3 million new cases (11.7%) in 2020, breast cancer is regarded as the most common cancer in women and the leading cause of cancer death; nevertheless, the improvement of screening and treatment programs in recent decades has led to a considerable decline in breast cancer death rates.[1,2] Lately, attention has been directed to the effect of breast cancer and its treatment on psychological functioning and perceived quality of life.[3]

***Address for correspondence:**
Mahdiee Salehi.
Department of Clinical Psychology, Central Tehran Branch, Islamic Azad University, Tehran, Iran
Tel: +982122481634
Email: mah.salehi@iauctb.ac.ir

Fear of cancer recurrence (FCR) is a special and highly conscious experience affecting emotional, cognitive and behavioral domains. According to recent systematic reviews of breast cancer survivors, 22% to 87% report moderate-to-high degree of FCR.[4] In view of such situations, patients, including those with breast cancer, are prone to life-threatening conditions, which may be accompanied by lasting and exaggerated anxiousness.[5] In fact, as one of the most common concerns and the biggest unresolved psychosocial problem of survivors, FCR affects the quality of life, including physical, mental, and social well-being, feelings of being healthy along with symptoms related to the disease or treatment.[6,7] FCR is coupled with anxiety, intrusive thoughts, rumination, and psychological distress, which pose increased risk of anxiety, depression, and maladaptive behaviors.[8] Therefore, understanding the psychological factors that contribute to FCR in cancer survivors would inform psychological interventions aimed at reducing this risk.

Cognitive emotion regulation can affect FCR, requiring a conscious and cognitive method to manage the intake of emotionally arousing information including adaptive strategies (putting into perspective, acceptance, positive refocusing, positive reappraisal and refocus on planning) and maladaptive strategies (self-blame, blaming others, rumination and Catastrophizing).[9] Emotion regulation by cognitions or thoughts helps people to control their emotions during or after experiencing threatening or stressful events. For example, when experiencing a negative life event, people may be inclined to blame themselves or others. They may concentrate on their feelings by ruminating or may accept or positively reappraise the situation.[9] Previous studies have revealed that maladaptive strategies lead to many psychological symptoms associated with cancer, including FCR. The studies have demonstrated the association between higher reappraisal as an adaptive strategy and decreased FCR[10], and also habitual rumination as a maladaptive cognitive style to cope with high FCR.[8]

Based on Leventhal's self-regulation model, illness perception involves domains of cognitive representation (consequences, timeline, identity (symptoms), control/treatment and causes of the illness), emotional representation as well as the extent of clear understanding of the illness. Illness perception shows the patient's perception of an illness either as harmless or threatening.[11] Research has demonstrated that illness representations affect FCR.[12-14]

Psychological well-being is a model of positive psychological functioning comprising six components: self-acceptance, environmental mastery, positive relations with others, purpose in life, personal growth, and autonomy.[15] Psychological well-being in cancer survivors is defined by the presence or absence of distress and the presence or absence of positive well-being and psychological growth.[16] As psychological distress is regarded as an aspect of FCR, the relationship between psychological well-being and FCR is fairly revealing. A study on women with breast cancer demonstrated a negative and significant relationship between psychological well-being and FCR.[17]

Considering the dimensions of cognitive and emotional representation of illness perception, cognitive emotion regulation may be related to perceptions of illness. Cognitive restructuring as an adaptive strategy of cognitive emotion regulation can enhance illness perception.[18] Also, as the appraisal of positive and negative emotions exert effects on psychological well-being and considering that cancer patients undergo a wide range of negative emotions, emotion regulation can play a major role in their psychological well-being.[19]

Therefore, based on the issues outlined above, in view of the relationships between the variables, illness perception and psychological well-being seem to be capable of mediating the relationship between cognitive emotion regulation and FCR. Researchers have yet to investigate the relationship between these variables in a structural model. Therefore, the study is to answer whether the structural model of FCR in breast cancer survivors, based on the cognitive emotion regulation and the mediating roles of illness perception and psychological well-being, fits with experimental data.

METHODS

The study was a descriptive correlation. The population of this study included all women with breast cancer who were referred to Cancer Institute of Imam Khomeini hospital complex in Tehran for their regular checkups in the spring and summer of 2022. In the estimation of the sample size based on structural modeling, more than 200 people have been suggested.[20] Accordingly, 300 breast cancer survivors who satisfied the entry requirements were recruited based on convenience sampling. After providing necessary explanations about the study to participants and obtaining their informed consent, a link to the online questionnaire was sent to the respondents for completion.

Inclusion criteria

- Age: 25-70 years old;
- Ability to read and write and to comprehend the sentences of the questionnaire;

- At least three months since the completion of all post-diagnosis treatments, including surgery, chemotherapy and radiotherapy;
- No cancer recurrence;
- Having non-metastatic cancer;
- No use of psychiatric drugs and psychological interventions;

Research tools

Demographic and clinical Questionnaire

Demographic and clinical data include age, education, job and disease duration.

Fear of Cancer Recurrence Inventory (FCRI)

Simard and Savard developed this inventory with 42 items in 2009, which consists of seven dimensions: triggers, severity, psychological distress, coping strategies, functioning impairments, insight, and reassurance. Each item is rated on a 5-point Likert scale ranging from 0 (never) to 4 (all the time). Simard and Savard estimated the reliability of this inventory equal to 0.95 based on Cronbach's alpha coefficient which indicates good internal consistency.[21] The validity and reliability of Iranian version of this inventory was confirmed by Bateni *et al.* The authors estimated Cronbach's alpha at 0.86.[22] In this study, Cronbach's alpha was 0.84.

Short version of Cognitive Emotion Regulation Questionnaire (CERQ-short)

Garnefski and Kraaij developed this short 18-item version in 2006, which consists of nine dimensions: putting into perspective, acceptance, positive refocusing, positive reappraisal and refocus on planning as adaptive strategies, self-blame, blaming others, rumination and Catastrophizing as maladaptive strategies. Each item is rated on a 5-point Likert scale ranging from 1 (never) to 5 (all the time). Garnefski and Kraaij estimated the reliability of this Questionnaire from 0.68 to 081 based on Cronbach's alpha coefficient.[23] The validity and reliability of the Iranian version of this questionnaire were confirmed by Mohsenabadi and Fathi-Ashtiani. The authors estimated Cronbach's alpha at 0.95 for adaptive strategies and 0.88 for maladaptive strategies subscales.[24] In this study, Cronbach's alpha was 0.82 for adaptive strategies and 0.77 for maladaptive strategies subscales.

Brief Illness Perception Questionnaire (BIPQ)

Broadbent *et al.* developed this questionnaire with 9 items in 2006. The BIPQ measures cognitive representations (consequences, timeline, personal control, treatment control, identity), emotional representations (concern and emotions), illness comprehensibility and causes. Scores can range from 0 to 10 for each item, Patients choose the number that best corresponds to their views. Broadbent *et al.* estimated the reliability of this scale equal to 0.80 based on Cronbach's alpha coefficient.[25] The validity and reliability of the Iranian version of this questionnaire were confirmed by Karimi-Ghasemabad *et al.* The authors estimated Cronbach's alpha at 0.90.[26] In this study, Cronbach's alpha was 0.64 for cognitive representations and 0.75 for emotional representations.

Short version of Psychological Well-being Scale (PWB-short)

Ryff and Keyes developed this short 18-item version in 1995, which consists of six subscales: self-acceptance, environmental mastery, positive relations with others, purpose in life, personal growth and autonomy. Each item is rated on a 6-point Likert scale ranging from 1 (strongly disagree) to 6 (strongly agree). [27] The validity and reliability of the Iranian version of this scale were confirmed by Khanjani *et al.* The authors estimated the reliability of this scale equal to 0.71 based on Cronbach's alpha coefficient. [28] In this study, Cronbach's alpha was 0.62.

Statistical analysis

Data were analyzed using Pearson's correlation coefficient to examine the relationship between variables, and Structural Equation Modeling (SEM) to examine direct and indirect effects of independent variable on dependent variable and the effect of mediating variables (model analysis). SPSS software (version 26) and AMOS software (version 24) were used for data analysis.

RESULTS

Overall, 300 patients participated in this study. The mean (± SD) age of patients was 44.06±7.52 years. Demographic and clinical data, consisting of age, education, job, and the duration of disease, are demonstrated in Table 1.

The mean (± SD) of variables for all participants and the correlation coefficients for the all dimensions of variables of study are presented in Table 2. Results showed the direction of correlation between the variables fulfilled the expectations and was in keeping with the theories of the study.

After the assumptions of normality data distribution, collinearity, and independence of errors were confirmed, the analysis of model was conducted. As Figure 1 illustrates, the latent variables of illness perception, psychological well-being, and FCR constitute the measurement model. It was assumed that the latent variables are measured through indicators as follows: psychological well-being by the indicators of self-acceptance, environmental mastery, positive relations, purpose in life, personal growth, and autonomy; illness perception by the indicators of

cognitive representation, emotional representation, and illness comprehensibility, and fear of cancer recurrence by indicators of triggers, intensity, psychological distress, coping strategies, functioning impairments, insight and reassurance

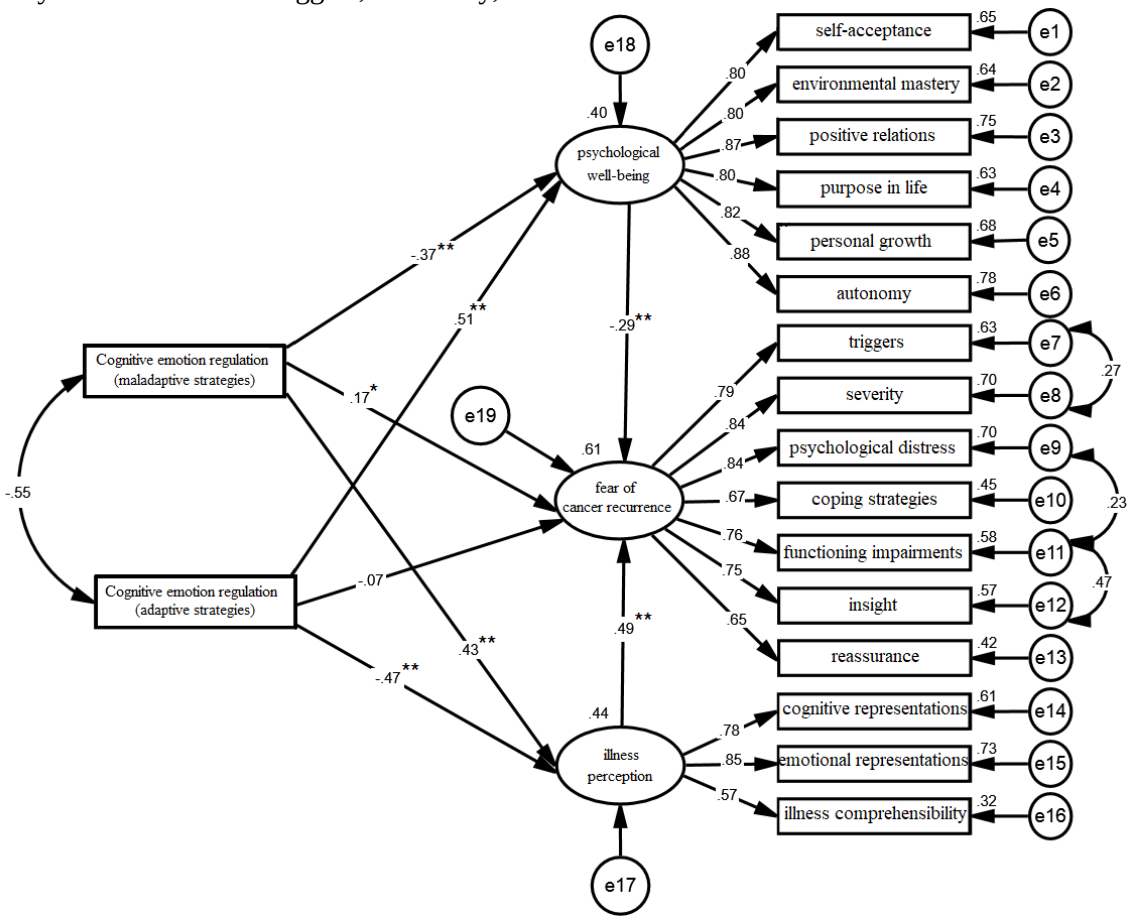

Figure 1. Standard estimates in the structural model of the research

Table 1. Demographic and clinical information of participants

Variables (N = 300)	N (%)
Age (year)	
≤ 35	38 (7.12)
36–40	58 (19.3)
41–45	83 (27.7)
46-50	67 (22.3)
≥ 50	54 (18)
Education	
Undergraduate degree	79 (26.3)
High school graduate	124 (41.3)
BS	77 (25.7)
MS and PhD	20 (7.6)
Job	
Housewife	213 (71)
Employed	68 (22.7)
Retired	19 (6.3)
Disease duration (year)	
< 1	51 (17)
1–5	203 (67.7)
5–10	42 (14)
> 10	4 (1.3)

The fitting of the measurement model was assessed using confirmatory factor analysis, AMOS software (version 24), and maximum likelihood (ML) estimation. Table 3 demonstrates the fit indices of the measurement model and the structural model.

Table 3 indicates that based on the cutoff points[29] except the CFI fit index (0.938, Cutoff Point: > 0.90), other fit indices which resulted from confirmatory factor analysis did not support the acceptable fit of the measurement model of the data collected. Consequently, the correction indices were evaluated and by creating the covariance between the errors the model was revised. Ultimately, the fit indices were obtained showing that the measurement model possesses an acceptable fit with the data collected.

Following the assessment of the fitting of the measurement model, the fit indices of the structural model at Stage 2 were estimated and assessed (Figure 1). In the structural model, it was assumed that FCR in breast cancer survivors is affected by the adaptive and maladaptive strategies of cognitive emotion regulation directly and by the mediation of psychological well-being and illness perception.

Table 2. Mean (± SD) and correlation matrix of descriptive analysis for all variables

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. CER (adaptive strategies)	-																	
2. CER (adaptive strategies)	-0.55 **	-																
3. PWB (self-acceptance)	-0.61 **	0.58**	-															
4. PWB (environmental mastery)	-0.46 **	0.55**	0.61**	-														
5. PWB (positive relations)	-0.56 **	0.60**	0.71**	0.69**	-													
6. PWB (purpose in life)	-0.53**	0.58**	0.62**	0.67**	0.67**	-												
7. PWB (personal growth)	-0.56**	0.62**	0.66**	0.65**	0.70**	0.67**	-											
. PWB (autonomy)8	-0.54**	0.62**	0.71**	0.72**	0.79**	0.68**	0.71**	-										
9. IP (cognitive representations)	0.58**	-0.64**	-0.58**	-0.55**	-0.61**	-0.57**	-0.59**	-0.65**	-									
10. IP (emotional representations)	0.58**	-0.58**	-0.56**	-0.51**	-0.55**	-0.50**	-0.52**	-0.59**	0.64**	-								
11. IP (illness comprehensibility)	0.35**	-0.32**	-0.34**	-0.30**	-0.37**	-0.32**	-0.35**	-0.40**	0.44**	0.54**	-							
12. FCR (triggers)	0.58**	-0.54**	-0.45**	-0.50**	-0.49**	-0.50**	-0.51**	-0.53**	0.56**	0.65**	0.42**	-						
13. FCR (severity)	0.59**	-0.58**	-0.53**	-0.55**	-0.55**	-0.54**	-0.52**	-0.55**	0.59**	0.65**	0.36**	0.76**	-					
14. FCR (psychological distress)	0.63**	-0.62**	-0.62**	-0.52**	-0.60**	-0.54**	-0.58**	-0.57**	0.54**	0.62**	0.31**	0.65**	0.69**	-				
15. FCR (coping strategies)	0.52**	-0.55**	-0.45**	-0.52**	-0.49**	-0.53**	-0.52**	-0.48**	0.46**	0.47**	0.32**	0.49**	0.55**	0.62**	-			
16. FCR (functioning impairments)	0.52**	-0.55**	-0.54**	-0.53**	-0.56**	-0.49**	-0.58**	-0.54**	0.52**	0.59**	0.36**	0.61**	0.62**	0.74**	0.54**	-		
17. FCR (insight)	0.49**	-0.47**	-0.45**	-0.50**	-0.55**	-0.47**	-0.57**	-0.55**	0.48**	0.58**	0.39**	0.62**	0.67**	0.68**	0.48**	0.74**	-	
18. FCR (reassurance)	0.54**	-0.48**	-0.42**	-0.42**	-0.44**	-0.48**	-0.42**	-0.47**	0.49**	0.51**	0.30**	0.61**	0.61**	0.49**	0.36**	0.41**	0.42**	-
Mean	20.22	33.34	12.02	10.96	12.41	10.66	13.09	11.07	14.07	10.25	5.02	10.44	15.20	5.43	17.09	5.61	3.24	7.14
SD	4.93	6.57	3.53	3.27	4.30	3.27	3.54	3.35	3.52	2.98	2.98	2.80	3.18	1.23	3.55	2.09	1.41	2.18

**P> 0.01,*P>0.05

The structural model, being the focus of this study, was analyzed using the structural equation modeling method and the fit indices, as shown in Table 3, show the acceptable fit of the structural model with the data.

Table 3. Fit indices of measurement model and structural model

Fitness Indicators	Measurement Model		Structural Model	Cutoff Point
	Primitive	Corrected		
Chi-Square	323.24	230.97	339.64	-
Degree of freedom of the model	101	98	125	-
/df$^2\chi$ Normed Chi-Square)	3.20	2.36	2.72	< 3
GFI (Goodness Fit Index)	0.874	0.914	0.911	0.90 >
AGFI (Adjusted Goodness Fit Index)	0.831	0.880	0.859	0.850 >
CFI (Comparative Fit Index)	0.938	0.963	0.947	0.90 >
RMSEA (Root Mean Square Error of Approximation)	0.086	0.067	0.076	0.08 <

Table 4 indicates the path coefficients of the structural model. The total path coefficient between adaptive strategies of cognitive emotion regulation and FCR (β=-0.449, P=0.001) is negative and significant, and the total path coefficient between the maladaptive strategies and FCR (β=0.490, P=0.001) is positive and significant. The path coefficient between illness perception and FCR (β=0.491, P=0.001) is positive and significant, and the path coefficient between psychological well-being and FCR (β=-0.294, P=0.001) is negative and significant. Table 4 indicates that the indirect path coefficient between the adaptive strategies of emotion regulation and FCR (β=-0.381, P=0.001) is negative and significant, and the indirect path coefficient between maladaptive strategies and FCR (β=0.321, P=0.001) is positive and significant.

Table 4. Direct and indirect path coefficients between the variables in the structural model

Effect	Path	b	S.E	β	P
Direct effect	Adaptive strategies→ Psychological well-being	0.150	0.016	0.505	0.001
	Adaptive strategies→ Illness perception	-0.369	0.050	-0.474	0.001
	Adaptive strategies → fear of cancer recurrence	-0.044	0.049	-0.068	0.382
	Maladaptive strategies →Psychological well-being	-0.151	0.023	-0.370	0.001
	Maladaptive strategies→ illness perception	0.465	0.066	0.432	0.001
	Maladaptive strategies→ fear of cancer recurrence	0.150	0.061	0.169	0.023
	Psychological well-being→ fear of cancer Recurrence	-0.635	0.141	-0.294	0.001
	Illness perception → fear of cancer recurrence	0.404	0.093	0.491	0.001
Indirect effect	Adaptive strategies→ fear of cancer recurrence	-0.244	0.040	-0.381	0.001
	Maladaptive strategies → fear of cancer recurrence	0.284	0.057	0.321	0.001
Total effect	Adaptive strategies →fear of cancer recurrence	-0.288	0.033	-0.449	0.001
	Maladaptive strategies→fear of cancer recurrence	0.434	0.045	0.490	0.001

Table 5 indicates the mediating roles of psychological well-being and illness perception in explaining the effect of adaptive and maladaptive strategies of cognitive emotion regulation on FCR using Baron and Kenny's formula.[30] According to the results in Table 5, the indirect path coefficient between adaptive strategies and FCR through psychological well-being (β=-0.148, P=0.001) and illness perception (β=-0.233, P=0.001) is negative and significant. Additionally, the indirect path coefficient between maladaptive strategies and FCR through psychological well-being (P=0.001, β=0.109) and illness perception (β=0.212, P=0.001) is positive and significant. The results of this study revealed that psychological well-being and illness perception would negatively and significantly mediate the effect of adaptive strategies of cognitive emotion regulation on FCR, and positively and significantly mediate the effect of maladaptive strategies of cognitive emotion regulation on FCR.

Table 5. The roles of psychological well-being and illness perception in explaining the effect of adaptive and maladaptive strategies of cognitive emotion regulation on fear of cancer recurrence

Paths	a*b	β	SE_{ab}	Z
Adaptive strategies→Psychological well-being→ fear of cancer recurrence	-0.095	-0.148	0.023	-4.13**
Adaptive strategies→ illness perception→ fear of cancer recurrence	-0.149	-0.233	0.031	-4.80**
Maladaptive strategies→ Psychological well-being →fear of cancer recurrence	0.096	0.109	0.036	2.67**
Maladaptive strategies→ illness perception→ fear of cancer recurrence	0.188	0.212	0.044	4.27**

Figure 1 shows that the sum of squared multiple correlations (R2) for FCR is equal to 0.61; this explains that the cognitive emotion regulation, psychological well-being, and illness perception account for 61% of the variance of FCR in breast cancer survivors.

DISCUSSION

High levels of FCR and its progression may persist over time and adversely affect mental health and quality of life, imposing a huge burden on health care resources.[31] Therefore, examining factors predicting and affecting FCR in patients is of outstanding importance. The purpose of this study was to examine and explain the effect of cognitive emotion regulation on FCR with the mediating roles of illness perception and psychological well-being in breast cancer survivors under a structural model we designed to examine the direct effect of adaptive and maladaptive strategies of cognitive emotion regulation and the indirect effect of them through the illness perception and psychological well-being on FCR. According to the results, the model demonstrated fitting to the data.

As to the direct effect of adaptive and maladaptive strategies of cognitive emotion regulation on FCR, the findings of this study correspond with the results of the studies of Guimond *et al.*, Tomei *et al.*, Lebel *et al.* and Jianlin *et al.* Their findings revealed that cognitive behavioral interventions, reappraisal, and cognitive restructuring- as adaptive strategies- have effectively decreased FCR in cancer survivors including those with breast cancer and gynecological cancer.[8,10,32,33] In a meta-analysis reviewing 23 studies on cancer patients, Taber *et al.* found that cognitive behavioral therapies focusing on cognitive processes such as worry, rumination, and attentional bias, whose objectives were to change how individuals relate to their internal experiences, had greater effects on reducing FCR.[34] Emotion regulation techniques which are employed by an individual do not substitute negative emotions for positive emotions, as the individual is still subject to negative emotions, but adaptive responses to the environment bring better results.[13] In view of the results obtained and their correspondence with previous findings, patients employing adaptive strategies think about joyful and pleasant issues instead of thinking about the actual event, assign a positive meaning to the event in terms of personal growth and accept what they have experienced; therefore they are more successful in controlling their emotions. Therefore, such strategies can contribute to controlling the key aspects of FCR and mitigate the effect of stimuli and situations resulting in FCR, fear intensity, and the period of time that a patient reflects on the disease recurrence, psychological distress caused by cancer such as sadness, despair, anger, and worry and personal and social functional disorder, whereas maladaptive strategies will increasingly lead to FCR.

As to the direct effect of illness perception on FCR, the results of this study correspond with those of other studies. In a study by Freeman *et al.*, breast cancer survivors with more emotional representation of the experience and those who attributed unrelated symptoms to breast cancer were subject to more fear of the illness recurrence.[12] The findings of Shim *et al.* also revealed a positive relationship between fear of progression and components of illness perception such as consequences, timeline, identity, and emotions in individuals with breast cancer; However, in the multivariate regression analysis, only the timeline, identity and emotions predicted the fear of cancer progression.[14] The results of Zang's study also indicated that the perceived identity of the illness predicted psychological distress, which is one of the dimensions of FCR, in head and neck cancer survivors.[35] According to the scores for illness perception presented in the results section, including scores for cognitive and emotional representation as well as the correspondence of our findings with those of previous studies, those patients who believe that the disease may not have so great a bearing on their lives, and it will not last for a long time, may not experience certain symptoms and their disease is thus

manageable and causes less anxiety and emotional consequences; they face less threatening illness perception and, therefore, undergo less FCR.

As to the direct effect of psychological well-being on FCR, the results of this study correspond with the study by Sharifi.[17] No other research has been done on the relationship between these two variables; nevertheless, considering the nature of fear, as a multifaceted factor, which is often one of the major factors in risking mental health and well-being, the findings of Tekir's study indicated that individuals whose fear of COVID-19 was lower than the average exhibited a higher than the average level of psychological well-being.[36] In another study, there was a significant positive relationship between the fear of COVID-19 and psychological distress and a significant negative relationship between the fear of COVID-19 with psychological well-being; psychological distress did mediate the relationship between the fear of COVID-19 and psychological well-being.[37] The results of our study and the findings of the above studies accordingly show the negative relationship between psychological well-being and FCR. As per our findings, where the patient exhibits an acceptable psychological well-being, despite constraints imposed by the disease, the patient demonstrates a positive attitude towards oneself and life, and actively involves in life activities and events, and explores meaning behind life's challenges and is also capable of managing life and its essentials; these aspects will result in a reduction in FCR dimensions such as psychological distress, worry and anxiety about the possibility of disease recurrence, and functional disorder in determining goals in life, daily tasks and social activities.

As to the direct effect of cognitive emotion regulation strategies on illness perception, the results of this study correspond with those of Hamzepour *et al.* who showed that changing thought processes through cognitive restructuring as an adaptive strategy resulted in the improvement of illness perception.[18] They are also in keeping with the results of a study on patients with chronic pain, demonstrating that there is a significant relationship between illness perception and poor strategies of cognitive emotion regulation, and that individuals having negative beliefs and threatening perceptions about their illness employ significantly maladaptive strategies such as self-blame and blaming others, and catastrophizing.[38]

The direct effect of cognitive emotion regulation strategies on psychological well-being was shown to have been in line with the results of a study by Karbalie *et al.* who established a significant positive relationship between reappraisal, as an adaptive strategy, and psychological well-being in women with cancer and found an increase in their participants' psychological well-being[19] and the findings of Salajegheh *et al.* who reported that the adaptive strategies of cognitive emotion regulation affected psychological well-being in women with breast cancer[39] and the results of a study by Erisian *et al.* who demonstrated a change in the adaptive strategy of reappraisal is linked with a change in the psychological well-being of women with breast cancer.[40] The findings of a study by Balzarotti *et al.* have also emphasized the role of positive reappraisal and refocus on planning in contributing to adults' psychological well-being; as some cognitive emotion regulation strategies are more interconnected with emotional issues than others, the strategies may also affect the enhancement of the well-being of the individuals in different ways.[41] Employing adaptive strategies- especially acceptance of the disease, through putting into perspective and positive refocusing of the disease, patients consider their disease as more controllable; they undergo less anxiety; and finally display a less threatening perception of the disease. By exhibiting positive attitudes towards oneself and life, the patient will possess a higher psychological well-being.

Therefore, in addition to the direct effect of cognitive emotion regulation strategies on FCR, the indirect effect of them on FCR is elaborated by considering the effect of cognitive emotion regulation on illness perception and psychological well-being and the effect of these two variables on FCR.

The three variables of cognitive emotion regulation, illness perception and psychological well-being explained 61% of the variance in FCR in breast cancer survivors, highlighting the major roles of these variables in FCR. By and large, the results are confirmed based on the relationships between the variables of the study and their correspondence with the findings of previous studies.

CONCLUSION

According to the results of this study, cognitive emotion regulation strategies can affect FCR through influencing the perception of illness and psychological well-being. Breast cancer survivors who increasingly employ adaptive strategies of cognitive emotion regulation, have a less-threatening perception of their illness, and that those with higher psychological well-being exhibit less FCR. High FCR can negatively affect overall quality of life; therefore, psychological interventions for improving such factors are suggested in order to decrease FCR and increase quality of life in breast cancer survivors. Few studies have been conducted on FCR in Iran, hence further research is essential in the field of the psychological aspects of cancer especially FCR.

The study is limited for being cross-sectional, using self-report questionnaires, and limiting the samples only to Cancer Institute of Iran in Tehran; therefore, there is a need for similar studies in other cities using different samples.

ACKNOWLEDGMENTS

The authors express their sincere gratitude to the staff of Cancer Institute of Imam Khomeini hospital complex and the participants.

ETHICAL CONSIDERATIONS

The study was approved by the Ethical Committee of Islamic Azad University-Central Tehran Branch (code: IR.IAU.CTB.REC.1400.105). The written permission was obtained from research units. Also, the authors affirm their observance of ethical rules when processing the results of the studies.

CONFLICT OF INTERESTS

The authors declare that there is no conflict of interests.

FUNDING

This study received no grant from any institution/company/university.

REFERENCES

1. Sung H, Ferlay J, Siegel R L, Laversanne M, Soerjomataram I, Jemal A, et al. Global Cancer Statistics 2020: GLOBOCAN Estimates of Incidence and Mortality Worldwide for 36 Cancers in 185 Countries. Cancer J Clin. 2021; 71(3):209-249. doi:10.3322/caac.21660.
2. Nafissi N, Khayamzadeh M, Zeinali Z, Pazooki D, Hosseini M, Akbari MS. Epidemiology and Histopathology of Breast Cancer in Iran versus Other Middle Eastern Countries. Middle East J Cancer. 2018; 9(3):243-251. doi:10.30476/mejc.2018.42130.
3. Martino G, Catalano A, Agostino, R M, Bellone F, Morabito N, Lasco C G, et al. Quality of life and psychological functioning in postmenopausal women undergoing aromatase inhibitor treatment for early breast cancer. plos one. 2021; 1-16. doi:10.1371/journal.pone.0230681.
4. Maheu Ch, Hébert M, Louli J, Yao T, Lambert S, Cooke A, et al. Revision of the fear of cancer recurrence cognitive and emotional model by Lee-Jones et al with women with breast cancer. Cancer Rep. 2019; e1172:1-12. doi:10.1002/cnr2.1172.
5. Tatyana I B, Svetlana Yu V, Natalya I N. Factors of the Development of Fear of Disease Progression in Patients with Breast Cancer. Macedonian J Med Sci. 2020; 8(E):74-80. doi:10.3889/oamjms.2020.3922.
6. Vagner I L, Duffecy J, Begaie M, Levine B J, Beaumont J, Duffecy J, et al. Development and refinement of FoRtitude: An eHealth intervention to reduce fear of recurrence (FoR) among breast cancer survivors. Psycho-oncology.2020; 29(1), 227-231. doi:10.1002/pon.5297.
7. Gormley M, Knob MT, Vorderstrasse A, Aouizerat B, Hammer M, Fletcher J, et al. Exploring the effects of genomic testing on fear of cancer recurrence among breast cancer survivors. Psycho-oncology. 2021; 30(8):1322-1331. doi:10.1002/pon.5679.
8. Jianlin L, Simard S, Peh Ch X, Griva K, Mahendran R. Beyond the fear that lingers: The interaction between fear of cancer recurrence and rumination in relation to depression and anxiety symptoms. Sychosom Res. 2018; 111:120-126. doi:10.1016/j.jpsychores.2018.06.004.
9. Garnefski N, Kraaij V. The Cognitive Emotion Regulation Questionnaire - Psychometric features and prospective relationships with depression and anxiety in adults. European J Psychol Assess. 2007; 23(3):141-149. doi:10.1027/1015-5759.23.3.141.
10. Guimond J A, Ivers H, Savard J. Is emotion regulation associated with cancer-related psychological symptoms? Psychol Health. 2019; 34(1): 44-63. doi:10.1080/08870446.2018.1514462.
11. Morris RM, Weinman J, Petrie K J, Horne R, Cameron L, Buick D. The revised Illness Perception Questionnaire (IPQ-R). Psychol Health. 2002; 17(1): 1-16. doi: 10.1080/08870440290001494.
12. Freeman A L, Janz N K, Katapodi C M, Zikmund-Fisher J B, Northouse L. The relationship between illness representations, risk perception and fear of cancer recurrence in breast cancer survivors. Psycho-oncology. 2017; 26(9): 1270-1277. doi:10.1002/pon.4143.
13. Conley C C, Bishop B T, Andersen L B. Emotions and Emotion Regulation in Breast Cancer Survivorship. Healthcare. 2016; 4(3), 56. doi:10.3390/healthcare4030056
14. Shim E J, Lee J W, Min Y H. Does depression decrease the moderating effect of self-efficacy in the relationship between illness perception and fear of progression in breast cancer? Psycho-oncology. 2018; 27(2):539-547. doi:10.1002/pon.4532. 2017
15. Ryff CD. Psychological Well-Being Revisited: Advances in the Science and Practice of Eudaimonia. Psychother Psychosom. 2014; 83(1): 10-28. doi:10.1159/000353263.
16. Andrykowsk M, Lykins E, Floyd A. Psychological health in cancer survivors. Seminars in Oncol Nursing. 2008; 24(3): 193- 201. doi:10.1016/j.soncn.2008.05.007.
17. Sharifi M. relationship between fear of recurrence and psychological well-being in woman with breast cancer: The predictive role of causal cancer attribution. Nurs midwifery. 2021; 19(6): 496-506. doi:10.52547/unmf.19.6.496.
18. Hamzepour Haghigi T, Dousti Y, Mirzaian B, Fakhri M. The effectiveness of group-based cognitive behavioral therapy on disease perception and pain perception in patients with rheumatoid arthritis. Sci J Kurdistan Med Sci. 2014; 20(3): 45-47. doi:10.22102/20.3.45.
19. Karbalaie M, Yazdanbakhsh K, Karimi P. Predicting Psychological Well-Being Based on Emotion Regulation, Cognitive Flexibility and Mindfulness in Cancer Patients.

Quarterly J Health Psychol. 2021; 10(1): 141-160. doi:10.30473/hpj.2021.50258.4653.
20. Gerbing D W, Anderson J C. The Effects of Sampling Error and Model Characteristics on Parameter Estimation for Maximum Likelihood Confirmatory Factor Analysis. Multivariate Behav Res. 1985; 20(3): 255-271. doi:10.1207/s15327906mbr2003_2.
21. Simard S, Savard J. Fear of Cancer Recurrence Inventory: development and initial validation of a multidimensional measure of fear of cancer recurrence. Support Care Cancer. 2009; 17(3): 241-251. doi:10.1007/s00520-008-0444-y.
22. Bateni FS, Rahmatian M, Kaviani A, Simard S, Soleimani M. Nejatisafa A A. The Persian Version of the Fear of Cancer Recurrence Inventory (FCRI): Translation and Evaluation of Its Psychometric Properties. Arch Breast Cancer. 2019; 6(4): 174-180. doi:10.32768/abc.201964174-180.
23. Garnefski N, Kraaij V. Cognitive emotion regulation questionnaire – development of a short 18-item version (CERQ-short). Pers individ differ. 2006; 41(6): 1045-1053. doi:10.1016/j.paid.2006.04.010
24. Mohsenabadi H, Fathi-Ashtiani A. Evaluation of psychometric properties of the Persian version of the short form of Cognitive Emotion Regulation Questionnaire (CERQ-18). Payesh. 2021; 20 (2):167-178. doi:10.52547/payesh.20.2.167
25. Broadbent E, Petriea K J, Maina J, Weinman J. The Brief Illness Perception Questionnaire. J Psychosom Res. 2006; 60: 631– 637. doi:10.1016/j.jpsychores.2005.10.020.
26. Karimi-Ghasemabad S, Akhbari B, Saeedi A, Talebian Moghaddam S,. Nakhostin Ansari N. The Persian Brief Illness Perception Questionnaire: Validation in Patients with Chronic Nonspecific Low Back Pain. Sci World J. 2021; 1-6. doi:10.1155/2021/3348011.
27. Ryff C D, Keyes C L. (1995).The structure of psychological well-being revisited. J Pers Soc Psychol. 69(4), 719-727. doi:0.1037/0022-3514.69.4.719
28. Khanjani M, Shahidi Sh, Fath-Abadi J, Factor structure and psychometric properties of the Ryff's scale of Psychological well-being, short form (18-item) among male and female students. J Thought Behavior Clin Psychol. 2014; 8 (32): 27-36. Available from: https://jtbcp.riau.ac.ir/article_67_en.htm.
29. Kline R B, Principles and practice of structural equation modeling. 4th ed, Guilford press, New York & London; 2016.
30. Mallinckrodt B, Abraham WT, Wei M, Russell DW. Advances in Testing the Statistical Significance of Mediation Effects. J Counsel Psychol. 2006; 53 (3): 372–378. doi:10.1037/0022-0167.53.3.372.
31. Shaw J, Kamphuis H, Sharpe L, Lebel S, Ben Smith A, Williams N H, et al. Setting an International Research Agenda for Fear of Cancer Recurrence: An Online Delphi Consensus Study. Fronitiers Psychol. 2021; 12: 1-10. doi:10.3389/fpsyg.2021.596682.
32. Tomei Ch, Lebel S, Maheu Ch, Lefebvre M, Harris Ch. Examining the preliminary efficacy of an intervention for fear of cancer recurrence in female cancer survivors: a randomized controlled clinical trial pilot study. Support Care Cancer. 2018; 26(8): 2751-2762. doi:10.1007/s00520-018-4097-1.
33. Lebel S, Maheu Ch, Tomei Ch, Bernstein M, Lori J d, Courbasson Ch, et al. Mechanisms of change of a cognitive-existential group intervention for fear of cancer recurrence: mediation analyses of the FORT trial. J Psycho-Oncology Res Pract. 2022; 4(3): 120-126. doi:10.1097/OR9.0000000000000077.
34. Tauber N M, O'Toole M S, Dinkel A, Galica J, Gerry Humphris G, Lebel S, et al. Effect of Psychological Intervention on Fear of Cancer Recurrence: A Systematic Review and Meta-Analysis. J Clin Oncol. 2019; 37(31): 2899–2915. doi:10.1200/JCO.19.00572.
35. Zhang N, Fielding R, Soong I, Chan K K, Lee C, Alice Ng, et al. Illness perceptions as predictors of psychological distress among head and neck cancer survivors: a longitudinal study. Head Neck. 2018; 40(11):2362-2371. doi: 10.1002/hed.25343.
36. Tekir O. The relationship between fear of COVID-19, psychological well-being and life satisfaction in nursing students: A cross-sectional study. Plos one. 2022;17(3): 1-15. doi:10.1371/journal.pone.0264970.
37. Lathabhavan R. Fear of COVID-19, psychological distress, well-being and life satisfaction: A comparative study on first and second waves of COVID-19 among college students in India. Curr Psychol. 2022; 1-8. doi:10.3389/fpsyg.2020.565153.
38. Sayeed Khan M N, Naser A, Zulqarnain A, Naz A. Illness Perception, Cognitive Emotional Regulation and Quality Of Life in Chronic Pain Patients. Res Gate. 2016, researchgate.net/publication/311627572.
39. Salajegheh S, Emamipour S, Nematolah Zadeh Mahani K. Explaining structural modeling of the relationship between self-coherence and mental well-being based on the mediating role of cognitive emotion regulation strategies in women with breast cancer. J Thought Behavior Clin Psychol. 2017; 11(45): 67-76. https://jtbcp.riau.ac.ir/article_1210_en.html.
40. Erisian Z, Torkan H, Mokarian F. Simple and Multiple Relationships of Emotional Regulation, Pain Self-efficacy and Perception of Disease with Psychological Well-being in Breast Cancer Women. J clin Psychol. 2019; 11(41):49-59. doi:10.22075/JCP.2019.16415.1567.
41. Balzarotti S, Biassoni F, Villani D, Prunas A, Velotti P. Individual Differences in Cognitive Emotion Regulation: Implications for Subjective and Psychological Well-Being. J Happiness stud. 2016; 17, 125–143. doi:10.1007/s10902-014-9587-3.

How to Cite This Article

Hoseini S, Salehi M, Jadidi M, Aghili M. A Structural Model Explaining the Effect of Cognitive Emotion Regulation on Fear of Cancer Recurrence in Breast Cancer Survivors: the Mediating Roles of Illness Perception and Psychological Well-being. Arch Breast Cancer. 2023; 10(2): 138-47.
Available from: https://www.archbreastcancer.com/index.php/abc/article/view/665