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Original Article

Structural Equation Modeling of Adherence to Treatment Based on Cognitive Function Mediating Role of Coping Strategies in Women with Breast Cancer Undergoing Chemotherapy

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Abstract

Background and Aim: The present study aimed to investigate the structural equations of treatment adherence based on cognitive function mediated by coping styles in women with breast cancer undergoing chemotherapy.
Materials and Methods: The present study was correlational and structural equation modeling. The statistical population included patients with breast cancer referred to specialized cancer clinics in Tehran between October and February 2017. The sample consisted of 250 patients with breast cancer who were selected by voluntary sampling. Data were obtained using the Folkman and Lazarus Coping Strategies Questionnaire, the Cognitive Function Questionnaire, and Morisky Medication Adherence Scale (MMAS-8). Data were also analyzed using correlation coefficient, Pearson correlation matrix, multiple regression, and structural equation modeling. Also, all statistical calculations were performed using Amos.22 and SPSS.22 software.
Results: The results showed that cognitive function had a direct effect on coping strategies (β=0.48, P<0.001) and adherence to treatment (β=0.63, P<0.001). Coping strategies had a mediating role in the relationship between cognitive function and adherence to treatment.
Conclusion: It can be concluded that cancer and the patient's necessity to follow treatment cause many challenges in daily life that necessitate the use of coping styles to adapt, coping styles play an important role in the course, control and psychosocial adjustment of the patient with cancer can have.

Keywords: Cognitive function, Coping strategies, Adherence, Breast cancer

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Introduction

Cancer is a complex, debilitating, and common disease that has many psychological, biological, and social consequences (1). In many countries around the world, including Iran, this disease is the second bio-medical cause of death after cardiovascular diseases, and while its bio-medical dimensions have been studied by many specialists and experts, its psychosocial aspects have been less studied, especially in Iran (2). There are more than 200 types of cancer and various factors have been mentioned in the pathology of different types of this disease (3). The most important risk factors in this disease are genetic factors, exposure to carcinogens, neuroimmune and neuroendocrine factors, as well as emotional and behavioral factors (4).

Cancer patients suffer from a variety of psychological problems, including fatigue, anxiety, hopelessness, and clinical signs of depression (5). According to the American Cancer Society, more than 25% of people with various cancers in the United States show clinical signs of depression, and depressed cancer patients suffer more pain, discomfort, and physical complaints (6). Cancer is the second leading cause of death in developed countries and the cause of one-fifth of deaths. Cancer is a disease in which the body's cells become malignant in a tumor known medically as a neoplasm (7). There is a possibility of cancer at different ages, but the probability increases with age. Cancer causes 13% of deaths, according to the American Health Association in 2016, 7.6 million people died of cancer (8). Cancer is not unique to humans, and all animals and plants can be affected by cancer. According to research in this field and the information gathered, psychological interventions can improve the secondary symptoms associated with the disease and even help in the biological treatment of individuals. On the other hand, there is a close relationship between psychological states and cancer. Among the various types of cancer, breast cancer accounts for 23% of all cancers in women. It is the most common cancer and the deadliest malignancy among women and is one of the most important factors in women's health in the world (9). Breast cancer is defined as an abnormal growth change in cells in the breast tissue that occurs abnormally in the mammary glands (lobules) or in the ducts that connect the lobules to the nipple (duct) (10).

Personal functioning and the level of medical advice in cancer patients are factors associated with the following treatment. On the other hand, the degree of the desire of each person to follow the treatment instructions is one of the factors that can play a role in improving cancer (11). Noncompliance with medication and treatment regimens is often seen in cancer patients. This inability to follow the treatment, decision-making and cognitive function care of cancer patients may lead to death (12). Several factors are influencing the follow-up of treatment, which can be based on the bio-psycho-social pattern and the pattern of medical and psychological integration, which are known to be the dominant patterns of health psychology. Several psychological factors affect the treatment, including the physician-patient relationship, memory error, and health control center (13).

On the other hand, one of the psychological factors that play an important role in the health of cancer patients is emotion (14). Emotion plays an important role in various aspects of life such as adapting to life changes and stressful events, so cognitive function is a basic principle in initiating, evaluating, and organizing adaptive behavior as well as preventing negative emotions and maladaptive behaviors (15). The term cognitive function includes strategies that reduce, maintain, or increase an emotion, and refers to processes that affect a person's current emotions and how they experience and manifest them (16).

In addition, cancer in the family somehow affects all members of the family and puts them under a lot of psychological and financial pressure. In such situations, people use strategies to reduce stress and pressure. A person uses a general coping strategy whenever he is facing problems such as cancer of himself or a family member, which includes problem-oriented coping strategy and emotion-focused coping strategy (17). Usually, when people feel that they can do something about a problem, they use problem-oriented coping strategies, and if they see the situation beyond their capabilities, they turn to emotion-oriented confrontation. However, they often use a combination of these two methods to get a more reliable result (18).

People with cancer may develop mood swings that lower their quality of life during their lifetime, but stronger psychological resources such as secure attachment and an adaptive coping strategy may be able to accompany them on a calmer course of treatment to experience higher mental health (19). Coping with stress reduces the pressure of illness and returns to balance and mental health. By using the optimal coping methods, the person will be able to maintain his or her adaptation, while inefficient methods will increase stress, unsatisfied vital needs, and emotional instability (20). According to research, people who respond to life stresses with optimism and resilience, use constructive coping strategies, and take control of life events have better immune system function, better coping with illness. These people have also higher mental health (21). So, the present study aimed to investigate the structural equations of treatment adherence based on cognitive function mediated by coping styles in women with breast cancer undergoing chemotherapy.

Methods

The present study was correlational and structural equation modeling. The statistical population included patients with breast cancer referred to specialized cancer clinics in Tehran between October and February 2017. The sample consisted of 250 patients with breast cancer who were selected by voluntary sampling. After selecting the statistical population and preparing the research tool, the researcher in the days when the specialized cancer clinic in Tehran was established, by referring to these clinics, selected people from the oncology ward of these centers according to the inclusion criteria.

Inclusion criteria were diagnosis of breast cancer by a specialist, patients having undergone chemotherapy for at least one period, age range 18 to 50 years, satisfaction with participating in the study and having sufficient literacy to complete the questionnaire, and no history of mental disorder (mania or severe depression) was also incomplete information based on the psychiatrist's diagnosis and exclusion criteria.

After explaining the research and obtaining patients' consent to participate in it, the researcher gave them the questionnaires simultaneously. To comply with ethical principles, the researcher emphasized to patients that their information would be kept confidential and analyzed as a group. The ethical considerations of the present study were as follows: 1) All participants received information about the research orally and participated in the research if they wished and obtained informed consent. 2) The subjects were assured that all information is confidential and will be used for research purposes. 3) To protect privacy, the names and surnames of the participants were not registered. 4) To ensure the work process, all questionnaires were administered by the researcher.

Materials

Coping Strategies Questionnaire

The questionnaire was developed by Lazarus and Folkman (22) and consists of 66 items that measure eight problem-oriented and emotion-oriented coping methods. Each of the subscales of this questionnaire is Confrontation; this dimension includes six items. Avoidance or distance: This dimension includes six items. Self-control: this dimension includes seven. Seeking social support; this dimension includes six items. Responsibility: this dimension includes four items. Escape – Avoidance: this dimension includes eight items. Planned problem solving: this dimension includes six items. Positive reassessment: this dimension includes seven items. These eight patterns are divided into two categories: problem-oriented methods (social support, responsibility, planned problem-solving and positive re-evaluation) and emotion-oriented (confrontation, avoidance, escape-avoidance, and self-control). Lazarus and Folkman (22) reported internal stability of 0.79 to 0.66 for each coping method. In Abravani & Gharibzadeh's (23) study, using Cronbach's alpha coefficient, the internal stability of the whole scale and its subscales were obtained 0.76 of the total scale, 0.75 of the problem-oriented dimensions, and 0.72 of the emotion-oriented dimensions, respectively.

Cognitive Function Questionnaire

This questionnaire is used to measure the cognitive status of individuals and was developed in 1975. The questionnaire has 20 items. Selection criteria were evaluation of different areas of cognitive functions and ability to remember and no need for equipment. The

cognitive functions and functions evaluated in this test are orientation memory, recording, attention and calculation, recent memory, different linguistic functions, and spatial thinking. The answer to each question is correctly incorrect and the overall score is calculated based on the number of correct answers. The validity of this test was obtained by concurrent criterion method and its reliability was obtained by Cronbach's alpha and bihalves (r=0.71 and α=0.78) (24).

Morisky Medication Adherence Scale (MMAS-8)

The Treatment Adherence Scale is a self-report questionnaire designed by a team of researchers in 2010 and contains eight items. At this scale, adherence to high treatment with a score of 8 out of 8, adherence to moderate treatment with a score of 6 out of 8, and adherence to low treatment with a score of less than 6 are determined (25). The treatment adherence scale was constructed from a scale of four previously validated items and supplemented with other items that include conditions that include treatment adherence. This scale was first translated into Persian by Ranjbaran et al. (26), and then reviewed. The reliability of the Cronbach's alpha follow-up scale was 0.89, which indicates the optimal reliability of this scale.

To analyze the collected data, descriptive statistics and inferential statistics were used. In the descriptive statistics section, the mean, standard deviation was used. In the inferential statistics section, to test the assumed relationships in the proposed model, the statistical method of structural equation modeling was used. For this purpose, model fit indices such as chi-square, Comparative Fit Index (CFI), the goodness of fit index (GFI), Adjusted Goodness of Fit Index (AGFI), and root mean square error approximation (RMSEA) were calculated. The data were also analyzed using correlation coefficient, Pearson correlation matrix, multiple regression, and structural equation modeling. In addition, all statistical calculations were performed using Amos.22 and SPSS.22 software.

Results

The mean age of the respondents was 39.5 years with a standard deviation of 6.72. The minimum age was 23 years, and the maximum age was 50 years. The highest education of the participants was related to primary education with 77 people (30.8%) and the lowest was related to university education with 16 people (6.4%). A total of 103 participants (41.2%) were in stage 2 and 147 (58.8%) were in stage 3 cancer. The highest duration of the disease was related to one to five years with 97 patients (38.8%) and the lowest was related to the duration of more than ten years with 30 patients (12%).

Kolmogorov-Smirnov test was used to evaluate the normality of data distribution. When checking the normality of the data, we test the researcher's assumption that the data distribution is normal at an error level of 0.5. Therefore, if the larger test statistic equals 0.05, then there is no reason to reject the null hypothesis that the data is not normal. In other words, the data distribution will be normal. In general, the Kolmogorov-Smirnov test indicates that the data are normal. Therefore, in general, according to the study of data normality with the Kolmogorov-Smirnov test, it can be concluded that at present, the data are normal, and inferential data analysis can be performed. To investigate the conceptual model presented in the research, the initial model was analyzed according to the prediction of following the treatment in direct and indirect ways by the variables of cognitive function and coping strategies.

According to Table 4, the statistics obtained from three comparative, absolute, and economical indices show that the model obtained after a correction has an acceptable fit and the model is correct in the path of errors and variances obtained. Table 5 shows the values obtained from regression weight statistics to determine the effect values (B) according to the significance level obtained from the critical ratio, which shows the significant effect values of subscales on the overall variable and the exogenous variable (cognitive regulation strategies).

Table 5 shows the standardized and non-standardized values of the prediction paths of the exogenous research variables on the endogenous variable together concerning the value of t obtained in the model. In general, all values obtained are significant and represent a significant prediction. According to Table 6, direct pathways by cognitive function variables, and coping strategies have a direct effect on adherence to treatment.

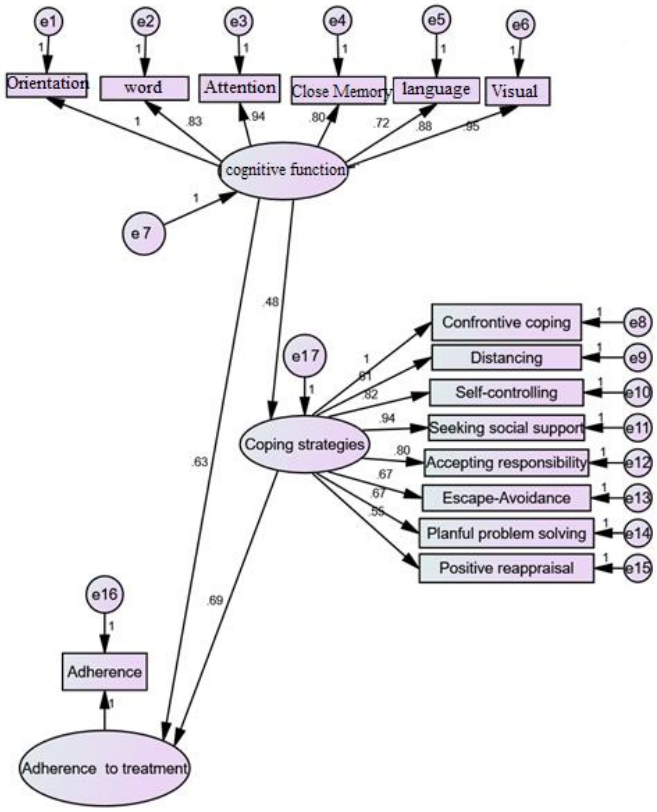

Figure 1. The basic model of standardized pathways Predicting treatment in direct and indirect pathways by variables of cognitive function and coping strategies.

Paying attention to the above in the direction of the results obtained from the measurement model, the final model of the research can be drawn between explicit and implicit variables, and in general, the conceptual model has been approved. According to the statistics obtained from three basic indicators: absolute, comparative, and economical, the research model was approved and in general, four variables can predict (R^2= 0.56) of the variable of treatment, which is 53% of Adherence to treatment can be explained by variables of cognitive function strategies and coping strategies in direct and indirect ways.

According to Table 7, as can be seen, the indirect paths considered concerning the standardized values (β) are obtained, the indirect path of cognitive function to adherence to treatment mediated by coping strategies in women with breast cancer undergoing chemotherapy according to the bootstrap estimation method.

Discussion

This study aimed to investigate the modeling of structural equations of adherence to treatment based on cognitive functions by mediating coping styles in women with breast cancer undergoing chemotherapy. The results showed that modeling adherence to treatment based on cognitive functions was fitted by mediating coping styles in women with breast cancer undergoing chemotherapy. These findings were in line with the results of Massey et al. (27).

Table 1: Descriptive statistics of research variables.

Variables	Components	M	SD	Min	Max
Coping Strategies	Confrontive coping	11.47	1.93	3	18
	Distancing	10.36	1.22	3	16
	Self-controlling	14.84	4.13	5	21
	Seeking social support	11.56	3.70	4	18
	Accepting responsibility	7.11	1.24	2	12
	Escape-Avoidance	16.31	3.02	6	22
	Planful problem solving	11.30	2.85	3	17
	Positive reappraisal	12.53	3.15	3	21
Cognitive function	Orientation Memory	6.14	1.81	0	10
	word Records	1.54	0.43	0	3
	Attention and Calculations	2.83	0.71	0	5
	Close Memory	2.89	0.85	0	5
	Different language functions	1.38	0.40	0	3
	Visual-spatial thinking	3.80	0.69	0	6
	Total score of cognitive function	24.18	7.12	0	30
Adherence to treatment		3.94	1.83	0	8

Table 2: Fit indicators from data analysis and variables.

The goodness of Fit Index	$\chi 2$/df	root mean square error of approximation (RMSEA)	adjusted goodness of fit index (AGFI)	the goodness of fit index (GFI)	comparative fit index (CFI)
Path pattern	1.90	0.067	0.98	0.98	0.95

Table 3: Weight regression statistics and critical ratios of research variables.

Exogenous variable	Direction	Endogenous variable	b	β	t	P
Cognitive function	➔	Adherence to treatment	0.745	0.634	12.874	0.001
Coping Strategies	➔	Adherence to treatment	0.620	0.518	7.486	0.001
Cognitive function	➔	Coping Strategies	0.535	0.480	5.987	0.001

In explaining that there is a relationship between cognitive functions and adherence to treatment in women with breast cancer undergoing chemotherapy, it can be said that since brain imaging studies show a decrease in brain volume, a decrease in the volume of important structures in executive functions such as the forehead and prefrontal cortex, a decrease in functional communication and the low response of the prefrontal cortex of cancer patients undergoing chemotherapy, which is why it reduces adherence. Also, when people experience attention deficits, they usually experience working memory failure (21). For example, they have

Table 4: Direct estimation of the model with the maximum mean level.

Variable	b	β	R2
Cognitive function to adherence to treatment	0.745	0.634	0.396
Coping strategies to adherence to treatment	0.624	0.518	0.260
Cognitive function to coping strategies	0.535	0.480	0.230

Table 5: Indirect estimation of the model using the bootstrap method.

Variable	B	Low limit	High limit	P
Cognitive function to adherence to treatment mediated by coping strategies	0.467	0.316	0.511	0.001

difficulty concentrating to do things, generally forgetting what they wanted to do, especially in cancer patients, the problem appears that they have difficulty remembering what to do or are unable to plan for a suitable operation. Therefore, it can be said that cognitive functions are associated with daily living activities (22). In other words, to perform daily activities properly and efficiently, we need normal and effective functions of cognitive functions of the brain. In a more abstract view, these behaviors shape adherence to treatment. Cognitive functions are one of the cognitive domains that are impaired in patients with cancer. Since people with cognitive impairments have difficulty showing inflexible thtttaought patterns, inability to understand ideas or behaviors, lack of acceptance of mistakes, and difficulty in identifying diverse responses to specific tasks in planning and solving their life problems, including adherence to treatment (28).

Also, in explaining that there is a relationship between coping styles and adherence to treatment in women with breast cancer undergoing chemotherapy, it can be said that cancer and the patient's necessity to follow treatment cause many challenges in daily life that necessitate the use of coping styles to adapt, coping styles play an important role in the course, control and psychosocial adjustment of the patient with cancer can have. Various studies have shown that coping styles are related to control and adherence to treatment and are a strong predictor of treatment adherence in cancer patients (29). Some studies have shown that problem-oriented coping styles are correlated with positive treatment adherence and emotion-focused coping style with negative treatment in chronic diseases, and in cancer patients coping styles play an important role in following treatment and appropriate performance of patients. However, the ability to follow treatment is influenced by a person's adaptation to the disease, which is also greatly caused using appropriate coping styles by patients. Coping styles can directly affect patients' control by reducing or increasing stress through treatment adherence disorder. The correlation is that the higher the use of coping styles by patients, the higher the adherence to their treatment, the more mutual this relationship can be so that the higher the adherence to the treatment of the patients, the higher the rate of applying coping styles (30). The presence of a positive correlation between adherence to treatment and coping styles of confrontation, optimism, supportive and self-reliance shows that these coping styles, most of which are characteristic of confrontation with the source of stress and relying on the individual's abilities to cope with disease stresses and also the use of supportive systems, which appropriately control stresses and increase compatibility with Chronic disease in these patients using these coping methods to follow the treatment more and do. Also, explaining that there is a relationship between coping strategies and adherence to treatment in women with breast cancer undergoing chemotherapy, it can be said that having

cancer and requiring the patient to follow treatment cause many challenges in daily life. Makes coping necessary for adaptation, coping styles can play an important role in the course, control, and psychosocial adaptation of the cancer patient. Various studies have shown that coping strategies are associated with control and adherence to treatment and are a strong predictor of adherence to treatment in cancer patients (31).

Some studies have shown that problem-oriented coping strategies are associated with positive treatment and emotion-focused coping strategies are associated with negative treatment in chronic diseases. Also, in cancer patients, coping styles play a very important role in following the patient's treatment and proper functioning. They play. However, the ability to follow treatment is affected by the individual's adaptation to the disease, which is also largely created using appropriate coping styles by patients. Coping styles through reducing or increasing stress can directly affect patient control through impaired treatment compliance. The correlation is that the higher the use of coping styles by patients, the higher the adherence to their treatment. This relationship can be two-way, so that the higher the patient's treatment, the higher the use of coping styles (32-33). There is a positive correlation between treatment adherence and coping styles of coping, optimism, supportiveness, and self-reliance. It is one of the support systems that cause proper control of tensions and increases adaptation to chronic disease in these patients by using these coping methods to follow and follow the treatment more (34-35).

There were some limitations to the current study. First, only a questionnaire has been used. Therefore, there may be a bias in the information obtained; Because some participants may answer some questions with a bias to better express themselves, another limitation of the present study was the use of the correlation method, which limits the causal inference about the resulting relationships. Second, the sample population is limited to breast cancer patients in Tehran. Thus, the generalization of the results to other cities is limited. Also, the lack of sufficient research in this field, especially in the case of breast cancer patients in our country, which made the work of this study difficult, and the complexity and abundance of research variables and therefore the large number Questionnaire questions that caused fatigue and confusion of some subjects in answering them. It is also suggested that combined research methods be used using methods such as interviews and observation along with a questionnaire to collect information, updating the tools of the studied variables to be a priority in future research, another achievement that can the potential for future research is to prepare and standardize cognitive function training packages for greater patient adaptation. It is suggested that a similar study be conducted in other cities so that the results of the present study can be compared with the present results and used. From other similar structures in this regard, instead of this method and comparing its results with the present study, considering the importance of confirming the efficiency of intervention approaches to develop their application is suggested. This research should be examined with a different community and also in the form of other research projects.

Conclusion

It can be concluded that there is a relationship between cognitive function and adherence to treatment with coping strategies in women with breast cancer undergoing chemotherapy. It can be concluded that cancer and the patient's necessity to follow treatment cause many challenges in daily life that necessitate the use of coping styles to adapt, coping styles play an important role in the course, control and psychosocial adjustment of the patient with cancer can have.

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Conflict of Interest

The authors declare that they have no conflict of interest.

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