Structural Model of Medication Adherence based on Health Anxiety, Positive Meta-Emotion, and Pain Self-Efficacy Mediated by Health Locus of Control in Cancer Patients

Fatemeh Soleimani Nameghi[1], Hasan Abdollahzadeh[2*], Javanshir Asadi[3]

Abstract

Objective: Cancer is one of the most essential health issues in the world and Iran which is usually associated with significant clinical and psychological discomfort in the optimal use of coping strategies. Therefore، the purpose of the present study was to analyze a structural model of medication adherence based on health anxiety, positive meta-emotion, and pain self-efficacy mediated by health locus of control in men with cancer.

Method: The research was descriptive-correlational using structural equation modeling to test the relationships between the variables. The statistical population was men with gastrointestinal cancer in Golestan province referred to Shafi Hyrkan Cancer Patients Support Center. According to, 227 people were selected through targeted sampling. The research instruments included the Salkowski and Warwick Health Anxiety Inventory, Beer and Moneta Positive Metacognitions and Positive Meta-Emotions Questionnaire, Nicholas Pain Self-Efficacy Questionnaire, Morisky, Ang, and Wood's Medication Adherence Questionnaire, and Wallston's Health Control Source Inventory. Data analysis was performed in LISREL software version 8.71.

Results: The results showed that health anxiety, internal health locus of control, and positive meta-emotion had a positive effect (P <0.005) and pain self-efficacy had a negative and significant effect on medication adherence (P <0.001). The source of internal health locus of control mediated the effect of pain self-efficacy and positive meta-emotion mediated the medication adherence positively and significantly (P <0.005).

Conclusion: Health anxiety, positive meta-emotion, and pain self-efficacy are correlated with medication adherence and affect medication adherence mediated by health locus of control.

Keywords: Health Anxiety, Positive Meta-Emotion, Pain Self-Efficacy, Medication Adherence, Health Locus of Control.

Introduction

Cancer is considered one of the most important health issues in the world and our country, Iran. According to scientific, experimental, and research evidence, cancer is one of the most fundamental and dangerous chronic illnesses after cardiovascular diseases and accidents and is one of the most threatening factors in society (hemmati et al., 2008). Gastrointestinal cancer due to population growth, increasing average age, changes in diet and lifestyle (drug use, environmental pollution, the presence of Helicobacter pylori), and genetic factors in recent decades has increased significantly in Iran, especially in Golestan province (Yazdani et al., 2010). The Comprehensive Cancer System of Golestan Province in 2010 announced that the prevalence of gastrointestinal cancers in men is much higher than the occurrence of gastrointestinal cancers in women. On the other hand, in patients with gastrointestinal cancers, cultural aspects, life experiences, behaviors, lifestyle, and economic and social status determine the meaning of cancer for patients and their families (Kerner & Bailey, 2009).Therefore, in addition to medical therapy, the need for psychological and social

1-PhD student in Psychology, Faculty of Humanities, Islamic Azad University, Gorgan Branch. Gorgan, Iran.
2-Department of Psychology, Payame Noor University, Tehran, Iran
3-Assistant Professor, Department of Psychology, Faculty of Humanities, Islamic Azad University, Gorgan Branch. Gorgan, Iran
∗ Corresponding Author: Hasan Abdollahzadeh, Email:abdollahzadeh2002 @yahoo.com

support is felt for patients with this type of cancer (Seligman, Park & Patterson, 2005).Numerous studies have confirmed the connection between cancer and unrealistic fear of death, social phobia, panic disorders, anxiety disorders, depression, interpersonal sensitivity (Marcus & Chiwich, 2003), decreased self-efficacy (Paraga & Lopez, 2015), and negative emotions (Shim & Et al., 2020.

In this regard, one of the most common psychological reactions patients show during the diagnosis and treatment of cancer causes a lot of suffering, frequent hospitalizations, constant worries for patients and their companions, and paying exorbitant costs is health anxiety (Karimi et al., 2018). This anxiety dramatically affects their job, academic and interpersonal performance, adjustment, and quality of life (Babuski et al., 2016). For people suffering from cancer, such worries cause them to pay too much attention to any physical symptoms to seek timely treatment (Abramovis & Bradek, 2008). Constant worrying about physical symptoms causes the patient to think about unpleasant things, such as thinking about cancer experience, constantly evoking negative feelings and thoughts related to cancer, and reducing the health conditions (Lopez Sola et al., 2018).

Positive meta-emotion is one of the factors which seems to be associated with cancer and anxiety. The news people receive about the growing number of people with cancer increases their health concerns by threatening their safety and well-being (Shim et al., 2020). Meta-emotion is the emotional reactions of individuals to experienced emotions that play an important role in organizing patients' thoughts and feelings (Nalipi & Mordno, 2018). Positive meta-emotion, by using mindfulness and psychological acceptance, ensures the improvement of health in cancer patients (Nef, 2003). This structure is associated with good cognitive performance and leads to life satisfaction (Haradwala, 2016), and causes cancer patients to use desirable and adaptive coping strategies to deal with critical situations (Amir Fakhraei et al., 2019). On the other hand, people with negative emotions in the face of stressful situations use negative strategies including negative rumination, self-blame, blaming others, and considering it catastrophic (Pandi & Jaysulal, 2017). These negative and maladaptive strategies have a devastating effect on the mental health and quality of life of cancer patients (Izadpanah et al., 2015).

Among the cancer effects, another component that seriously disrupts the quality of life of cancer patients is pain (Anna et al., 2015). Pain as a physical factor affects many life aspects and behaviors of the individuals so that continuous pain gradually has negative and harmful effects on their general health, mental, physical, and social functions and often interferes with their ability to perform various life activities and renders them incapable in doing normal daily activities (Nicholas, 2007). One of the psychological factors affecting the amount of pain that a cancer patient experiences is self-efficacy. In the framework of social learning theory (Bandura, 1997), self-efficacy reflects the individual's confidence in their abilities to achieve the desired result. In this viewpoint, self-efficacy determines the degree of individuals' resistance against obstacles and unpleasant experiences, and by assessing the person's confidence in the ability to perform certain activities, his/her performance can be predicted while performing those actions (Philip & McAllie, 2014).

Pain self-efficacy is the degree to which a person is confident in his or her ability to maintain function despite having pain. Several studies in cancer patients with chronic pain have shown that increased self-efficacy resulting from cognitive behavioral therapy for chronic pain can be associated with better treatment outcomes, including reduced severity of physical disability (Kopman et al., 2013). Therefore, the level of ability and independence in performing daily activities can be an important indicator in determining the adaptation of cancer patients to their disease, reducing psychological problems, and improving the emotional states of cancer patients because people with cancer experience changes in their quality of life during the disease stages (Weaver & Flannelly, 2004),

so that the effects of the disease on various dimensions of their mental, social, spiritual, and physical health are evident (Maraviglia, 2009).

Numerous studies have shown that one of the factors that can affect these dimensions is the acceptance of medication and treatment regimens by cancer patients. Gastrointestinal cancers due to metastasis in different parts of the body and sometimes its appearance and diagnosis in advanced stages require different treatments for long periods. Failure to accept the medication treatment leads to slowing down the process of treatment and recovery, reducing the health potential and decreasing the quality of life, and sometimes even leading to readmission and premature death (Rudsari et al., 2013). Although surgery, chemotherapy, radiation therapy, and hormone therapy, as the most common methods used to treat cancer, have increased the survival rate of these people, they in turn cause short-term and long-term side effects in these patients. Lack of proper control of these complications intensifies the negative effects on patients' quality of life and may neutralize any advantage of this rate of survival due to increased costs and side effects (Ghani et al., 2015). Among the many factors affecting the adherence to treatment based on the Bio-Psycho-Social Model and Bio-Psychological Integration Model, which are the dominant models of health psychology, we can refer to the quality of life, emotional distress, attitude to treatment, perception of self-efficacy, high levels of anger, low self-esteem, stress, depression, physician-patient relationship, and memory problems as well as demographic characteristics such as age, race, and socioeconomic status (Brett, 2018; Hanghøj et al., 2014). In this regard, Bandura in his conceptual model of reciprocal determinism refers to individual determinants of health. He believes that the individual participates in cognitive, proxy, self-conceptual, and self-regulatory processes in order to achieve a set goal (Rosen Stock et al., 1988). He argues that people influence their motivations and actions for change by practicing behavior control through their thought processes (Bandura, 2004). He also states that people

who engage in health-promoting behaviors have self-confidence that allows them to control their thoughts, feelings, and actions. Thus, people who engage in self-management of health habits reduce major health risks and create healthier and more productive lives (Clark et al., 1999).

In addition, among other cognitive variables affecting the quality of life and daily activities, we can refer to the health locus of control that plays an essential role in promoting health behaviors of cancer patients (Zahednejad et al., 2011). In fact, one of the dimensions that differentiate cancer patients in treatment is the degree of control they think they have over their life events (Mazaheri et al., 2007). The restraint position or locus of control, first proposed by Rutter, refers to the perception an individual has of the causality and consequences of his behavior. Based on restraint position theory, people have a wide range of beliefs about individuals or objects that have a restraining role in their rewards and punishments (Knop, 2016). Therefore, the health locus of control can be a predictor of health behaviors of cancer patients (Zahednejad et al., 2011). Health resource theory holds that people who believe in the source of internal health control believe that their health status is directly due to their own behavior and actions. While those who believe in the source of external control of health believe that their health status depends on physicians, luck, or fate (Kelly et al., 2007). Belief in the internal control of disease creates a positive attitude towards preventive behavior by the individual. In such situations, they consider themselves responsible and promote their physical and mental health by using active and problem-oriented coping strategies (Indik, 2013). The health control model is closely related to the health locus of control, health behaviors, and patients' sense of control and responsibility in the process of care and treatment of their disease (Fathabadi et al., 2017). Based on the above mentioned, it is possible that health anxiety, positive meta-emotion, and pain self-efficacy, directly and indirectly, affect adherence to treatment mediated by internal health locus of control. In particular,

examining the direct and indirect factors together in the form of a model can provide comprehensive information for psychological studies. Accordingly, in this study, the researcher intends to examine the direct role of health anxiety, positive meta-emotion, pain self-efficacy on treatment adherence and also the indirect role of mediating variables of internal health locus of control in predicting treatment adherence by answering the fundamental question of whether the hypothetical model for predicting adherence to treatment based on health anxiety, positive meta-emotion, pain self-efficacy mediated by the internal health locus of control fits the data.

Method

The present study is applied in terms of purpose and is descriptive-correlational in terms of research method using structural equation modeling. The statistical population consisted of men aged 45 to 65 years with gastrointestinal cancers living in Golestan province in 2021. Given that the total number of male patients with gastrointestinal cancers in Golestan province was 500, by the use of Krejcie Morgan table, 230 people were selected through convenience sampling. The procedure of collecting data started with selecting respondents from Golestan province who were covered by the Shafi Hyrkan Golestan Cancer, Incurable Cancer Support Center, and the Golestan Cancer Support Association (Palliative Medicine); then, they were asked to fill up the questionnaires carefully. Inclusion criteria for selecting the sample included: 1- Men 45-65 years old with gastrointestinal cancers in Golestan province; 2- Contentment of individuals to participate in research and complete the questionnaires; 3- Patients with chronic pain from gastrointestinal cancers. Finally, after completing the questionnaires, LISREL software was used to analyze data collected from all 230 questionnaires.

Measures

Salkowski and Warwick Health Anxiety Inventory (2002): This questionnaire was developed by Salkowski and Warwick in 2002. The Health Anxiety Scale is an 18-item self-assessment scale. This 18-item standard questionnaire was scored based on a 4-point Likert scale (not at all = 0, sometimes = 1, often = 2, and always = 3), with higher scores signifying higher health anxiety. Each option includes describing the components of health and illness in the form of a sentence in which the respondents must choose one of the options that best describe them. The psychometric properties of this scale have been examined and validated in numerous studies. In the Persian version of this scale, Cronbach's alpha coefficients for overall health anxiety were calculated at 88%, which was a sign of its good internal consistency (Abdi, 2014). This questionnaire was translated into Persian for the first time in Iran by Nargesi (2011) and the Ahvaz self-morbidity questionnaire (Ahadi & Pasha, 2001) was used to assess its validity. The correlation coefficient of this questionnaire and the Ahvaz self-morbidity test was -0.75. Therefore, the Health Anxiety Questionnaire has good validity (Nargesi, 2000).

Beer and Moneta's positive metacognition and meta-emotion questionnaire (2010): The positive metacognition and meta-emotion questionnaire was designed and developed by Beer and Moneta in 2010 to assess metacognitive beliefs about cognitive and emotional processes in the face of challenging situations (trust in turning off the thoughts and sustaining emotions, trust in interpreting self-emotions as a sign and avoid immediate reaction and adjust the mind to solve the problem, and trust in setting a hierarchy of flexible and practical goals). This questionnaire has 18 questions and 3 dimensions and evaluates positive metacognition and culture based on a 5-choice Likert scale. Psychometric properties of the scale have been evaluated and confirmed in numerous studies. In the Persian version of this scale, Cronbach's alpha coefficients for metacognition meta-emotion were calculated at 0.83 overall and for three dimensions of trust in turning off the thoughts and sustaining emotions, trust in interpreting self-emotions as a sign and avoiding immediate reaction, and adjusting the mind to solve the problem, and

trust in setting a hierarchy of flexible and practical goals were 0.71, 0.73, and 0.72, respectively, which was a sign of good internal consistency of scale (Rahmanian & Vaez Mousavi, 2014). The content and face validity of this questionnaire have been evaluated as appropriate (Sarmad, 2010).

Nicholas Pain Self-Efficacy Questionnaire (PSEQ) (1980): The Pain Self-Efficacy Questionnaire (PSEQ) was developed by Nicholas in 1980. The Pain Self-Efficacy scale is a ten-item questionnaire based on Bandura's theory of self-efficacy designed to assess a patient's belief in his or her ability to perform a variety of activities despite having pain (Nicholas, 2007). The score range of this questionnaire is from 0 to 60, in which a higher score indicates a stronger belief in doing daily activities despite the pain, and a score of zero or close to zero indicates a strong lack of belief in performing daily activities in the presence of pain and suffering caused by the disease. Asghari Moghadam et al. obtained test validity coefficients using Cronbach's alpha, split-half, and test-retest methods 0.81, 0.78, and 0.77, respectively, which indicates the desired and satisfactory reliability of the test (Asghari & Nicholas, 2000).

Morisky, Ang, and Wood's Medication Adherence Measure (2008): The questionnaire was developed by Morisky, Ang, and Wood et al. in 2008. This scale has 8 options, in which only 8 items are formulated on the 4-point Likert scale and the other items are answered based on yes = 1 and no = 0. Items 5 and 8, unlike other items, are scored adversely, and to calculate the overall score of the questionnaire, the scores of all items in the questionnaire are added together. The overall score range is from zero to 8, a score higher than two is considered weak drug adherence, a score of one and two has moderate adherence, and a score of zero has high adherence. Research by Koushiar, Shurozi, Dalir, et al. (2013) in addition to measuring the face and content validity of this instrument by expert professors, reported its reliability calculated by Cronbach's alpha at

0.68, which indicates the desirable and satisfactory reliability of the test.

Wallston et al.'s multidimensional Health Locus of Control Scale (1978): The Multidimensional Health locus of Control scale was developed in 1978 by Wallston et al. to determine the source of individual health control. Whether a person has an internal or external health control axis (health locus of control) is based on a set of characteristics. These characteristics exist in a scaled manner and determine the type of health control in individuals. One-dimensional scales to measure the type of control were first designed by Wallston et al. The MHLC scale consists of three components based on a 6-point Likert scale and stands for the following words: 1- Powerful Other Locus of Control (PHLC), including a person's degree of belief that his or her health is determined by other people; 2- Internal Health Locus of Control (IHLC), which refers to a person's degree of belief that internal factors and behaviors are responsible for his or her illness and health; 3- Chance Locus of Control (CHLC), which refers to the degree to which a person believes that his health depends on luck, fortune, fate, and destiny. This questionnaire has three forms A, B, and C, each of which contains eighteen statements and each component has six items. Forms A and B were published in 1978 and Form C, which can be used for specific diseases or conditions, was published in 1994. This questionnaire is a self-report tool and the subject should express his / her agreement or disagreement with each of them on a six-point Likert scale from strongly disagree (1) to strongly agree (6). In scoring this questionnaire and to obtain the score of each subscale, it is enough to add the score of all the items related to the desired subscale. In the present study, internal consistency coefficients using Cronbach's alpha method were obtained at 0.81 for internal health, 0.83 for health attributed to effective people, and 0.79 for chance-related health. Concurrent validity of the Health locus of Control Scale with the Rutter Internal-External Scale has

been determined. The correlation of the scores of this test with the health status of the subjects also indicates the validity of the desired criterion of this test.

Results

Data analysis in this study was performed in two descriptive and inferential statistics parts. In the descriptive statistics section, the demographic characteristics of the participants are described and the mean, standard deviation, and correlation coefficients between the research variables are analyzed and reported. In the inferential statistics section, the skewness and elongation indices were used to observe the normality of the study sample and structural equations in the LISREL software environment were used to test the research hypotheses.

Table 2 shows the mean, standard deviation, skewness, and elongation of the research variables. According to the Table, Cronbach's alpha coefficients of all variables and components are close to or higher than 0.7, indicating that the items of the questionnaires used to measure the variables of the present study have an acceptable internal consistency. Also, the elongation and skewness values of all variables are in the range of 2%, indicating that the data are

Table 1: Demographic characteristics of the participants

Variable		Frequency	Percentage	Cumulative percentage
Age	45-50	48	21.1	21.1
	51-55	35	15.4	34.5
	56-60	43	18.9	55.4
	61-65	101	44.6	100
Marital status	Single	16	7	7
	Married	170	74.9	81.9
	Divorced	7	3.1	85
	Widow	39	12.8	97.8
	Not declared	5	2.2	100
Education	Under diploma	116	51.1	51.1
	Diploma	49	21.6	72.7
	Associate Degree	28	12.3	85.1
	Undergraduate	27	11.8	96.9
	Postgraduate	7	3.1	100
Occupation	Employed	142	62.6	62.6
	Unemployed	12	5.3	67.9
	Retired	73	32.1	100

Table 2: Mean, standard deviation, skewness, elongation, and Cronbach's alpha coefficient of the research variables

Variable	Mean	SD	Skewness	Elongation	Cronbach's alpha coefficient
Health anxiety	27.4	10.2	0.389	-0.641	88%
Metacognition and meta-emotion	57.3	4.1	-0.706	0.807	83%
Pain self-efficacy	26.3	9	-0.138	-1.317	81%
Internal health control	25	3.9	-0.077	-1.134	81%
Medication adherence	5.8	2	-0.55	-1.004	68%

symmetrically distributed.

Table 3 shows the correlation relationships between the research variables. Health anxiety and meta-emotion positively and pain self-efficacy negatively were correlated with the components of medication adherence at the level of 0.1. Also, the source of internal health control was negatively correlated with the components of medication adherence at

data (χ^2/df= 3.42, CFI=1/00, NFI=1/00, GFI=0/99, AGFI=0/96, RMSEA=0/001).

Table 5 shows that the standardized regression pathway coefficient from positive meta-emotion to medication adherence is negative and statistically significant (β = -0.2, Se = 0.04, t = -2.64, P<0.005). The standardized regression pathway coefficient of pain self-efficacy to medication adherence is

Table 3: Correlation matrix between research variables

Research variables	Mean	SD	1	2	3	4
Health anxiety	24.7	10.2	1			
Metacognition and meta-emotion	57.3	4.1	0.335**	1		
Pain self-efficacy	26.3	9	-0.692**	0.545**	1	
Internal health control	25	3.9	-0.57**	0.494**	0.648**	1
Medication adherence	5.8	2	0.19**	-0.29**	-0.35**	-0.29**
P=0.01**			P=0.05**		N=356	

a significant level of 0.1. Also, the internal health locus of control was negatively correlated with health anxiety and positively with emotional well-being and pain self-efficacy at a significant level of 0.1.

It should be noted that in order to evaluate the normality distribution, elongation, and skewness of univariates and to evaluate the assumption of non-alignment, the VIF (variance inflation factor) and tolerance coefficient of each variable were examined and the results showed that the two assumptions were observed in the study. Structural equation modeling was used to test the research hypotheses. Then, due to the importance of testing the theoretical model of the research, the main variables were entered into LISREL software and through this software, structural equation model analysis was performed and the fitness of the research measurement model and maximum probability estimation was evaluated. Examination of the fit indices obtained according to Table 4 showed that in most of the structural model

negative and statistically significant (β = -0.25, Se = 0.04, t = 5.99, P <0.001).The standardized regression pathway coefficient of internal health locus of control medication adherence is positive and statistically significant (β = 0.53, Se = 0.11, t = 6.95, P <0.005). The standardized regression pathway from health anxiety to internal health locus of control is negative and statistically significant (β = -0.26, Se = 0.02, t = -0.04, P <0.005).The standardized regression pathway coefficient of metacognition and meta-emotion to the internal health locus of control is positive and statistically significant (β = 0.22, Se = 0.05, t = 3.88, P <0.005).The standardized regression pathway of pain self-efficacy to internal health locus of control was positive and statistically significant (β = 0.35, Se = 0.03, t = 5.37, P <0.005).

As Table 6 indicates, the indirect effects are much less than the direct effects. For this purpose, the variance inclusion index (VAF) was used to determine the degree of absorption of the mediating variable in the

Table 4: Fit of the proposed model based on fit indices

X²/df	GFI	AGFI	RMSEA	NFI	CFI
3.42	0.99	0.96	0.001	1	1

fit indices, the obtained fit supports the acceptable fit of the initial measurement model with the collected

relationship between exogenous and endogenous variables. Considering that a moderate mediation

Table 5: Standardized and non-standardized regression coefficients, standard coefficient error of structural model

Model	Predictor variable	Criterion variable	β	B		T	Sig.	
	Positive metacognition and meta-emotion	Medication adherence	-0.2	-4.4	0.04	-2.64	meaningful	
1	Pain self-efficacy	Medication adherence	-0.25	0.24	0.04	5.99	meaningful	0.2
	Internal health locus of control	Medication adherence	0.53	0.78	0.11	6.95	meaningful	
	Health anxiety	Internal health locus of control	-0.26	-4.04	0.02	4.04	meaningful	
2	Positive metacognition and meta-emotion	Internal health locus of control	0.22	0.21	0.05	3.88	meaningful	0.38
	Pain self-efficacy	Internal health locus of control	0.35	0.15	0.03	5.37	meaningful	

can be expected in the VAF value between the two modes of 0.20 and 0.80, for the mediation path of the Internal Health locus of control in relation to pain self-efficacy with medication adherence, the value of the VAF index is equal to 0.20, and for the path of the center of internal health control in relation to metacognition and positive meta-emotion with medication adherence, the value of VAF index is 0.31 (Moradi & Miralmasi, 2017). Therefore, it can be said that the mediating variable of the Internal Health locus of Control has a mediating effect on both paths between the exogenous and endogenous variables. Figure 1 shows a graph of t-values for

predicting medication adherence based on health anxiety, positive meta-emotion, and pain self-efficacy mediated by the internal health locus of control in men with cancer.

Discussion and Conclusion

This study aimed to analyze the structural equations model of medication adherence based on health anxiety, positive meta-emotion and pain self-efficacy mediated by internal health locus of control in men with cancer. The results testing the first hypothesis confirmed the positive and significant relationship between health anxiety and medication adherence

Table 6: Standardized direct and indirect coefficients, total effect and inclusion of structural model variance

Exogenous variable	Mediator variable	endogenous variables	Direct effect	Indirect effect	Total effect	VAF
Positive metacognition and meta-emotion	Internal health locus of control	Medication adherence	-0.2	-0.09	-0.29	0.31
Pain self-efficacy	Internal health locus of control	Medication adherence	-0.25	-0.06	-0.31	0.20
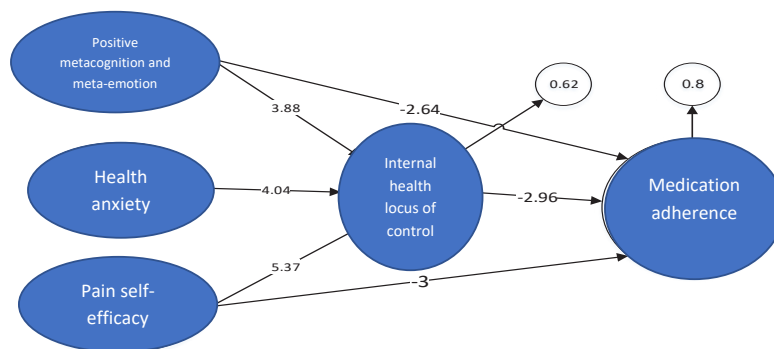
Figure 1 Structural model of research

of cancer patients. This finding is consistent with the results of previous studies (Amir Fakhraei et al., 2020; Rudsari et al. 2013).Other studies have shown that new patterns of health anxiety focus more on cognitive factors (Marcus et al., 2007).Cognitive researchers believe that these patients are in a state of focusing on their physical symptoms (Abramovitz, Schwartz, & White, 2012) and regulate their behaviors in a way that they seek reassurance in the case of arising such situations (E. Wangelos et al., 2007).These patients believe that they have little control over the recurrence of the disease and their physical symptoms (Rokens et al., 2018). The feeling of fear of cancer can be caused by a change in the ability to perform family responsibilities, a loss of control over life events, appearance change, body image, or a shock of being diagnosed with cancer. These feelings can include uncertainty about the future and worry about pain, suffering, and other ambiguities (Avon et al., 2004). As a result, these patients repeatedly re-examine and scan their physical conditions and constantly search for the disease (Asmundson et al., 2001).For people suffering from this disease, these concerns are adaptive and cause these people to pay attention to their physical symptoms so that if they are observed, they can seek treatment in time, which in turn increases the use of health care and the instructions of health professionals (Abramovitz, Olatonich, &Dyson, 2007).This type of health concern can increase stress, anxiety, and depression in cancer patients and reduce general health and ultimately reduce their quality of life and delay their recovery process (Rudsari et al., 2013).

According to the results, the second hypothesis stating a negative and significant relationship between positive meta-emotion and medication adherence was confirmed. This finding is consistent with the study of Selajgeh et al. (2019) and Bahrami et al. (2015). Due to the fact that cancer is one of the most dangerous and threatening chronic diseases in society, people suffering from cancer continue to live with short-term and long-term complications and the resulting stress (Hemmati, Zaman, & Hassani, 2009). These

conditions affect the person's ability to adapt and lead to the use of maladaptive strategies such as rumination, catastrophizing, thinking about unpleasant experiences, negative feelings, and thoughts, harming the body, and thus reducing the efficiency of the immune system and lack of physical recovery (Mitt Mans Gruber et al., 2009).This causes the patient to worry and refer to the clinics and hospitals repeatedly for physical examination, repeated tests, and medical follow-up. Thus, high cognitive function is an important and determining factor in mental well-being and effective performance and plays an essential role in adapting to stressful life events in cancer patients (Garnefski et al., 2006). These individuals have a greater ability to accept and use appropriate emotional tools (positive refocus, positive reappraisal, acceptance, refocus on planning) (DepT, Kumar, 2018). On the other hand, one of the most important factors that can affect the mental development and quality of life of cancer patients with chronic pain is the ability of individuals to perform their daily activities (Kiani et al., 2020). According to a study by the International Association for the Study of Pain in 2003, between 33 and 50 percent of people with chronic pain become incapacitated or unable to perform their normal daily activities (Channel et al., 2017). Therefore, having pain self-efficacy is important and necessary for cancer patients as the ability to work or achieve a goal that produces a specific outcome or has a special effect on the individual's feelings and emotions (Burgess, Cornelius, & Graham, 2005).

According to the results, the third hypothesis of the study stating that there is a negative and significant relationship between pain self-efficacy and adherence to treatment was confirmed. These findings are consistent with the findings of Kiani et al. (2020) and Khezerloo et al. (2019). In the framework of social learning theory (Bandura, 1997), self-efficacy determines the degree of resistance of individuals against obstacles and unpleasant experiences and reflects the individual's ability to achieve the desired result and a sense of adequacy to cope with life-threatening events (Danesh et al., 2013). Chronic pain

condition is associated with poor adaptation, which includes severe pain, low self-esteem, poor quality of life, depression and health-related concerns, physical disability, catastrophic pain, and rumination (Nicholas et al., 2011). As cancer patients with chronic pain often have negative and inconsistent assessments of their condition and their ability to control pain, they tend to see pain as a threat (Kachel & Turk, 2002). This reduces their ability to maintain health and leads people with pain to passive coping, including frequent visits to health centers, consecutive hospitalizations, and extreme care for the painful part as a reflection of their perceived helplessness in controlling pain (Bromand et al., 2014).Several studies on cancer patients with chronic pain have shown that increasing pain self-efficacy can be associated with better treatment outcomes, including reducing the severity of physical disability (Mosher et al., 2010).In addition, another important factor that can affect the sense of responsibility in controlling the disease and self-care behaviors and not engaging in unpleasant experiences is the health locus of control (Salarfard et al., 2020).

Accordingly, the fourth hypothesis of the study stating that the internal health locus of control mediates the effect of positive emotional well-being and pain self-efficacy on medication adherence was confirmed. The finding is consistent with the results of research conducted by Salarfard et al. (2020) and Baluchi et al. (2017). To explain this finding, it can be stated that patients who have internal health locus of control have more responsibility, which leads to a sense of control over painful and threatening events (chronic pain), greater adaptability, adequacy, and ability to manage their activities. This is related to patients' health behaviors to maintain their health (Fathabadi et al., 2018).Based on the model of health locus of control, there is a close relationship between this structure, health behaviors, patients' sense of control, and responsibility in the process of cancer care and treatment (Amiri, Agha Mohammadian, Sharabaf, &Kimiaei, 2012).Walston (2005) showed that patients with perceptual control (the internal health locus of

control) believe that internal factors and their behaviors are responsible for their illness and health and their attitudes and explanatory styles can be effective in predicting their health behaviors. These patients have a greater sense of responsibility, psychological and physical well-being, and quality of life (Brown, 2005). This group is happier, more social, more active in daily activities, and more hopeful about the future; as a result, they have lower levels of depression and anxiety and fewer visits to health centers, whether immediately after a stressful event or a long time afterward (Amiri, Agha Mohammadian, Sharabaf, & Kimiaei, 2012).

Finally, the test of the fifth hypothesis stating a significant effect of the source of internal health control on pain self-efficacy and meta-emotion positively and health anxiety negatively was confirmed, which is in line with the findings of Fathabadi et al. (2018) and Hassanzadeh et al. (2009). In explaining the result, it can be said that the patients' beliefs in personal control affect their behaviors. One of the most common characteristics of cancer patients with internal health locus of control is that they show resilience and perseverance in the face of failure and are better able to strive for long-term goals (Clark, 2007).People with an internal locus of control tend to obtain more information about the situation in which they are and make better use of them. They cope better with stress, have fewer psychological and physiological problems, perform better under stress compared to people with externals locus of control, and are more likely to try to control the source of the stress (Beckham et al., 2007). It also seems that these people do sports activities to prevent the progression of the disease and try to adhere to more proper diets. They see the stress of their lives as a result of their actions and lifestyle; therefore, they use a stress management program to reduce it. It also seems that these people are active not only in physical and psychological aspects but also in spiritual aspects and care about the development of all aspects of their existence (Fathabadi et al., 2018).

The limited statistical population of the research and the research type imposed limitations in generalizability,

interpretations, and etiological evidence of the research variables, which should be taken into account. Due to the prevalence of Covid-19, face-to-face access to the sample was not possible and sampling was done non-randomly. To examine the results more accurately, it is suggested that more diverse studies including qualitative and mixed methods be conducted to examine the type and quality of the relationship between the variables of health anxiety, positive meta-emotion, pain self-efficacy, and health locus of control with medication adherence. Similar studies should be performed on clinical samples, including those with psychological disorders, personality disorders, and family, interpersonal, and other chronic illnesses. According to the research findings, it is suggested that intervention training programs and support systems in the field of promoting medication adherence, positive emotion, pain self-efficacy, and personal control be performed for cancer patients, their families, and specialized treatment staff in order to adopt mechanisms including a more appropriate response to cancer in different sectors and institutions of society. It is suggested that by creating research and psychotherapy centers, the disabling dimensions of health anxiety, lack of personal control, negative emotions in cancer patients and the community are studied to reduce the vulnerability of cancer patients by creating new methods of diagnosis, identification, and appropriate treatment.

Acknowledgment

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