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Predicting life expectancy based on self-efficacy and psychological hardiness in cancer patients

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ABSTRACT

This study investigated the relationship between life expectancy, psychological hardiness, and self-efficacy in cancer patients. The statistical population of this study consisted of all cancer patients residing in Shiraz in 1402 (2023). Using a non-random sampling method, 150 patients were selected and voluntarily responded to the questionnaires. This research is descriptive and correlational. Three scales were used to measure the variables: Snyder's Adult Hope Scale, Kobasa's Psychological Hardiness Questionnaire, and Jerusalem and Schwartz's Self-Efficacy Scale. Data analysis was performed using the simultaneous multiple regression method. The data analysis confirmed all three hypotheses of the research. Thus, self-efficacy and psychological hardiness can predict life expectancy in cancer patients ($p < 0.001$). Accordingly, the coefficient of determination was 0.52. Of these two variables, the share of the psychological hardiness variable in predicting life expectancy was greater than that of self-efficacy.

1. Introduction

Cancer is a persistent and often debilitating disease that disrupts an individual's life trajectory and both short-term and long-term plans. It is one of the most pressing healthcare challenges of the current century, as recognized by global scientific communities (Deka et al., 2016). Despite significant medical advancements, cancer remains a serious illness, not only posing immense physical and emotional challenges for individuals but also straining healthcare systems with substantial financial burdens (Hakimipour, Naseri, & Mahmoudi, 2019). According to the World Health Organization's latest report, an estimated 20 million new cancer cases were diagnosed in 2022, with 9.7 million individuals succumbing to the disease. As cancer compromises an individual's immune system and often necessitates prolonged and sometimes gruelling treatment, it inflicts a range of psychological distress on patients (Bid et al., 2022). Among the identified psychological repercussions, a marked decline in life expectancy and psychological well-being is prevalent in cancer patients (Mozaati et al., 2016; Riese et al., 2018). Given the high mortality rate associated with cancer, patients often perceive themselves as nearing the end of their lives and tend to overestimate their likelihood of death (Movahedi, Movahedi, & Farhadi, 2015).

The concept of life expectancy, first introduced by Snyder, refers to the average lifespan of a population. Snyder defined hope as the ability to design pathways towards desired goals despite existing obstacles and to possess the agency or motivational drive to utilize these pathways. Life expectancy is a critical predictor of patients' adaptation and quality of life, providing physical and emotional support in their battle against illness (Benzen & Berg, 2005). Life expectancy stands as a particularly crucial factor for cancer patients, experiencing a steeper decline compared to other chronic disorders (Bagheri Zanjani & Entesar Foumani, 2016). Extensive research has highlighted the pivotal role of life expectancy in treatment adherence (Sosiou et al., 2021) and the quality of life among cancer patients (Ruiz-Rodriguez et al., 2022). Individuals with high life expectancy tend to approach treatment with a more positive outlook, demonstrating greater psychological adaptability (Bakhshi et al., 2020).

Self-efficacy, an individual's perception of their skills and capabilities to effectively perform tasks, is a crucial factor linked to life expectancy. Individuals with low self-efficacy tend to perceive challenges as insurmountable and feel overwhelmed, leading to a perpetual state of helplessness that can ultimately culminate in depression and burnout (Sharma & Kumra, 2022). Self-efficacy serves as a powerful predictor of patient adaptation to chronic illnesses like cancer, enhancing their ability to cope with the disease (Langford et al., 2023). Patients with high self-efficacy report fewer physical and emotional symptoms and are less likely to experience depressive and anxiety disorders in the face of a distressing event such as a cancer diagnosis (Yoogald, Krishnaswami, & Schofield, 2014; Fisher et al., 2023). Conversely, individuals with a strong sense of self-efficacy are more likely to adhere to their treatment plans and engage actively in their healthcare, ultimately contributing to improved life expectancy (Chen et al., 2023).

Psychological hardiness, another key factor influencing life expectancy, plays a pivotal role in an individual's adaptation to illness (Joulkannen et al., 2015). This personality trait is the primary moderator of the negative effects of stress on the immune system. Individuals with low psychological hardiness tend to exhibit intense emotional reactions to life's challenges and

experience more severe long-term damage from stress (Barton, 2012). The higher an individual's resilience and coping ability, the greater their tolerance for adversity. Psychological hardiness, a personality trait composed of commitment, control, and challenge, can enhance an individual's adaptation to illness (Zhu et al., 2022). It is a crucial factor in psychological well-being, empowering individuals to cope with life's distressing circumstances. Extensive research has demonstrated a positive correlation between psychological hardiness and life expectancy. Patients with chronic illnesses who exhibit higher levels of psychological hardiness report greater life expectancy (Fuladi & Shahidi, 2020), improved psychological well-being, and reduced experiences of depression and anxiety (Tadin et al., 2018).

In light of the escalating prevalence of chronic diseases, particularly cancer, and the associated physical, emotional, economic, and social burdens imposed upon these patients, researchers and healthcare providers have shown a growing interest in investigating this domain. Recognizing the significance of life expectancy for cancer patients in adhering to treatment (Sosiou et al., 2021) and promoting health-enhancing behaviours, identifying factors associated with life expectancy, and striving to enhance this variable can lead to improved quality of life for cancer patients. Therefore, the present study aims to examine the role of self-efficacy and psychological hardiness in predicting the life expectancy of cancer patients.

Research Method

This research employs a correlational design to examine the relationship between the study variables. The statistical population of this study consisted of all cancer patients residing in Shiraz in 2023. A sample of 150 individuals (74 males and 76 females) was selected using a convenience sampling method. The inclusion criteria for the study were: Minimum literacy level, No concurrent diagnosis of another chronic disease, and No participation in any other interventional study simultaneously with the current research. Data collection was conducted using the following instruments: Snyder's Adult Hope Scale, Kobasa's Psychological Hardiness Scale, and Schwartz and Jerusalem's General Self-Efficacy Scale.

Snyder’s Adult Hope Scale: The Adult Hope Scale, developed by Snyder et al. (1991), is a 12-item questionnaire designed to assess an individual's level of life expectancy. It utilizes a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). Reverse scoring is applied to questions 3, 7, and 11. The validity and reliability of this questionnaire have been examined and confirmed by professors in the Department of Management and Experimental Studies at Ferdowsi University of Mashhad and Tarbiat Moallem University (Karimian, 2012). Bryant and Wong (2001) reported an internal consistency coefficient for the entire test ranging from 0.79 to 0.71.

Kobasa's Psychological Hardiness Scale: Developed by Kobasa and colleagues in 1979, the Psychological Hardiness Scale is a 50-item questionnaire that measures an individual's level of psychological hardiness. It comprises three subscales: commitment, control, and challenge. Employing a Likert scale, the items range from 0 (not at all true) to 3 (entirely true). The total score for the questionnaire ranges from 0 to 150, with higher scores indicating greater psychological hardiness. The predictive and content validity of the scale have been established, and its internal consistency reliability, measured using Cronbach's alpha, has been reported as 0.78 (Kobasa, 1979).

Schwartz and Jerusalem's General Self-Efficacy Scale: Developed by Schwartz in 1979, the General Self-Efficacy Scale is a 10-item questionnaire that assesses an individual's level of

general self-efficacy. It employs a 4-point Likert scale, ranging from 1 (not at all like me) to 4 (exactly like me). The total score for the questionnaire falls within the range of 10 to 40. Scores between 10 and 20 indicate low self-efficacy, scores between 21 and 30 reflect moderate self-efficacy and scores above 30 suggest high self-efficacy (Schwarzer, 2000). This questionnaire has been utilized in 23 countries and exhibits a Cronbach's alpha coefficient of 0.83. In Iran, Rajabi (2006) reported a Cronbach's alpha of 0.82 for the entire sample of cancer patients.

Data Collection Procedure

After obtaining the necessary authorization, the questionnaires were distributed among cancer patients visiting Namazi Hospital in Shiraz. Once the data was collected, it was analyzed using the SPSS 26 statistical software. The findings were then used to conclude, explain the hypotheses, and provide recommendations.

Results

In this study, there were 74 male and 76 female participants with an average age of 22.6 years. The highest and lowest scores in the variables of life expectancy, self-efficacy, and psychological hardiness were (55-28), (40-15), and (92-23), respectively. The descriptive findings of this study, including the means and standard deviations of the variables of life expectancy, self-efficacy, and psychological hardiness, are presented in Table 1.

Table 1. Average and standard deviation of the variables

Variable	Minimum	Maximum	Average	Standard deviation
Life expectancy	28	55	40.82	6.016
Self-efficacy	15	40	26.23	5.255
Hardiness	23	92	60.11	14.07

As observed in Table 1, the average scores for life expectancy, self-efficacy, and psychological hardiness in cancer patients were 40.82 ± 6.01, 26.25 ± 5.23, and 60.11 ± 7.14, respectively.

Table 2. The correlation coefficient between self-efficacy, hardiness and life expectancy

Variable	Life expectancy	
	Correlation coefficient	Significance
Self-efficacy	0.67**	0.001
Psychological hardiness	0.69**	0.001

The correlation coefficients between the variables were calculated, and the following values were obtained. According to Table 4-4, the correlation between self-efficacy and life expectancy is 0.67, and the correlation between psychological hardiness and life expectancy is 0.69. Based on these values, it can be concluded that self-efficacy and psychological hardiness strongly correlate with life expectancy.

Main question: Can psychological hardiness and self-efficacy predict life expectancy in cancer patients?

Pearson's correlation coefficient and simultaneous multiple regression were used to test this hypothesis. The results are presented in the following tables.

Table 3. Summary of the regression model for life expectancy in cancer patients based on psychological hardiness and self-efficacy

Correlation coefficient	Coefficient of determination	Adjusted coefficient of determination	Standard error
0.721	0.520	0.510	4.209

Table 3 shows the multiple correlation coefficient between psychological hardiness and self-efficacy with life expectancy in cancer patients, which is 0.721. As can be seen, 52% of the variance in the dependent variable (life expectancy) is explained by the two independent variables (self-efficacy and psychological hardiness). If 95% of the data is considered, the adjusted R-squared value is 51%, indicating that the effect of the independent variables in explaining the dependent variable is not coincidental and there is overlap.

Table 4. Multivariate regression analysis of variance to determine the predictive power of psychological hardiness and self-efficacy on life expectancy in cancer patients

	Sum of squares	Degree of freedom	Average of squares	F	Significance
Regression	1864.047	2	932.024	52.601	0.001
Residual	1718.713	97	17.719		
Sum	3582.760	99			

The observed F-statistic, calculated by dividing the mean square of regression by the mean square of error (residuals), is 6.52. The observed F-value is larger compared to the critical F-value, which is 4.19 for these degrees of freedom and at the 5% level. Therefore, the null hypothesis is rejected, and our research hypothesis is supported. As can be seen, the significance of this relationship is also at the triple zero level, meaning that the power of the test to reject the null hypothesis was high. The conclusion is that the explanation and prediction of the life expectancy variable depend on the predictor variables, namely self-efficacy and psychological hardiness. To further confirm this, we will examine the regression model coefficients.

Table 5. Regression coefficients for life expectancy in cancer patients based on psychological hardiness and self-efficacy

	Slope	Standard error	β	t	Significance
Self-efficacy	0.3777	0.126	0.329	2.980	0.004
Hardiness	0.187	0.047	0.436	3.951	0.001

Table 5 presents the various indices obtained from the regression analysis for the dependent variable of life expectancy in cancer patients. The data in the table show that, based on the significance level, self-efficacy (β=0.329, sig<0.01) and psychological hardiness (β=0.436, sig<) have a predictive role in the dependent variable of life expectancy in cancer patients. The sign of both predictor variables in this equation is positive, meaning they both have a direct relationship with life expectancy. To determine the contribution of each predictor variable, we look at the beta coefficient. Based on this, the coefficient for the self-efficacy variable is 0.329, and for the psychological hardiness variable is 0.436; therefore, according to this regression

test and under these conditions, the contribution of psychological hardiness to predict life expectancy is slightly more than that of self-efficacy.

Conclusion

This study aimed to predict life expectancy based on self-efficacy and psychological hardiness in cancer patients residing in Shiraz, Iran. The research findings revealed that self-efficacy and psychological hardiness can predict life expectancy in cancer patients. This finding is consistent with previous research (Park & Suh, 2023; Vaez Karami et al., 2023; Samavi & Saeedi, 2022; Kim & Suh, 2021; Mahboubeh Niya et al., 1400; Kaveh, 2018; Amin Al-Sharifi et al., 2017; Nadri & Hosseini, 1389).

Self-efficacy can directly influence treatment adherence, which is crucial for effective cancer management (Chen et al., 2023). Patients with high self-efficacy have greater confidence in their ability to follow complex treatment regimens, including medication schedules (Komatsu et al., 2020), dietary restrictions (Bouwman et al., 2020), and regular medical appointments (Diehl, 2014). This confidence leads to consistent adherence to prescribed treatments, resulting in more effective disease management and better clinical outcomes. Treatment adherence is critical because any deviation can reduce the effectiveness of cancer therapies and potentially lead to decreased disease progression and life expectancy.

Furthermore, individuals with high self-efficacy are more likely to engage in health-promoting behaviours that support their overall physical well-being. Self-efficacy is an essential prerequisite for behaviour change. Individuals confident in their abilities are more likely to participate actively in health promotion programs (Abbasi et al., 2020). Among factors including self-efficacy, health value, stress, and social support, self-efficacy is the strongest predictor of health-promoting lifestyle behaviours (Peker & Bermek, 2011). These behaviours include maintaining a nutritious diet, exercising regularly, and avoiding harmful habits such as smoking or excessive alcohol consumption (Ross et al., 2017). Engaging in such behaviours can strengthen the immune system and improve the body's resilience, making it better equipped to handle the demands of cancer treatment. Improved physical health can reduce the side effects of treatments, lower the risk of complications, and ultimately contribute to more prolonged survival and increased life expectancy.

In other words, self-efficacy enhances patients' ability to navigate the healthcare system effectively. Patients who believe in their ability to influence their health outcomes are more likely to seek information, ask relevant questions, and advocate for themselves in medical settings. This proactive engagement can lead to better-personalised care, as healthcare providers better understand the patient's needs and preferences. Timely and appropriate medical interventions, facilitated by effective communication and self-advocacy, can significantly improve treatment outcomes and enhance the survival of cancer patients.

In addition, self-efficacy plays a vital role in stress management (Calindo-Domínguez & Buzanilla, 2021) and psychological resilience (Calindo-Domínguez et al., 2020), which are essential for improving life expectancy. Cancer diagnosis and treatment are often accompanied by significant stress and emotional turmoil. Patients with high self-efficacy are better at coping strategies such as positive thinking, seeking social support, and engaging in relaxation techniques (Krasa & Kutlathurkan, 2021). Effective stress management is crucial as chronic stress can impair immune system function and potentially accelerate cancer progression. By maintaining a positive mental state, patients can improve their overall quality of life, enhance their body's ability to fight cancer and experience longer life expectancy.

In explaining the prediction of life expectancy based on psychological resilience among cancer patients, it can also be said that cancer and its treatment-related factors (stressors) will have

various adverse effects on patients (the system), which in turn can lead to changes in their psychological resilience, such as resilience (Zhou et al., 2022). Psychological resilience is one of the variables that can moderate the stresses and adverse life effects in conditions such as cancer (Ghorbani et al., 2023) and increase flexibility in the face of the physical and emotional challenges caused by cancer. Psychological resilience improves flexibility and adaptation in cancer patients (Seiler & Jenewein, 2019). Psychological resilience provides mental skills such as emotional control, perseverance, and self-confidence, allowing for greater flexibility in facing potential obstacles (Lin et al., 2017). Resilient patients can better cope with problems such as treatment side effects or disease recurrence. This resilience is partly due to their ability to maintain a positive outlook and set realistic goals (Mak et al., 2011) while still challenging themselves to improve. By focusing on achievable goals and hope, these patients maintain their motivation and perseverance, which is critical for increasing life expectancy and long-term survival. Their ability to continue treatment and live despite the challenges contributes to improved outcomes and increased life expectancy.

In addition, psychological resilience impacts social interactions and support networks, which play a crucial role in cancer prognosis (Jalali & Rahimi, 2019). Patients with high psychological resilience are more likely to seek out and maintain strong social connections that provide emotional and practical support (Jalali & Rahimi, 2019). Social support enhances treatment outcomes and increases life expectancy in cancer patients by reducing feelings of isolation and increasing overall well-being, decreasing feelings of depression and anxiety (Corovic et al., 2023; Katsaros et al., 2022). Supportive relationships can also provide patients with additional resources, such as transportation to medical appointments and assistance with daily tasks, which further facilitates their adherence to treatment and maintenance of their health (Solikhah et al., 2023) and contributes to increased life expectancy.

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