

# Development of a Predictive Model of Psychosocial Adjustment to Illness Based on Health-Promoting Lifestyle with the Mediating Role of Illness Perception in Female Patients with Systemic Lupus Erythematosus

Nooshin. Gharibpanah<sup>1</sup>, Sara. Hashemi<sup>2\*</sup>, Setareh. Tehrani<sup>3</sup>

<sup>1</sup> Department of Psychology, UAE.C., Islamic Azad University, Dubai, United Arab Emirates

<sup>2</sup> Department of Psychology, SR.C., Islamic Azad University, Tehran, Iran

<sup>3</sup> Department of Medical Sciences, TeMS.C., Islamic Azad University, Tehran, Iran

\* Corresponding author email address: Hashemi2026@iau.ac.ir

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### ABSTRACT

**Objective:** This study aimed to determine the mediating role of illness perception in the relationship between health-promoting lifestyle and psychosocial adjustment to illness among female patients with systemic lupus erythematosus.

**Materials and Methods:** The present study was a descriptive-correlational study using a structural equation modeling design. The statistical population included all female patients with systemic lupus erythematosus who referred to hospitals affiliated with Islamic Azad University in Tehran, including Bou-Ali, Farhikhtegan, and Amir-Al-Momenin hospitals, as well as the Lupus Association, during the first six months of 2025. Based on the inclusion criteria, 280 participants were selected through purposive sampling. Data were collected using the Psychosocial Adjustment to Illness Scale developed by Derogatis (1986), the Health-Promoting Lifestyle Profile developed by Walker (1990), and the Brief Illness Perception Questionnaire developed by Broadbent et al. (2006). Data were analyzed using regression analysis and structural equation modeling through SPSS and PLS software at a significance level of 0.05.

**Findings:** The inferential findings showed that health-promoting lifestyle had a significant relationship with psychosocial adjustment to illness in female patients with systemic lupus erythematosus. In addition, illness perception was significantly associated with psychosocial adjustment to illness. The results of structural equation modeling confirmed the mediating role of illness perception in the relationship between health-promoting lifestyle and psychosocial adjustment to illness. Accordingly, the indirect path from health-promoting lifestyle to psychosocial adjustment through illness perception was statistically significant, indicating that patients' cognitive appraisal of their illness plays an important explanatory role in how health-related lifestyle behaviors affect psychosocial adaptation.

**Conclusion:** The findings highlight the importance of mediating cognitive processes in adaptation to chronic illness and indicate that promoting health-related behaviors alone may not be sufficient. Interventions for women with systemic lupus erythematosus should also focus on modifying patients' illness perceptions and cognitive interpretations in order to improve psychosocial adjustment.

**Keywords:** Illness perception; psychosocial adjustment; health-promoting lifestyle; systemic lupus erythematosus; female patients

## 1. Introduction

Systemic lupus erythematosus is a chronic, multisystem autoimmune disease characterized by a heterogeneous clinical course, recurrent flare-ups, periods of remission, and involvement of different organs and functional systems. Although the clinical manifestations of lupus vary considerably across patients, the disease is commonly associated with fatigue, pain, dermatological symptoms, joint involvement, renal complications, neuropsychiatric manifestations, and substantial disruption in daily functioning. This variability makes lupus not only a biomedical condition but also a long-term psychosocial challenge that requires continuous adaptation by the patient. Contemporary reviews have emphasized that systemic lupus erythematosus remains a complex disease in terms of etiology, diagnosis, prognosis, and treatment management, and despite advances in immunology and clinical care, many patients continue to experience a significant disease burden across physical, psychological, and social domains (Mayo, 2023; Uzun et al., 2024). Recent research has also highlighted the role of endocrine and biological factors, including thyroid-related mechanisms, in disease progression and symptom complexity, indicating that the experience of lupus cannot be reduced to a single biological pathway (Li et al., 2025).

Epidemiological evidence indicates that systemic lupus erythematosus is distributed unevenly across sex, age, and ethnicity, with women being disproportionately affected. This female predominance is particularly important because the disease often occurs during adulthood, a period in which individuals are simultaneously involved in family, occupational, relational, and social responsibilities. Comprehensive epidemiological reviews have shown that systemic lupus erythematosus differs across populations in prevalence, clinical patterns, access to care, and outcomes, and these differences may intensify the psychosocial consequences of the disease (Choi et al., 2023; Goh et al., 2023). From a global perspective, lupus is associated not only with medical complications but also with reduced quality of life, limitations in social participation, psychological distress, and increased health-related vulnerability (Tselios et al., 2023). Therefore, the study of lupus in women requires attention to the interaction between disease-related factors and the psychosocial resources through which patients manage, interpret, and adjust to illness.

Psychosocial adjustment to illness refers to the extent to which individuals are able to adapt emotionally, cognitively, behaviorally, and socially to the demands imposed by a chronic disease. In patients with systemic lupus erythematosus, adjustment is not limited to acceptance of diagnosis; rather, it involves the ability to maintain meaningful social roles, regulate emotional distress, participate in family and interpersonal relationships, preserve self-concept, and manage the uncertainty of symptoms and treatment. The social and psychological consequences of systemic lupus erythematosus have been repeatedly emphasized in clinical and psychosomatic research, showing that the disease may affect self-esteem, interpersonal functioning, sexuality, work capacity, family life, and perceived autonomy (Swaak et al., 2023). Broader psychosocial literature also indicates that adjustment is shaped by the quality of interpersonal environments, perceived support, and exposure to stressors; for example, longitudinal evidence on psychosocial adjustment has shown that relational and contextual experiences can influence adaptation over time (Deng et al., 2024). Thus, psychosocial adjustment in lupus should be understood as a multidimensional construct that reflects the patient's ability to live with the disease while preserving psychological stability and social functioning.

One of the most important determinants of adaptation to chronic illness is health-promoting lifestyle. Health-promoting lifestyle includes a set of voluntary, preventive, and self-regulatory behaviors that aim to maintain health, reduce risk, and improve well-being. These behaviors generally include appropriate nutrition, physical activity, responsibility for health, stress management, interpersonal support, and self-actualization. In lupus, lifestyle-related behaviors are particularly relevant because patients often have to manage fatigue, pain, medication adherence, stress sensitivity, physical limitations, and the uncertainty of flare-ups. Evidence from lupus research suggests that lifestyle modifications can have meaningful effects on psychological health, quality of life, and disease-related well-being (Kumar et al., 2023). More recent intervention-based evidence has also shown that structured lifestyle programs may improve well-being in patients with systemic lupus erythematosus, supporting the clinical relevance of lifestyle-oriented approaches in this population (Mazzolani et al., 2025).

The importance of health-promoting lifestyle is not restricted to lupus. Studies in other chronic conditions and women's health contexts show that health-related behaviors are closely related to psychological resources, coping

strategies, and perceived control. For instance, research on women with polycystic ovary syndrome has shown that health-promoting behaviors are associated with psychological factors such as locus of control and coping strategies, suggesting that lifestyle is partly embedded in cognitive and emotional regulation processes (Fatima et al., 2021). Similarly, studies on adolescents have shown that health-related behaviors may be influenced by subjective perceptions of the body and related control behaviors, indicating that perception can mediate the relationship between personal characteristics and health behavior (Park et al., 2022). In chronic disease contexts such as diabetes, health-promoting interventions have also been compared with psychological interventions in terms of their effects on illness perception and adjustment, highlighting the shared behavioral and cognitive foundations of adaptation to illness (Soltanian et al., 2022). These findings collectively suggest that health-promoting lifestyle may contribute to psychosocial adjustment, but its effect is likely to operate through psychological and cognitive mechanisms as well as direct behavioral pathways.

Among the cognitive variables involved in chronic illness adaptation, illness perception has received considerable theoretical and empirical attention. Illness perception refers to the patient's cognitive and emotional representation of disease, including beliefs about consequences, duration, personal control, treatment control, symptoms, concern, understanding of illness, and emotional responses. From a self-regulation perspective, patients do not respond only to objective disease indicators; rather, they respond to the meaning they assign to those indicators. Therefore, two patients with similar clinical conditions may differ considerably in psychological adjustment depending on how threatening, controllable, chronic, or understandable they perceive their illness to be. Research on patients with preexisting premature coronary artery disease has shown that illness perception is associated with health-related quality of life, demonstrating that cognitive representations of illness can influence how patients experience and manage chronic disease (Lotfi-Tokaldany et al., 2019). Evidence from diabetes research similarly indicates that illness perceptions are related to quality of life, reinforcing the relevance of this construct across different chronic disease populations (Padhy & Valli, 2022).

In systemic lupus erythematosus, illness perception may be particularly influential because the disease is unpredictable, often invisible to others, and accompanied by fluctuating symptoms. Patients may experience uncertainty

about future disease activity, concerns about organ involvement, fears about disability, and ambiguity regarding the relationship between symptoms, stress, and treatment. Longitudinal research on lupus patients has shown that illness perception is associated with coping strategies, suggesting that the way patients interpret their disease can shape how they respond to its demands over time (Gomez et al., 2023). In addition, studies on coping and quality of life in systemic lupus erythematosus have indicated that adaptive coping strategies are linked to better quality of life, whereas maladaptive strategies may intensify psychological distress and reduce adjustment (Da Silva et al., 2024). Integrative review evidence has further emphasized that coping strategies and emotional well-being are closely connected in lupus, suggesting that cognitive appraisals, emotional regulation, and behavioral responses form an interdependent system of adaptation (Zhou et al., 2024).

Stress is another major factor in the psychosocial experience of lupus. Chronic illness exposes patients to repeated stressors, including symptom monitoring, treatment decisions, uncertainty about disease progression, role limitations, financial burden, and concerns about social acceptance. In lupus, stress can influence both psychological functioning and perceived disease burden. Recent longitudinal evidence has shown that stress management can produce psychological benefits in lupus patients, indicating that interventions targeting stress-related processes may improve emotional outcomes (Zhang et al., 2025). Moreover, the role of family and social networks in stress and coping among patients with systemic lupus erythematosus has been emphasized, suggesting that adjustment is strengthened when patients have supportive interpersonal resources and weakened when they face isolation or relational strain (Johnson et al., 2023). These findings show that psychosocial adjustment is shaped by both internal resources, such as perception and coping, and external resources, such as social support and family functioning.

Psychological resilience and optimism are also relevant to the adaptation process in chronic illness. Resilience helps patients maintain psychological stability despite ongoing disease-related challenges, while optimism may support hope, treatment engagement, and constructive coping. Evidence from patients with chronic illnesses indicates that optimism and well-being are associated with psychological resilience, suggesting that positive psychological resources can improve the subjective experience of illness (Johnson et al., 2024). In educational interventions based on Leventhal's

self-regulation model, modification of illness-related beliefs has been shown to reduce stress, anxiety, and depression in women with chronic neurological disease, demonstrating that cognitive representations of illness are modifiable and clinically meaningful (Hosseini et al., 2025). Although this evidence comes from multiple sclerosis rather than lupus, it provides theoretical and empirical support for the assumption that changing illness perception may improve psychological outcomes in women facing chronic autoimmune conditions.

Despite the growing body of research on lupus, several conceptual and empirical gaps remain. First, many studies have separately examined lifestyle behaviors, coping strategies, psychological distress, and quality of life, but fewer studies have tested an integrated predictive model that explains how health-promoting lifestyle relates to psychosocial adjustment through illness perception. Second, although lifestyle modification is often recommended for patients with chronic illness, the mechanisms through which lifestyle affects psychosocial adaptation remain insufficiently specified. It is possible that health-promoting behaviors directly enhance adjustment by increasing physical functioning, reducing stress, and supporting social participation. However, it is also possible that these behaviors indirectly improve adjustment by changing patients' perceptions of control, understanding, and emotional response to illness. Third, many studies on chronic disease adaptation have been conducted in general or mixed patient populations, whereas women with systemic lupus erythematosus represent a clinically and psychosocially important group because of the gendered burden of disease, role demands, and long-term adaptation challenges (Mazzolani et al., 2025; Swaak et al., 2023; Tselios et al., 2023).

The mediating role of illness perception is theoretically important because it connects behavioral and psychosocial dimensions of chronic disease management. A health-promoting lifestyle may increase patients' sense of agency and personal control, improve their understanding of illness, reduce emotional reactivity, and support more adaptive interpretations of symptoms. In turn, more adaptive illness perception may facilitate psychosocial adjustment by reducing fear, improving coping, and helping patients preserve social and emotional functioning. This mediating pathway is consistent with evidence showing that illness perception is related to quality of life and adjustment in chronic disease (Lotfi-Tokaldany et al., 2019; Padhy & Valli, 2022; Soltanian et al., 2022), that coping and

emotional well-being are central to lupus adaptation (Da Silva et al., 2024; Gomez et al., 2023; Zhou et al., 2024), and that lifestyle and stress-management interventions can improve psychological outcomes among lupus patients (Kumar et al., 2023; Zhang et al., 2025). Therefore, examining illness perception as a mediator can clarify whether lifestyle-related behaviors influence psychosocial adjustment merely as behavioral habits or as part of a broader cognitive-emotional adaptation system.

From a clinical and health-management perspective, identifying the relationships among health-promoting lifestyle, illness perception, and psychosocial adjustment can guide more comprehensive interventions for women with systemic lupus erythematosus. If health-promoting lifestyle predicts psychosocial adjustment both directly and indirectly through illness perception, then interventions should not be limited to encouraging exercise, nutrition, stress management, and treatment responsibility. Rather, they should also include cognitive and educational components that help patients reinterpret illness consequences, increase perceived controllability, strengthen illness coherence, and regulate emotional responses. Such an approach is consistent with contemporary chronic disease management models that emphasize patient-centered care, self-management, psychological education, and integrated behavioral health. It also aligns with the evidence that social networks, resilience, coping strategies, and cognitive representations are important determinants of adaptation in lupus and other chronic illnesses (Hosseini et al., 2025; Johnson et al., 2023; Johnson et al., 2024). Accordingly, a structural model that tests these pathways can provide a more precise basis for designing psychosocial and lifestyle-oriented interventions.

Therefore, the present study aimed to develop a predictive model of psychosocial adjustment to illness based on health-promoting lifestyle with the mediating role of illness perception in female patients with systemic lupus erythematosus.

## 2. Methods and Materials

### 2.1. Study design and Participant

The present study was a descriptive-correlational study using a structural equation modeling design. Its objective was to determine the mediating role of illness perception in the relationship between health-promoting lifestyle and psychosocial adjustment to illness in patients with systemic lupus erythematosus. The statistical population included all

female patients with systemic lupus erythematosus who referred to Islamic Azad University hospitals in Tehran, including Bou-Ali, Farhikhtegan, and Amir-Al-Momenin hospitals, as well as the Lupus Association, during March–September 2025. The research sample was selected through purposive sampling and assigned based on the inclusion and exclusion criteria. The inclusion criteria included women diagnosed with the disease aged 35 to 55 years, willingness to participate in the study, a minimum educational level of high school diploma, absence of psychiatric disorders based on self-report, no use of psychiatric medication based on self-report, no substance or alcohol abuse, and no concurrent psychotherapy during participation. The exclusion criteria included distorted or incomplete questionnaires and withdrawal from continued cooperation.

Data collection in this study was conducted using library and field methods. In the library method, the Internet, books, and articles were used. In the field method, after obtaining informed consent, the questionnaires were administered to all participants in the sample.

## 2.2. Measures

Three valid instruments were used to measure the research variables. The Psychosocial Adjustment to Illness Scale developed by Derogatis (1986) includes 46 items and measures psychosocial adjustment to illness, including attitude toward the disease, vocational environment, domestic environment, sexual relationships, extended family relationships, social environment, and psychological distress. The Health-Promoting Lifestyle Profile developed by Walker (1990) includes 54 items and is designed to measure health-promoting behaviors, including nutrition, exercise, health responsibility, stress management, interpersonal support, and self-actualization. The Brief Illness Perception Questionnaire developed by Broadbent et al. (2006) includes 9 items and was designed to assess the emotional and cognitive representation of illness; it measures consequences, timeline, personal control, treatment control, identity, concern, illness coherence, and

emotional responses, respectively. The validity of the instruments was confirmed through the opinions of professors and specialists in psychology. Before the main implementation, the reliability of the questionnaires was examined using a preliminary sample of 15 participants. Cronbach's alpha coefficients for the Psychosocial Adjustment to Illness Scale, Health-Promoting Lifestyle Profile, and Illness Perception Questionnaire were 0.868, 0.884, and 0.765, respectively, indicating their acceptable reliability.

## 2.3. Data Analysis

In the descriptive section, the data were analyzed using mean and standard deviation. To achieve the final model, structural equation modeling and the bootstrap method were tested and reported using SPSS-27 and PLS-4.

## 3. Findings and Results

In the present study, the sample included 280 participants. Regarding the age distribution of the participants, 15% were between 35 and 41 years old, 37.86% were between 42 and 48 years old, and 47.14% were between 49 and 55 years old. As shown, participants aged 49 to 55 years constituted the largest group, whereas those aged 35 to 41 years constituted the smallest group.

In terms of educational level, 37.86% of the participants had a high school diploma or associate degree, 43.21% had a bachelor's degree, and 18.93% had a master's degree or higher. As shown, participants with a bachelor's degree constituted the largest group, whereas those with a master's degree or higher constituted the smallest group.

This demographic distribution indicates that the samples had appropriate diversity in terms of age and education and were acceptably homogeneous in terms of demographic characteristics, which increases the validity of the research findings.

Considering the title of the study, three main variables were measured using standardized questionnaires. Their descriptive findings are reported in Table 1.

**Table 1**

*Mean and Standard Deviation of the Scores of the Main Variables*

Variable	Mean	Standard Deviation
Psychosocial adjustment to illness	1.50	0.403
Health-promoting lifestyle	2.94	0.391
Illness perception	5.49	0.948

Based on the descriptive findings, the index of psychosocial adjustment to illness had a mean of 1.50 and a standard deviation of 0.403; the index of health-promoting lifestyle had a mean of 2.94 and a standard deviation of 0.391; and the index of illness perception had a mean of 5.49 and a standard deviation of 0.948. Furthermore, since the

measured indicators were examined within the methodological framework of structural equation modeling, the software output was used to test the hypotheses and examine the significance of the path coefficients between the variables. The path coefficients and their significance results are presented in Table 2 and Figure 1.

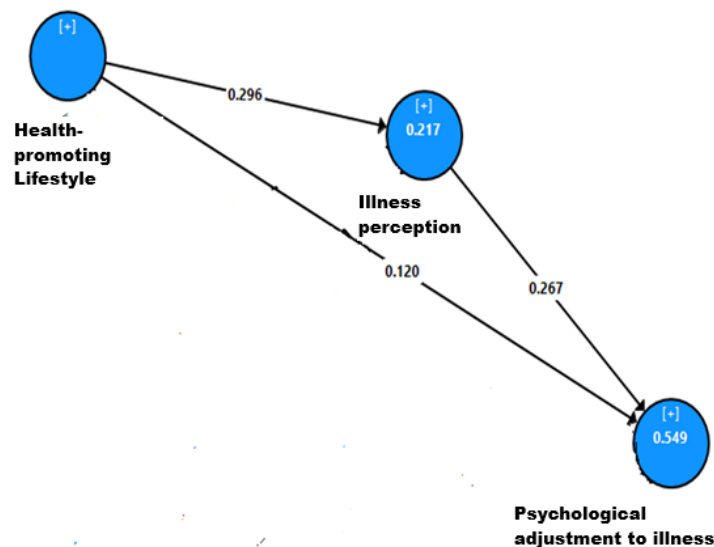
**Table 2**

*Path Coefficients and t-Scores Related to the Overall Model*

Path	Effect	t Statistics	p-value	Result
Illness perception → Psychosocial adjustment to illness	0.267	3.091	0.002	Relationship confirmed
Health-promoting lifestyle → Illness perception	0.296	2.046	0.041	Relationship confirmed
Health-promoting lifestyle → Psychosocial adjustment to illness	0.120	2.199	0.028	Relationship confirmed

**Figure 1**

*Test of the Overall Research Model*



The coefficient of determination is the fundamental criterion for evaluating endogenous latent variables in the path model. The coefficient of determination values for the endogenous variables of the study, namely psychosocial adjustment to illness (0.549) and illness perception (0.217), indicate the weak explanatory power of the research model. Considering the Q<sup>2</sup> values for the endogenous variables of the study, namely illness perception (0.113) and

psychosocial adjustment to illness (0.222), the values fall within weak and moderate levels. Therefore, it can be stated that the examined structural model has relatively acceptable quality and that the model has a relatively favorable predictive ability for predicting the endogenous latent variable. To examine the significance of the model, the PLS output fit indices were reviewed, and the summary of the results is reported in Table 3.

**Table 3**

*Results of the Model Fit Indices: SRMR, rms Theta, and NFI*

Fit Index	Saturated	Estimated	Criterion Threshold
SRMR	0.092	0.104	< 0.10 acceptable
rms Theta	—	0.150	< 0.12 desirable
NFI	0.817	0.811	> 0.80 acceptable

According to the results in Table 3, although the SRMR value of the estimated model was reported as acceptable, the rms Theta value was higher than the desirable threshold, and the NFI value was also acceptable and desirable.

The mean communality value was 0.399, and the mean R<sup>2</sup> value was 0.283. Considering the GOF criterion value of

0.341, the model demonstrates an appropriate ability to predict the endogenous latent variable of the model.

The bootstrap method was also used to examine this hypothesis. Based on this index, the significance or non-significance of the indirect path is presented in Table 4.

**Table 4**

*Bootstrap Results for Examining the Significance of the Indirect Effect*

Independent Variable	Mediating Variable	Dependent Variable	Indirect Effect	Upper Bound	Lower Bound	t Statistic	Estimation Error	Significance Level
Health-promoting lifestyle	Illness perception	Psychosocial adjustment to illness	0.079	0.137	0.035	2.653	0.059	0.023

According to Table 4, the research hypothesis was accepted ( $p < .05$ ). This means that illness perception plays a mediating role in the relationship between health-promoting lifestyle and psychosocial adjustment to illness in patients with systemic lupus erythematosus.

#### 4. Discussion

The present study was conducted to develop a predictive model of psychosocial adjustment to illness based on health-promoting lifestyle with the mediating role of illness perception in female patients with systemic lupus erythematosus. The findings showed that illness perception had a significant positive effect on psychosocial adjustment to illness. In addition, health-promoting lifestyle had a significant positive effect on illness perception and also directly predicted psychosocial adjustment to illness. The bootstrap results further confirmed that illness perception significantly mediated the relationship between health-promoting lifestyle and psychosocial adjustment to illness. Therefore, the overall findings indicate that female patients with systemic lupus erythematosus who report more favorable health-promoting lifestyle behaviors are more likely to have more adaptive illness perceptions, and these adaptive perceptions, in turn, contribute to better psychosocial adjustment to illness. The structural model also showed that the model had an acceptable predictive capacity for explaining psychosocial adjustment, although the predictive power for illness perception was weaker, suggesting that other psychological, clinical, and social variables may also contribute to the formation of illness perceptions in this population.

The finding that illness perception significantly predicted psychosocial adjustment to illness is consistent with theoretical and empirical evidence emphasizing that

patients' cognitive and emotional representations of disease play a central role in chronic illness adaptation. Systemic lupus erythematosus is a chronic autoimmune disease with unpredictable symptoms, periods of relapse and remission, and potential multisystem involvement; therefore, patients' interpretation of the illness may substantially influence their emotional reactions, coping behaviors, social functioning, and capacity to maintain daily roles (Mayo, 2023; Uzun et al., 2024). Previous studies have shown that lupus is associated with considerable psychological and social consequences, including distress, disruption of interpersonal functioning, role limitations, and reduced quality of life (Swaak et al., 2023; Tselios et al., 2023). In this context, illness perception can operate as a cognitive framework through which patients evaluate the seriousness, controllability, duration, consequences, and emotional meaning of their disease. When patients perceive their illness as understandable and manageable, they may experience greater psychological control and show more adaptive responses to disease-related stressors. Conversely, when the illness is perceived as uncontrollable, threatening, and emotionally overwhelming, psychosocial adjustment may become more difficult.

This result is aligned with previous research showing that illness perception is related to quality of life, coping, and adjustment in chronic disease populations. Lotfi-Tokaldany et al. found that illness perception was associated with health-related quality of life in patients with premature coronary artery disease, indicating that patients' beliefs about illness consequences and controllability can shape their overall adaptation to chronic disease (Lotfi-Tokaldany et al., 2019). Similarly, research on patients with diabetes has shown that illness perceptions are associated with quality of life, supporting the view that cognitive representations of

illness are important across different chronic conditions (Padhy & Valli, 2022). In lupus patients, Gomez et al. reported longitudinal associations between illness perception and coping strategies, suggesting that patients' perceptions of lupus influence how they manage the disease over time (Gomez et al., 2023). These findings support the present result and indicate that illness perception is not merely a passive belief system, but a dynamic cognitive-emotional mechanism that affects how patients respond to illness demands.

The significant direct effect of health-promoting lifestyle on psychosocial adjustment to illness also supports previous evidence indicating that lifestyle-related behaviors are important for psychological health and adaptation in lupus. Health-promoting lifestyle includes behaviors such as healthy nutrition, regular physical activity, health responsibility, stress management, interpersonal support, and self-actualization. These behaviors can improve adjustment through several pathways: they may reduce stress, strengthen self-efficacy, enhance physical functioning, increase perceived control, improve social participation, and help patients maintain a more stable daily routine despite illness-related limitations. The present finding is consistent with studies showing that lifestyle modifications can improve psychological health among lupus patients (Kumar et al., 2023). It also corresponds with evidence from a randomized controlled trial indicating that a structured lifestyle intervention improved well-being in patients with systemic lupus erythematosus (Mazzolani et al., 2025). Therefore, lifestyle behaviors appear to represent not only physical health practices but also psychosocial resources that help patients manage the long-term burden of lupus.

The relationship between health-promoting lifestyle and psychosocial adjustment can also be explained through self-regulation and coping mechanisms. Patients who engage in health-promoting behaviors may become more active participants in disease management and may experience a stronger sense of agency in relation to their health. This sense of agency may reduce helplessness and promote more adaptive psychological functioning. Evidence from other health conditions supports this interpretation. Fatima et al. showed that health-promoting behaviors in women with polycystic ovary syndrome were related to psychological factors and coping mechanisms, indicating that health behaviors are closely connected with cognitive and emotional regulation (Fatima et al., 2021). Park et al. also demonstrated that health-related behaviors can mediate the

relationship between subjective perceptions and health outcomes, emphasizing that behavior and perception are often interdependent components of adjustment (Park et al., 2022). In addition, Soltanian et al. showed that both acceptance and commitment therapy and health-promoting lifestyle interventions could influence illness perception and adjustment to illness in patients with type 2 diabetes, supporting the role of lifestyle-oriented interventions in improving chronic illness adaptation (Soltanian et al., 2022).

The significant effect of health-promoting lifestyle on illness perception is another important finding of this study. This result indicates that patients who engage more frequently in health-promoting behaviors may develop more adaptive cognitive and emotional representations of their illness. In other words, lifestyle behaviors may influence not only physical or behavioral functioning but also the way patients understand and evaluate their disease. When patients practice stress management, seek interpersonal support, take responsibility for their health, and engage in self-care behaviors, they may perceive the disease as more controllable and less threatening. This interpretation is consistent with Leventhal's self-regulation model, according to which illness-related behaviors and illness representations interact dynamically over time. Evidence from intervention research based on this model has shown that modifying illness-related beliefs can reduce stress, anxiety, and depression in women with chronic neurological disease (Hosseini et al., 2025). Although that study was conducted among women with multiple sclerosis, its findings are conceptually relevant to lupus because both conditions are chronic, unpredictable, and psychologically demanding. Thus, the present finding suggests that health-promoting lifestyle may contribute to more adaptive illness perception by strengthening patients' perceived control, health responsibility, and emotional regulation.

The confirmed mediating role of illness perception is the central finding of the present study. This result means that part of the effect of health-promoting lifestyle on psychosocial adjustment occurs through patients' illness perceptions. In practical terms, a health-promoting lifestyle may help patients adjust to lupus not only because it improves health-related behavior, but also because it changes the meaning patients attribute to the illness. Patients who adopt healthier lifestyles may feel more competent in managing the disease, may interpret symptoms with less fear, may perceive treatment as more effective, and may experience less emotional distress in response to disease fluctuations. These more adaptive illness perceptions can

then facilitate psychosocial adjustment by improving coping, reducing anxiety, supporting interpersonal functioning, and preserving social roles. This finding is consistent with evidence showing that coping strategies and illness perception are closely connected in lupus patients (Da Silva et al., 2024; Gomez et al., 2023). It is also supported by integrative review evidence indicating that coping strategies are strongly related to emotional well-being in lupus (Zhou et al., 2024).

The mediating pathway observed in this study can also be understood in light of the psychological burden of lupus. Lupus patients often face uncertainty about symptom recurrence, concerns about disease progression, medication side effects, fatigue, pain, and limitations in social and occupational functioning. Epidemiological and clinical reviews have shown that lupus differs across populations and ethnic groups and that its burden may vary depending on biological, social, and contextual factors (Choi et al., 2023; Goh et al., 2023). Recent research has also suggested that biological factors such as thyroid hormones may be involved in disease progression, further emphasizing the complex and multidimensional nature of lupus (Li et al., 2025). Because patients must live with uncertainty and symptom variability, their perception of the disease becomes an essential determinant of adaptation. A health-promoting lifestyle may provide structure, predictability, and perceived control in the face of this uncertainty, while illness perception translates these behaviors into psychological adaptation. Therefore, the mediation result highlights the necessity of integrating behavioral and cognitive approaches in psychosocial care for lupus.

The present findings are also consistent with research emphasizing the role of stress, resilience, and social support in chronic illness adjustment. Stress management is one of the central components of health-promoting lifestyle and may be particularly important in lupus because stress can intensify emotional distress and undermine coping capacity. Zhang et al. reported that stress management had psychological benefits in lupus patients, supporting the importance of stress-related interventions in this population (Zhang et al., 2025). Johnson et al. also emphasized the role of family and social networks in stress and coping among patients with systemic lupus erythematosus, indicating that interpersonal resources are important for adjustment (Johnson et al., 2023). Furthermore, evidence from chronic illness research has shown that optimism and well-being are associated with psychological resilience, suggesting that patients with stronger positive psychological resources may

be better able to adapt to chronic disease demands (Johnson et al., 2024). These findings support the interpretation that health-promoting lifestyle and illness perception contribute to psychosocial adjustment through broader mechanisms of stress regulation, resilience, and social functioning.

Another explanation for the findings is that psychosocial adjustment is influenced by both individual and contextual processes. Although the present model focused on health-promoting lifestyle and illness perception, psychosocial adjustment is also affected by interpersonal relationships, family support, healthcare access, socioeconomic status, disease severity, and previous psychological experiences. Research on psychosocial adjustment has shown that relational and contextual stressors can influence adjustment trajectories, demonstrating that adaptation is not simply an individual psychological outcome but a process embedded in the patient's environment (Deng et al., 2024). Accordingly, the significant but modest path coefficients in the present study are theoretically meaningful. They indicate that lifestyle and illness perception are important predictors, but they do not fully explain psychosocial adjustment. This is expected in a complex chronic disease such as lupus, where biological, psychological, social, and cultural factors interact over time.

## 5. Conclusion

Overall, the findings of the present study support an integrated biopsychosocial interpretation of adjustment to systemic lupus erythematosus. Health-promoting lifestyle directly contributes to psychosocial adjustment and also indirectly improves adjustment through illness perception. Illness perception serves as a cognitive-emotional mechanism that explains how health-related behaviors are translated into psychosocial outcomes. These findings extend previous research by showing that in female patients with systemic lupus erythematosus, adaptation to illness is not merely the result of behavioral self-care or psychological interpretation alone, but rather the outcome of their interaction. Therefore, interventions designed for this population should combine lifestyle education, stress management, cognitive restructuring of illness beliefs, and interpersonal support in order to promote more sustainable psychosocial adjustment.

## 6. Limitations and Suggestions

The present study had several limitations. First, the research design was descriptive-correlational and based on

structural equation modeling; therefore, causal conclusions cannot be made with certainty. Second, the participants were selected through purposive sampling from specific hospitals and the Lupus Association in Tehran, which may limit the generalizability of the findings to all female patients with systemic lupus erythematosus. Third, the data were collected using self-report questionnaires, which may be affected by social desirability, recall bias, or participants' current emotional state. Fourth, clinical indicators such as disease duration, disease activity, medication regimen, comorbid conditions, and severity of symptoms were not fully controlled in the model. Finally, the study focused only on female patients aged 35 to 55 years, and the results may not be generalizable to men, younger patients, older patients, or patients from different cultural and healthcare contexts.

Future studies are recommended to use longitudinal and experimental designs to examine the causal relationships among health-promoting lifestyle, illness perception, and psychosocial adjustment to illness. Researchers should also include clinical variables such as disease activity, duration of diagnosis, medication use, fatigue severity, pain intensity, and comorbid psychological symptoms to obtain a more comprehensive model. It is also suggested that future research compare different age groups, male and female patients, and patients from different geographical and cultural backgrounds. In addition, future studies may examine other mediating or moderating variables, such as resilience, social support, coping styles, self-efficacy, perceived stress, treatment adherence, and quality of physician-patient communication. Qualitative studies could also be conducted to explore how women with lupus personally interpret their illness and how these interpretations influence their daily adjustment.

Based on the findings, healthcare professionals are recommended to design integrated intervention programs that address both lifestyle behaviors and illness-related cognitions in female patients with systemic lupus erythematosus. Patient education programs should not be limited to medical information but should also focus on improving patients' understanding of illness, perceived control, emotional regulation, and adaptive interpretation of symptoms. Nurses, psychologists, rheumatologists, and health educators can collaborate to provide lifestyle counseling, stress management training, cognitive-behavioral strategies, and family-based support. Screening patients for maladaptive illness perceptions may also help identify individuals at greater risk of poor psychosocial adjustment. Finally, clinical care for lupus patients should

adopt a patient-centered approach that strengthens self-care behaviors, improves psychological readiness, and supports social and emotional functioning throughout the course of the disease.

### Authors' Contributions

Authors equally contributed to this article.

### Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

### Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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### Declaration of Interest

The authors report no conflict of interest.

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### Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants. This article was extracted from the doctoral dissertation of the first author at the United Arab Emirates Branch, Islamic Azad University, Dubai, United Arab Emirates, and has an ethics code with the identifier IR.IAU.SRB.REC.1404.335 from the Research Ethics Committee of Islamic Azad University, Science and Research Branch, Tehran, Iran.

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