

The Mediating Role of Self-Compassion in the Relationship Between Emotional Schemas and Symptom Severity in Patients with Irritable Bowel Syndrome

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Abstract

Introduction: Irritable bowel syndrome is influenced by several psychological factors that influence individuals' vulnerability. Emotional schemas, which are a set of beliefs about emotions, are considered to be one of these important factors. The aim of this study is to investigate the role of self-compassion as a mediating mechanism in explaining the causal relationships between emotional schemas and the symptom severity in patients with irritable bowel syndrome.

Methods: The method of this study was descriptive-correlational. The statistical population included patients with irritable bowel syndrome who referred to the gastroenterology clinic of Imam Reza Hospital in Mashhad during 2020. A convenience sample of 323 patients was selected. The instruments included the Leahy Emotional Schema Scale, Francis et al. IBS Symptom Severity Questionnaire, and Neff Self-Compassion Scale. The collected data were analyzed using structural equation modeling.

Results: The total path coefficient for maladaptive schemas towards increasing the severity of irritable bowel syndrome symptoms was positive and significant. In contrast, adaptive schemas were related to decreasing the severity of irritable bowel syndrome symptoms. Self-compassion also showed a significant and negative relationship directly with the reduction in the severity of irritable bowel syndrome symptoms. Indirect effects through self-compassion were also significant: maladaptive schemas were negatively related to self-compassion and adaptive schemas were positively related to self-compassion, and finally this mediation was related to the symptom Severity.

Conclusion: The results show that emotional schemas, both directly and indirectly through the mechanism of self-compassion, play an important role in explaining the severity of irritable bowel syndrome symptoms.

Keywords: Emotional schema, irritable bowel syndrome, self-compassion

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Introduction

Irritable bowel syndrome (IBS) is a common functional gastrointestinal disorder characterized by chronic abdominal pain and changes in bowel habits, without a clear pathological cause ¹. It is the most common functional gastrointestinal disorder and significantly affects patients' quality of life, occupational performance, interpersonal relationships, and especially their ability and experience of traveling ²⁻⁵. Furthermore, with a prevalence ranging from 1.1 to 25% in Iran, it imposes a

heavy economic burden on the health system ⁶.

Numerous studies emphasize the pivotal role of psychological factors in the etiology and persistence of irritable bowel syndrome symptoms through the brain-gut axis ^{7,8}. This axis is a two-way communication between the central nervous system and the gastrointestinal tract and shows how stress, emotions and cognitive processes can change intestinal function ⁹. One of the psychological models that explains the role of emotions in physical and

mental disorders is Leahy's emotional schema model ¹⁰. Emotional schemas are defined as the beliefs, interpretations and strategies of the individual in response to emotional experiences and are divided into two general categories: adaptive (such as acceptance and validation of emotions) and maladaptive (such as blaming, rumination and emotional simplification) ¹¹. Research has shown that maladaptive emotional schemas are associated with a wide range of disorders including depression, anxiety and irritable bowel syndrome ¹². People with this syndrome report more maladaptive emotional schemas, such as guilt and blame, than healthy individuals. These patterns can lead to chronic stress and exacerbation of physical symptoms ¹³. However, the mere presence of Maladaptive emotional schemas cannot explain the severity of IBS symptoms alone, and the mediating mechanisms of this relationship need to be investigated. One psychological construct that seems to play a key role in this is "self-compassion" ¹⁴. Self-compassion, introduced by Neff ¹⁵, means adopting a kind and non-judgmental attitude towards oneself when faced with failure, suffering, and disappointment. This construct has three bipolar components: self-kindness versus judgment, understanding of common humanity versus isolation, and mindfulness versus excessive identification with painful experiences ¹⁶. Self-compassion has been shown to function as an adaptive emotion regulation strategy and can act as a protective shield against the damaging effects of stress ¹⁷. Research has shown that low levels of self-compassion are associated with more physical symptoms and lower quality of life in psychosomatic disorders ¹⁸. Furthermore, training in self-compassion skills can help reduce the symptom Severity of irritable bowel syndrome ¹⁹.

One important gap in the literature is the lack of a precise explanation of the mechanisms through which emotional schemas influence gut physiology. Ineffective coping strategies resulting from maladaptive schemas, such as emotional suppression and rumination, result in persistent sympathetic nervous system activation and dysregulation of the hypothalamic-pituitary-adrenal axis. This state of chronic physiological stress directly leads to visceral hypersensitivity, which is a key feature of irritable bowel syndrome ²⁰. In this state, the gut exhibits an exaggerated and painful response to normal stimuli, such as the passage of gas or food. Thus, emotional schemas not only influence the psychological experience but also directly affect the physical pain threshold in irritable bowel syndrome patients ²¹.

The role of self-compassion as a mediating variable also goes beyond a passive buffer. Self-compassion is an active emotion regulation strategy that

directly targets the damaging mechanisms of maladaptive schemas ²². Through its self-kindness component, it reduces rumination and self-blame, and through its mindfulness component, it allows the individual to observe painful emotions without identifying with them ²³. This process directly leads to a decrease in activity in the brain's threat system (amygdala) and an increase in activity in the soothing system (associated with oxytocin and the prefrontal cortex) ²⁴. As a result, self-compassion can modulate visceral hypersensitivity by reducing physiological arousal ²⁵ and thus counteract the effects of maladaptive schemas on symptoms of irritable bowel syndrome ²⁶.

Given that previous research has less investigated the exact mechanism of the interaction of self-compassion with emotional schemas and its effect on irritable bowel syndrome symptoms, the main aim of this study was to fill this research gap by examining the mediating role of self-compassion in the relationship between emotional schemas (adaptive and maladaptive) and symptom severity in patients with irritable bowel syndrome.

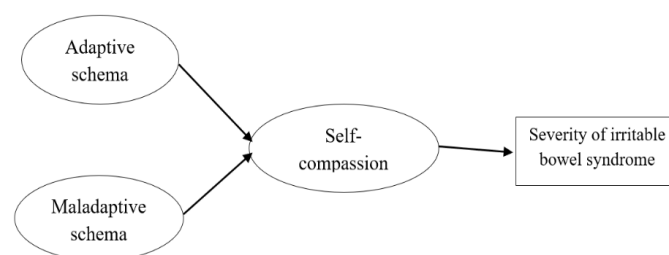


Figure 1. Conceptual research model

Materials and methods

The present study was descriptive-correlational and based on structural equation modeling, and the statistical population included all patients with irritable bowel syndrome who referred to the gastroenterology clinic of Imam Reza Hospital (AS) in Mashhad during 2020. Sampling was conducted using the convenience method. Initially, 323 patients were selected, and after removing 2 corrupted questionnaires, the final analysis was performed on the data of 321 people (213 women and 108 men). The inclusion criteria for the study included a definitive diagnosis of irritable bowel syndrome by a gastroenterologist and informed consent to participate in the study. The exclusion criteria were also major psychiatric disorders (such as psychosis) and substance dependence. After obtaining the necessary permits and coordinating with hospital officials, the objectives of the study were explained to the participants, and after receiving written consent, the questionnaires were provided to them.

Leahy Emotional Schema Scale

This 50-item scale assesses 14 dimensions of emotional schemas on a 5-point Likert scale. In this study, two total scores of adaptive and maladaptive emotional schemas were used. In the study by Shahorani and Khormaei¹, the validity and reliability of the Persian version of this instrument were reported to be satisfactory. In the present study, Cronbach's alpha coefficient for the adaptive (acceptance, general agreement, comprehensibility and controllable) and Maladaptive (rumination, rationality, which here means trying to suppress or invalidate emotions through purely logical analysis, and Simplistic view of emotion) subscales were obtained in the range of 0.53 to 0.84.

Irritable Bowel Syndrome Symptom Severity Questionnaire

The Irritable Bowel Syndrome Symptom Severity Questionnaire by Francis et al.²⁷ is a validated scale for assessing the clinical severity of irritable bowel syndrome. The scale has five separate dimensions, each of which uses a visual analog scale technique to assess the patient's level of discomfort. These dimensions include: abdominal pain, degree of disturbance in bowel habits, feeling of bloating and fullness, overall impact of symptoms on daily activities, and the presence and severity of extraintestinal symptoms. The total score calculated for this tool ranges from 0 to 500, and an increase in the score linearly indicates an increase in the severity of the disease. For clinical classification, mild cases are defined as those in the range of 75 to 175, moderate cases as those in the range of 175 to 300, and severe cases as scores greater than 300. The concurrent validity of this scale has been confirmed by Francis and his research team through its measurement of positive and significant correlation with measures such as health-related quality of life and general well-being.

In an internal study by Gholamrezaei et al.²⁸, the psychometric properties of this questionnaire have been confirmed. The reliability coefficient using Cronbach's alpha was reported to be 0.72. To assess concurrent validity, the correlation of this instrument with the overall quality of life score was calculated, and its coefficient was 0.62. In the current study, the reliability of the instrument was re-evaluated and its Cronbach's alpha was calculated to be 0.77, indicating the desirable reliability of this scale in the study sample.

Self-Compassion Scale

This 26-item scale is designed with a 5-point Likert scale (from almost never to almost always) and measures six subscales that form three main dimensions: self-kindness, self-judgment, common humanity, isolation, mindfulness,

and overidentification²⁹. In the study by Khosravi et al., the reliability of its Persian version was reported with a Cronbach's alpha of 0.86. In the present study, Cronbach's alpha for the six subscales ranged from 0.64 to 0.82.³⁰

Findings

The statistical sample of this descriptive-correlational study consisted of 321 patients with irritable bowel syndrome. The demographic distribution of the sample showed a clear predominance of the female gender, with women participating in the study almost twice as many times as men. In terms of age, the sample was concentrated in the young middle-aged category (between 25 and 45 years old), with the highest frequency belonging to the age group of 36 to 40 years old. In terms of marital status, more than half of the participants were married.

Another striking feature was the high level of education, such that the vast majority (more than two-thirds) of the sample had bachelor's and master's degrees, and the share of people with lower education was very small.

Based on the results of Table 1, the correlation coefficients between the variables were in the expected direction and in line with the theories of the research field. In this study, in order to evaluate the assumption of normal distribution of univariate data, the indices of elasticity and skewness were examined, and in order to evaluate the assumption of collinearity, the variance inflation factor (VIF) and the tolerance coefficient were examined.

Before applying the structural equation modeling method, the necessary statistical assumptions were examined. To assess the normality of the univariate distribution, the values of kurtosis and skewness were calculated for all variables, which were within the accepted range of +2 and -2. This finding indicates that the assumption of normal distribution of univariate data is valid among the data (Recklein, 2016). Also, to assess the normality of the multivariate distribution, the values of skewness (1.03) and kurtosis (0.82) of the Mahalanobis distance scores were confirmed within the allowed range of ± 2 . In addition, the assumption of collinearity between the predictor variables was also evaluated; given that the tolerance coefficient values were greater than 0.1 and the variance inflation factor values were less than 10, it was concluded that the assumption of collinearity was not violated in the research data. It is necessary to explain that in order to evaluate the assumption of homogeneity of variances, the scatter diagram of the standardized variances of the errors was examined, and the results showed that the aforementioned assumption holds among the data.

Table 1. Correlation matrix of research variables.

Research variables	1	2	3	4	5	6	7	8	9	10	11	12	13
1.Adaptive schemas - acceptance	-												
2. Adaptive schemas - general agreement	0.40**	-											
3.Adaptive schemas - comprehensibility	0.64**	0.43**	-										
4.Maladaptiveschemas-rumination	0.03	-0.14*	0.03	-									
5.Maladaptiveschemas-Rational	0.13*	-0.03	0.18**	0.62**	-								
6.Maladaptiveschemas-Simplistic view of emotion	0.13*	0.04	0.16**	0.49**	0.68**	-							
7.Self compassion-Self kindness	-0.11**	0.19**	0.18**	-0.26**	-0.05	0.02	-						
8.Self compassion-Self judgment	0.21**	0.17**	0.30**	-0.12*	-0.07	0.12*	-0.58**	-					
9. Self compassion-Common Humanity	0.09	0.24**	0.15**	-0.34**	0.06	0.03	0.60**	0.44**	-				
10. Self compassion-Isolation	0.27**	0.27**	0.36**	-0.27**	0.03	0.04	0.52**	0.74**	0.55**	-			
11. Self compassion-Mindfulness	0.18**	0.16**	0.20**	-0.27**	-0.04	0.03	0.61**	0.46**	0.63**	0.49**	-		
12. Self compassion-Over identification	0.23**	0.14*	0.32**	-0.20**	0.01	0.06	0.49**	0.70**	0.50**	0.75**	0.43**	-	
13.Irritable bowel syndrome	-0.19**	-0.12*	-0.16**	0.35**	0.16**	0.22**	-0.28**	-0.44**	-0.24**	-0.46**	-0.28**	-0.41**	-
Mean	3.56	6.79	17.18	6.63	7.74	6.07	15.87	14.10	13.10	10.37	13.23	11.68	23.84
Standard Deviation	1.83	2.65	3.94	2.19	2.45	2.48	4.47	4.08	3.29	3.74	2.66	3.38	6.63

Model analysis

The data were analyzed using structural equation modeling. Based on the theoretical design (as shown in Figure 2), the variables of adaptive emotional schemas, Maladaptive emotional schemas, and self-compassion were considered as latent variables. The latent variable of adaptive emotional schemas was measured with three indicators (acceptance, consensus, and comprehensibility, and control), and the Maladaptive variable was measured with three indicators (rumination, rationality, and

Simplistic view of emotion). The latent variable of self-compassion was measured with six indicators (self-kindness, self-judgment, understanding of human commonalities, isolation, omniscience, and over identification). The measurement model was examined through a confirmatory factor analysis conducted in AMOS 26 using the maximum likelihood approach to verify its correspondence with the collected data. Table 2 shows the fit indices of the measurement and structural models.

Table 2. Measurement model fit indices.

Fitness indicators	Measurement model		Structural Model	cut point
	Initial model	First Modification		
chi square	284.79	133.72	169.02	-
Degree of freedom of the model	51	47	56	-
χ^2/df	5.58	2.85	3.02	<3
GFI	0.861	0.936	0.927	<0.9
AGFI	0.788	0.894	0.882	<0.85
CFI	0.871	0.952	0.942	<0.9
RMSEA	0.120	0.076	0.079	0.08<

Table 2 shows that none of the fit indices obtained from the confirmatory factor analysis support an acceptable fit of the measurement model with the collected data. For this reason, the measurement model was modified by creating four covariances between the errors of the indicators of human commonality and mindfulness (first stage), self-kindness and mindfulness (second stage), self-kindness and human commonality (third stage), and self-kindness and self-judgment (fourth stage), and finally fit indices were obtained, which showed that the measurement model had an acceptable fit with the collected data. In the measurement model, the largest factor loading belongs to the indicator of rationality ($\beta = 0.925$) and the smallest factor loading belongs to the indicator of general agreement ($\beta = 0.503$). Thus,

considering that the factor loadings of all indicators were greater than 0.32, all of them had the necessary power to measure the latent variables of the present study. After ensuring the acceptable fit of the measurement model with the collected data and ensuring the power of the indicators in measuring the latent variables, the data were tested using the structural equation modeling method. In the structural model, it was assumed that emotional schemas, both directly and through the mediation of self-compassion, predict the severity of irritable bowel syndrome symptoms. As shown in Table 2, the fit indices obtained from the analysis showed that the structural model had an acceptable fit with the collected data. Table 3 shows the path coefficients between the variables in the structural model of the study.

Table 3. Path coefficients between variables in the model.

	Predictor variable	b	S.E	B	sig
Direct	Maladaptive schemas - symptom severity	1.213	0.279	0.245	0.001
	adaptive schemas - symptom severity	-1.416	0.407	-0.038	0.611
	Maladaptive schemas - Self compassion	-0.102	0.065	-0.116	0.122
	adaptive schemas - Self compassion	0.544	0.117	0.450	0.001
	Self compassion- symptom severity	-2.216	0.413	-0.483	0.001
Indirect	Maladaptive schemas - symptom severity	0.226	0.135	0.056	0.122
	adaptive schemas - symptom severity	-1.206	0.284	-0.217	0.001
Total	Maladaptive schemas - symptom severity	1/213	0.316	0.301	0.001
	adaptive schemas - symptom severity	-1.416	0.386	-0.255	0.001

The results of the structural equation modeling analysis, presented in Table 3, indicated key and significant relationships between the types of emotional schemas and the severity of irritable bowel syndrome symptoms. The total path coefficient between Maladaptive emotional schemas and the severity of irritable bowel syndrome symptoms was positive and significant ($p < 0.01$, $\beta = 0.301$), indicating that the individual's dysfunctional beliefs about emotions are associated with increased symptom Severity. In contrast, the total path coefficient of adaptive emotional schemas towards the severity of irritable bowel syndrome symptoms was negative and significant ($p < 0.01$, $\beta = -0.255$), confirming the role of adaptive schemas in the overall reduction of clinical symptom severity. These findings confirm the importance of examining and modifying the individual's emotional beliefs in understanding and managing the severity of irritable bowel syndrome symptoms.

Table 3 shows that the path coefficient between self-compassion and IBS symptom severity ($p = 0.001$, $\beta = -0.483$) was negative and significant. According to the results of Table 3, the indirect path coefficient between maladaptive emotional schemas and severity of irritable bowel syndrome symptoms through self-compassion ($p = 0.122$, $\beta = 0.056$) was not significant, and the indirect path coefficient between adaptive emotional schemas and severity of irritable bowel syndrome symptoms through self-compassion ($p = 0.001$, $\beta = -0.217$) was negative and significant. Accordingly, the results of the present study showed that self-compassion negatively and significantly mediates the relationship between adaptive emotional schemas and severity of irritable bowel syndrome symptoms. Figure 2 shows the structural model of the study in explaining the causal relationships between emotional schemas, self-compassion, and severity of irritable bowel syndrome symptoms.

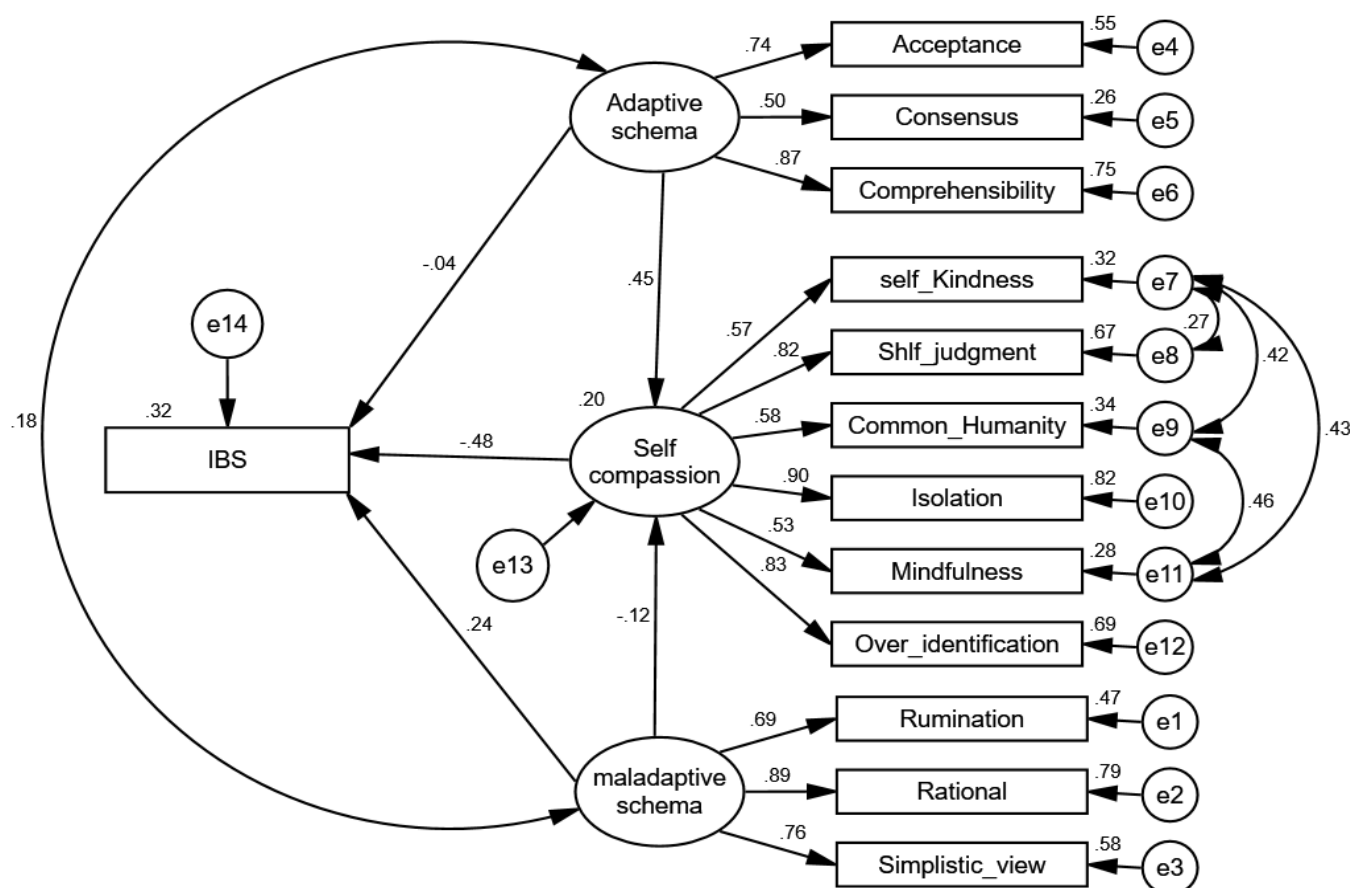


Figure 2. Structural model of the research.

Based on the results of the structural model shown in Figure 2, the multiple correlation squared for the criterion variable of IBS symptom severity was obtained as 0.32. This coefficient explains that adaptive and Maladaptive emotional schemas, together with the self-compassion variable, explain a total of 32% of the variance in IBS symptom severity. In other words, the presented model has moderate to strong explanatory power in predicting changes in IBS symptoms.

Discussion and conclusion

The main objective of this study was to test a model in which self-compassion mediates the relationship between emotional schemas and symptom severity in patients with irritable bowel syndrome. The results of structural equation analysis showed that the proposed model had a very good fit to the data and all main paths in it were significant. To explain the mechanism of this relationship, the model examined the communication paths between the variables. The results showed that emotional schemas directly affect self-compassion and self-compassion also affects symptom severity. This finding indicates that a person's fundamental beliefs about their emotions provide the basis for the formation of their attitude towards themselves during suffering. Maladaptive schemas, by creating feelings of shame and guilt, destroy the person's ability to be kind to themselves. In contrast, self-compassion, as an adaptive emotion regulation strategy, helps reduce symptoms by modulating stress systems in the brain (reducing amygdala activity and cortisol secretion).

The results of the study, in the first step, revealed a direct and significant relationship between emotional schemas and symptom severity. As expected, maladaptive schemas were positively related to symptom severity, and adaptive schemas were negatively related to symptom severity. This finding is consistent with the extensive literature emphasizing the role of the brain-gut axis.^{31, 32} Emotional schemas are defined as metacognitive or meta-experiential models of emotions and include individuals' beliefs and interpretations about emotions and how they are regulated.³³ This model suggests that individuals with negative beliefs about emotions (such as that emotions are abnormal, irrational, or shameful) engage in maladaptive coping strategies such as thought suppression, rumination, avoidance, and self-blame.³⁴ These strategies perpetuate psychophysical stress through chronic activation of the hypothalamic-pituitary-adrenal axis and sympathetic nervous system, leading to an exacerbation of physical symptoms in patients with irritable bowel syndrome.^{35, 36} When an emotion arises, individuals may have beliefs about the duration, need to

control, and acceptance of that emotion.³⁷ Individuals with maladaptive schemas tend to avoid or suppress negative emotions³⁸. This avoidance not only leads to an increase in internal conflicts, but also manifests itself in physical symptoms such as visceral sensitivity and abdominal pain in patients with irritable bowel syndrome.³⁹ Maladaptive emotional schemas can also lead to a decrease in the ability of individuals to manage negative emotions⁴⁰. For example, beliefs such as that emotions should always be under control or that expressing emotions makes one weak or vulnerable can lead to the creation of internal conflicts and prevent the healthy expression of emotions.⁴¹

The central finding of this study was the confirmation of the mediating role of self-compassion. The results of the study showed that self-compassion mediated the relationship between maladaptive emotional schemas and the severity of irritable bowel syndrome symptoms positively and the relationship between adaptive emotional schemas and the severity of irritable bowel syndrome symptoms negatively. These findings were consistent with the results of previous studies.^{42–44} In this regard, no studies with inconsistent results were found for comparison. This consistency in findings is to be expected, given the growing body of evidence. Indeed, extensive research suggests that self-compassion acts as a transdiagnostic protective factor; that is, its mechanism of action in reducing psychological distress across a wide range of chronic conditions is so robust and consistent that research consistently confirms this key mediating role.⁴⁵ Self-compassion is defined as a psychological construct and adaptive emotion regulation strategy that helps individuals adopt a compassionate and nonjudgmental attitude toward themselves.⁴⁶ This construct helps reduce physical symptoms associated with irritable bowel syndrome by reducing activity in brain regions associated with stress, such as the amygdala and cingulate, and increasing activity in the brain's pain-relieving system (associated with oxytocin and the prefrontal cortex)^{47, 48}. These patients show greater attention to disease symptoms, which leads to increased symptom severity.⁴⁹

The findings of this study suggest that self-compassion is a key mechanism that explains how a person's beliefs about their emotions (emotional schemas) influence the severity of their physical symptoms in irritable bowel syndrome. Maladaptive emotional schemas indirectly exacerbate symptoms by reducing self-compassion. These results have important clinical implications and suggest that therapeutic interventions for these patients should actively focus on strengthening and

teaching self-compassion skills, in addition to correcting dysfunctional beliefs.

Limitations and suggestions

The present study had limitations that should be considered when interpreting the results. First, the cross-sectional design of the study does not allow for definitive inferences of cause-and-effect relationships, and the possibility of an inverse effect of variables on each other (e.g., the effect of symptom severity on self-compassion) cannot be ruled out. Second, the reliance on self-report instruments, although common in assessing psychological constructs, can subject the data to biases such as social desirability bias. Third, the medications taken by the participants were not considered or controlled as a potential confounding variable, which may have influenced the outcomes. Fourth, the menstrual cycle of female participants was not taken into account; women who were menstruating during the experiment might have experienced hormonal or emotional fluctuations that could have affected their responses and, consequently, distorted the results. Finally, sampling from a specialized clinic makes it necessary to exercise caution when generalizing the findings to the broader population of patients who are not seeking active treatment.

Accordingly, and in order to address these limitations, it is suggested that future research take strategic steps. Longitudinal and experimental study designs can more accurately test causal relationships and assess the impact of a self-compassion-based intervention on schemas and symptoms over time. Additionally, combining psychological data with objective physiological indicators, such as salivary cortisol levels or inflammatory markers, could shed more light on the biological mechanisms underlying this model. Finally, examining the role of potential moderating variables, such as alexithymia or attachment styles, would help determine whether the effectiveness of self-compassion is consistent across patients or depends on their individual characteristics.

Highlights

What Is Already Known?

Irritable Bowel Syndrome (IBS) is one of the most common functional gastrointestinal disorders, with its prevalence particularly increasing among young adults. Despite remarkable advances in understanding the gut–brain axis and the gut microbiome, there is still no definitive treatment for this disorder. Therefore, conducting extensive multidisciplinary research that considers cultural contexts is essential to improve the understanding and management of this syndrome.

Highlights

What Does This Study Add?

Leahy's Emotional Schema Model and Neff's Self-Compassion framework serve as effective theoretical and therapeutic tools for explaining and alleviating symptom severity in Irritable Bowel Syndrome (IBS). In particular, emphasizing the enhancement of self-compassion as a protective factor can contribute to improving the quality of life among individuals suffering from this disorder.

Authors' Contributions

H.R. was involved in planning and supervised the work and proof outline. H.R., M.M., and A.G. drafted the manuscript and designed the figures. G.N. was responsible for the substantive review of the article and the project. All authors discussed the results and commented on the manuscript.

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Data availability

The data sets generated during and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Conflicts of Interest Disclosures

The researchers had no conflict of interest in this study.

Ethics approval

This project was approved by the university's ethics committee with ID IR.MUMS.REC.1399.464. Assurance was given regarding the confidentiality of the collected data.

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Conflict of interest

The researchers had no conflict of interest in this study.

The extent of AI use

Not applicable

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