

Original Article



Perceived stress and somatic symptoms with the mediating role of self-compassion in medical students

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Abstract

Background: The association between perceived stress and somatization symptoms is significant. Self-compassion is a valuable coping resource for dealing with negative life situations. We examined the relationship between perceived stress and somatic symptoms with the mediating role of self-compassion in medical students of Guilan University of Medical Sciences.

Methods: This study was a descriptive correlational study, based on structural equation modeling (SEM) on the medical students of Guilan University of Medical Science in the academic year 2022-2023. Demographic questionnaires, Perceived Stress Scale, Somatic Symptom Scale-8, and Self-Compassion Scale were used. Independent t-test, analysis of variance (ANOVA), Tukey's test, Pearson correlation, Mann-Whitney test, and Kruskal-Wallis test were used for analysis by SEM in LISREL and SPSS software.

Results: Participants were 200 students with a mean±SD age of 23.46±2.06 years. The mean scores of perceived stress, somatic symptoms, and self-compassion in the sample were 29.90±8.52, 10.59±4.94, and 3±0.63, respectively. There was a significant positive association between perceived stress and somatic symptoms ($r=0.299$, $P<0.001$) and a negative association between somatic symptoms and self-compassion ($r=-0.490$, $P<0.001$), but no relationship between perceived stress and self-compassion ($r=-0.124$, $P=0.081$). The mediating role of self-compassion was confirmed by none of the modified models.

Conclusion: Although increased perceived stress was related to increased somatic symptoms, and increased somatic symptoms were related to decreased self-compassion, self-compassion did not mediate the relationship between perceived stress and somatic symptoms.

Introduction

Perceived stress is the individual's feelings or thoughts about the amount of stress they experience at a given point in time or during a given time. Perceived stress includes feelings about the uncontrollable and unpredictable things in life, the number of times a person faces distressing problems, and confidence in their ability to cope with problems.¹ Perceived stress is not the types or frequency of a person's stressful events, but rather how a person deals with stressors in their life. Individuals may experience similar negative events, but their impact or intensity depends on factors such as personality, coping resources, and support.²

Stress in healthcare professionals has been one of the important problems.³⁻⁵ According to studies, mental health problems, including depression, stress, and burnout, are more common in medical students compared to their peers.⁶⁻⁹ This difference may be due to the higher

workload, psychological tensions, and shift work in the workplace. One of the common mental health problems among medical students is psychosomatic symptoms, which previous studies have reported as high as 70%.¹⁰ In the Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5), somatic symptom disorder (SSD) is characterized as the presence of one or more physical symptoms along with excessive thoughts, feelings, and/or behavior associated with the symptom that leads to intolerable distress and/or functional impairment.¹¹ Some studies have shown that perceived stress and somatization symptoms are related.¹²⁻¹⁴

Self-compassion might be a valuable coping resource in negative life situations and plays an important role in the coping process. It can help people to cope with negative situations and not avoid challenging tasks for fear of failure.¹⁵ Self-compassion includes three main components, self-kindness/self-judgment, feelings of

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common humanity/isolation, and mindfulness/over-identification.¹⁶ Studies showed that self-compassion and perceived stress had a negative correlation,¹⁷⁻²⁰ and self-compassion was known as a moderator of perceived stress.^{17,18} Also, self-compassion mediates the relationship between resilience and somatization,²¹ and people with a lower level of self-compassion had more physical symptoms.^{22,23} and the importance of the mental health of this group, it is necessary to conduct further investigation.

Considering the high prevalence of somatic symptoms and higher levels of stress among medical students in previous studies and its negative impact on people's mental health, conducting studies in this field seems necessary. On the other hand, the role of self-compassion in increasing the level of resilience and coping process, examining its relationship with stress and somatic symptoms can lead to interesting results. It is important to promote mental health in medical students in our country, and no study has been conducted to investigate the relationship between perceived stress, somatic symptoms, and self-compassion in this group. Therefore, the purpose of the present study was to investigate the relationship between perceived stress and somatic symptoms with the mediating role of self-compassion in medical students of Guilan University of Medical Sciences.

Methods

This study was a descriptive correlational study that was carried out on structural equation modeling (SEM). The medical students of Guilan University of Medical Science in the academic year 2022-2023 were the sample population. For selecting participants, the convenience sampling method was used. Inclusion criteria were medical students who were studying at the Guilan University of Medical Sciences and cooperation to join in the study. The only exclusion criterion was an incomplete questionnaire. Before participating in the study, the purpose of the study was explained to the participants and the informed consent was signed by them.

Sample size

Considering the analysis of SEM and the number of latent variables in the used questionnaires, which was equal to 9, 20 samples were required for each latent variable. The minimum sample size was calculated at 180. According to the recommendation of a minimum sample size of 200 for SEM,²⁴ a sample size of 200 was considered.

Measures

Demographic questionnaire: This questionnaire included age, gender, education level, marital status, grade point average (GPA), and history of medical and mental diseases.

Perceived Stress Scale (PSS): This tool was made by Cohen et al,²⁵ and is a 14-item scale for measuring stressful life situations. It has two subscales, the negative part

(items, including 1, 2, 3, 8, 11, 12, and 14) and the positive part (items, including 4, 5, 6, 7, 9, 10, and 13). This scale is scored from 0 "never" to 4 "very often", and the scoring of the positivity subscale is reversed. So, the total score is from 0-56, and higher scores indicate greater stress.²⁶ In this study, similar to two previous studies,^{27,28} the score of 28 was considered as a cut-off value for stressed and no stressed. In the original research, the coefficient alpha reliability for the scale was 0.84-0.86.²⁵ In the Persian version, all three forms of the PSS (PSS-14, PSS-10, and PSS-4) had a significant correlation with the Depression Anxiety and Stress Scale (DASS-21) which indicated an acceptable convergent validity.²⁹ Also, the coefficient alpha reliability of the Persian version of PSS was 0.76.³⁰

The Somatic Symptom Scale-8 (SSS-8): This scale is a self-report questionnaire for measuring the burden of somatic symptoms, developed by Gierk et al.³¹ The total score for the scale is between 0 and 32 (0 "not at all" - 4 "very much"), and the score categories are no to minimum (scores: 0-3), low (scores: 4-7), moderate (scores: 8-11), high (scores: 12-15), and very high (scores: >16) burden of somatic symptoms. The reliability was good (Cronbach $\alpha = 0.81$).³¹ In the study by Goodarzi et al, the concurrent validity analysis of the Persian version of the SSS-8 scale indicated a significant correlation with other mental health scales, such as General Health Questionnaire (GHQ-28), and internal consistency reliability by Cronbach's alpha was 0.75.³²

Self-compassion scale: It is a 12-item scale, measuring self-compassion. This scale has six subscales, including self-kindness, self-judgment, common humanity, isolation, mindfulness, and over-identification. Scoring is from 1 "rarely" to 5 "almost always". The mean of each of the subscales and the total mean are calculated, which is a number between 1 and 5. In scoring, a score of 1-2.5, 2.5-3.5, and 3.5-5 indicate low, moderate, and high levels of self-compassion, respectively. The test-retest reliability of the questionnaire was 0.92.³³ In the Persian version, the correlation between scores of the self-compassion scale with other questionnaires, such as the external shame scale and perfectionism was significant, indicating appropriate divergent validity. Also, Cronbach's alpha coefficient for the total and three subscales (including self-kindness/self-judgment, common humanity/isolation, and mindfulness/over-identification) was 0.79, 0.68, 0.71, and 0.86, respectively.³⁴

Statistical analysis

Descriptive analysis was used by frequency (percentage) and mean \pm standard deviation (SD). The Kolmogorov-Smirnov test was used for checking normality, and Levene's test for checking the homogeneity of the variances. For inferential analysis, Pearson correlation, independent t-test, analysis of variance (ANOVA), and Tukey's test were used, if the assumptions of parametric tests were not met, Mann-Whitney test and Kruskal-Wallis test

were used. Also, data were analyzed using SEM in LISREL software version 8/80 and SPSS® version 24. A *P* value less than 0.05 was considered statistically significant.

Results

In the present study, 200 medical students with a mean \pm SD age (min-max) of 23.46 ± 2.06 (17-28) years participated. The mean \pm SD GPA of subjects was 17.06 ± 1.11 . The demographic characteristics of the participants are indicated in Table 1.

The mean score of perceived stress in the participants was 29.90 ± 8.52 (min-max: 10-48). The mean scores of negative subscales and positive subscales of PSS were 15.04 ± 4.57 (min-max: 3-23) and 14.86 ± 4.41 (min-max: 7-25), respectively. The mean score of somatic symptoms was 10.59 ± 4.94 (min-max: 1-25). Based on mild, moderate, severe, and very severe levels, 25.0%, 33.5%, 21.0%, and 17.0% had somatic symptoms, respectively. Also, only 3.5% of the subjects had no somatic symptoms. 112 students (56%) experienced levels of stress. The total mean of self-compassion was 3 ± 0.63 . 25%, 43.5%, and 31.5% of participants had mild, moderate, and high self-compassion. The subscales' mean of self-compassion was 3.09 ± 0.77 for self-kindness, 2.98 ± 0.76 for self-judgment, 3.02 ± 0.75 for common humanity, 2.86 ± 0.85 for isolation, 3.14 ± 0.75 for mindfulness, and 2.92 ± 0.85 for over-identification.

The mean score of perceived stress in terms of demographic characteristics is shown in Table 2. In terms of education level, the perceived stress score had a significant difference, and people with a history of psychiatric disorder had a significantly higher score in perceived stress compared to the group without a history of psychiatric disorder. According to the results of the Pearson correlation coefficient, the score of perceived

stress and age had a significant negative correlation ($r = -0.241$, $P = 0.001$), and older participants had less perceived stress compared to younger ones.

Table 3 indicates the mean score of somatic symptoms in terms of demographic characteristics. The basic sciences and physiopathology groups of participants had significantly higher scores of somatic symptoms. Subjects with higher age had less somatic symptoms, but this relationship was not significant ($r = -0.128$, $P = 0.072$).

There was no significant difference between mean self-compassion scores in terms of demographic characteristics (Table 4). The score of self-compassion and age had no significant relationship ($r = 0.024$, $P = 0.735$).

Based on the Pearson correlation coefficient, perceived stress and somatic symptoms had a significant positive relationship ($r = 0.299$, $P < 0.001$). Also, somatic symptoms and self-compassion had a significant negative relationship ($r = -0.490$, $P < 0.001$), but no significant relationship was observed between perceived stress and self-compassion ($r = -0.124$, $P = 0.081$).

According to the model fit indicators (Table 5), the model presented in Figure 1 did not have a proper fit. Despite correlating the errors, none of the models had an acceptable fit.

Discussion

The purpose of this study was to survey the relationship between perceived stress and somatic symptoms with

Table 1. Demographic characteristics of medical students (N=200)

Variable	No. (%)
Gender	
Female	103 (51.5%)
Male	97 (48.5%)
Marital status	
Single	168 (84.0)
Married	32 (16.0)
Education status	
Basic sciences	53 (26.5)
Physiopathology	44 (22.0)
Externship	57 (28.5)
Internship	46 (23.0)
History of medical diseases	
Yes	20 (10.0)
History of psychiatric disorders	
Yes	10 (5.0)

Table 2. The mean score of perceived stress in terms of demographic characteristics

Variable	Perceived stress score (Mean \pm SD)	<i>P</i> value
Gender		
Female	29.04 ± 8.65	0.144 ^a
Male	30.81 ± 8.33	
Marital status		
Single	29.74 ± 8.61	0.542 ^a
Married	30.75 ± 8.14	
Education status		
Basic sciences	33.33 ± 8.25	0.004 ^b
Physiopathology	27.72 ± 7.50	
Externship	29.61 ± 8.16	
Internship	28.39 ± 9.21	
GPA		
< 17	29.63 ± 8.35	0.594 ^a
> 17	30.29 ± 8.81	
History of medical diseases		
Yes	31.50 ± 8.44	0.379 ^a
No	29.72 ± 8.54	
History of psychiatric disorders		
Yes	36.90 ± 4.01	0.004 ^c
No	29.53 ± 8.54	

^a Independent-samples *t* test; ^b Mann-Whitney U test; ^c One-way ANOVA.

Table 3. The mean score of somatic symptoms in terms of demographic characteristics

Variable	Somatic symptoms score (Mean ± SD)	P value
Gender		
Female	10.84 ± 5.01	0.463 ^a
Male	10.32 ± 4.87	
Marital status		
Single	10.34 ± 4.93	0.102 ^a
Married	11.90 ± 4.88	
Education status		
Basic sciences	10.88 ± 6.05	0.007 ^b
Physiopathology	12.84 ± 4.95	
Externship	9.10 ± 3.65	
Internship	9.95 ± 4.17	
GPA		
<17	10.37 ± 4.63	0.466 ^a
>17	10.91 ± 5.37	
History of medical diseases		
Yes	10.10 ± 5.19	0.638 ^a
No	10.65 ± 4.92	
History of psychiatric disorders		
Yes	9.70 ± 4.34	0.558 ^a
No	10.64 ± 4.97	

^a Independent-samples t-test; ^b Kruskal-Wallis test.

Table 4. The mean score of self-compassion in terms of demographic characteristics

Variable	Self-compassion score Mean ± SD	P-value
Gender		
Female	3.03 ± 0.64	0.478 ^a
Male	2.97 ± 0.62	
Marital status		
Single	2.97 ± 0.63	0.189 ^a
Married	3.14 ± 0.61	
Education status		
Basic sciences	3.01 ± 0.77	0.931 ^b
Physiopathology	3.02 ± 0.56	
Externship	3.02 ± 0.61	
Internship	2.95 ± 0.54	
GPA		
<17	2.95 ± 0.60	0.207 ^a
>17	3.07 ± 0.67	
History of medical diseases		
Yes	3.04 ± 0.62	0.788 ^a
No	3.00 ± 0.63	
History of psychiatric disorders		
Yes	2.90 ± 0.67	0.621 ^a
No	3.01 ± 0.63	

^a Independent-samples t-test; ^b Kruskal-Wallis test

the mediating role of self-compassion in medical students of Guilan University of Medical Sciences. In the present study, perceived stress in medical students was significantly different based on their educational status. The perceived stress level of the participants was higher at the basic science level. As expected, people with a history of psychiatric disorder compared to the group without a history of psychiatric disorder had a significantly higher score in perceived stress. Also, the score of perceived stress and age had a significant negative relationship, and younger students had higher perceived stress.

In the study by Borjalilu et al,²⁷ used PSS-14 for assessing perceived stress, 83% of medical students had levels of perceived stress (vs. 56% in this study), and the mean score of perceived stress was 32.02, which was slightly higher than our results. Wang et al³⁵ found that 82% of medical students reported moderate to high stress. In a Saudi Arabia study in 2016, severe stress was reported around 34%.³⁶ In a study in the United States, medical students had higher perceived stress, negative coping, and resilience than the general population.³⁷ As expected, medical students experienced more stress during the COVID-19 pandemic. However, the level of stress in our sample was less compared to similar studies, which may be due to different questionnaires and criteria to measure the level of perceived stress. Similar to our study, in the study by Wang et al³⁵ and Saeed et al,³⁶ junior students

experienced more perceived stress than senior ones, but the results of Borjalilu et al²⁷ were the opposite. Less qualified students might experience higher levels of stress due to lower levels of overall adjustment and maturity.⁵ Age may influence the experience of stress through the development of coping strategies, and older students use adaptive strategies, such as better planning ability.³⁸ We also found no difference between men and women in stress. But in other studies,^{27,35,36} women experienced more stress. In two previous studies,^{27,35} the number of women was almost double that of men, whereas the number of women and men in our study was almost the same.

According to the present study, most of the participants had moderate somatic symptoms. Basic science and physiopathology groups had significantly higher somatic symptoms. So, the level of somatic symptoms was higher in junior students like perceived stress. In a study in Saudi Arabia,³⁹ the rate of severe and very severe somatic symptoms in medical students was similar to ours (39% vs. 38%). However, the overall prevalence of somatic symptoms was much higher in our study. In a study in Mexico in 2020, the prevalence of somatization in medical students was 66.59%.⁴⁰ In a recent review article, the prevalence of somatic symptoms in medical students was reported 5.7 to 80.1% (the mean of all percentages was 26.3%), and females had a higher frequency of mental health-related somatic symptoms.⁴¹ Also, in a study in

Table 5. Values of the model fit indicators

Fit indicators	χ^2	χ^2/df	P	RMSEA	GFI	AGFI	CFI	NFI
Values	375.23	3.67	<0.001	0.12	0.81	0.75	0.90	0.87

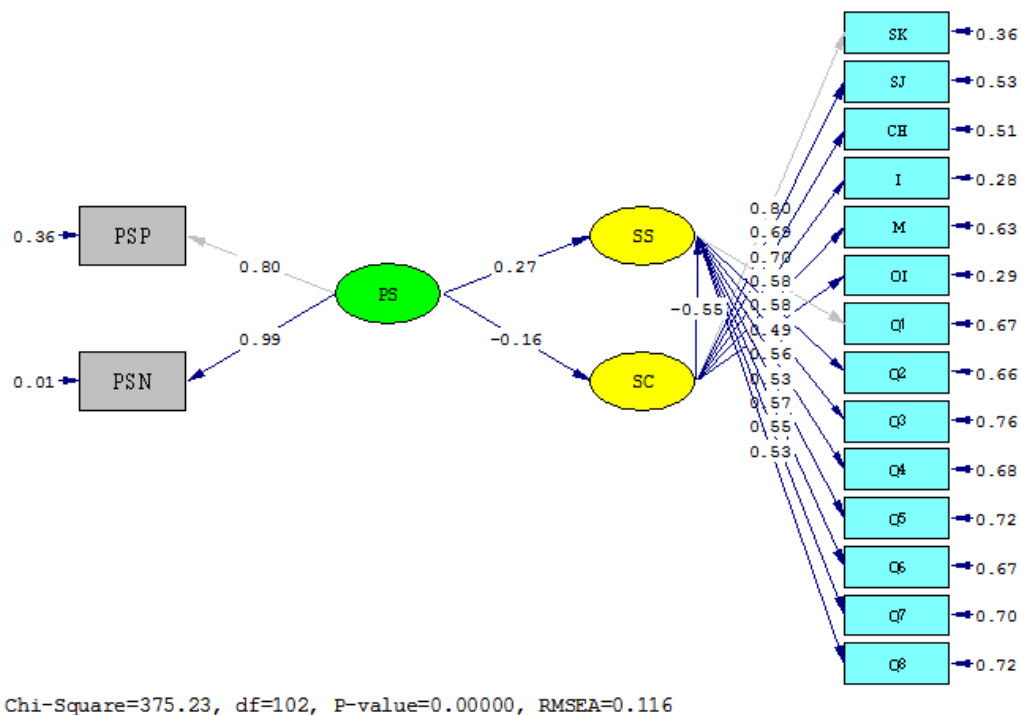


Figure 1. Structural equation model of the relationship between perceived stress and somatic symptoms with the mediating role of self-compassion
 PS: perceived stress, PSP: perceived stress positive domain, PSN: perceived stress negative domain, SS: somatization syndrome, SC: self-compassion, SK: self-kindness, SJ: self-judgment, CH: common humanity, I: isolation, M: mindfulness, OI: over-identification.

Kazakhstan in 2018, the prevalence of somatic distress in medical students was 36.1%, and females had significantly more somatic distress than males.⁴² In public, the prevalence of somatic symptoms (in the level of moderate to severe) was less reported (15%).⁴³ High prevalence of mental health problems in medical students^{9,44,45} might be due to stresses of daily life and extra stress caused by academic pressure, such as long periods of study, sleep deprivation, unhealthy work environments, and dealing with illnesses. In addition, according to evidence, the COVID-19 pandemic increased stress levels,⁴⁶ thereby increasing the rate of mental health problems.

Among the students, 43.5% of them had moderate self-compassion, and 31.5% had high self-compassion. Similar to our study, Zhao et al⁴⁷ found no significant difference in self-compassion scores in terms of demographic characteristics. However in the study by Godthelp et al,⁴⁸ males and older participants had higher levels of self-compassion. In a study in Brazil during the COVID-19 pandemic on medical students, the self-compassion of 29% of students was in the medium percentile and 32% in the medium-high and high percentile, and self-compassion had no significant differences in both genders similar to our study.⁴⁹ Self-compassion may be an effective strategy to cope with stressors.^{37,50} In some

studies,^{47,51} increasing self-compassion had a relationship with decreasing stress. However, the negative relationship between perceived stress and self-compassion was not significant in the present study.

Similar to our study, in other studies,¹²⁻¹⁴ perceived stress and somatic symptoms had a significant positive relationship. While a low level of stress can be a motivator, a high level of stress plays an important role in decreasing well-being.⁵² Thus, it can lead to health problems. Moreover, somatic symptoms and self-compassion had a negative relationship. Similar to our study, Sheikholeslami and Mohammadi found that teaching self-compassion to female heads of the household can reduce somatic symptoms in them.⁵³ In another study, in people suffering from somatoform disorder, less self-compassion was associated with more somatic symptoms. So, self-compassion was suggested as a target in the treatment of individuals with somatoform disorders.²² While self-compassion as a coping strategy can help people to deal with negative situations and stressors, we could not find any significant relationship between perceived stress and self-compassion in participants.

In our study, the presented model was not acceptable for examining the relationship between perceived stress and somatic symptoms with the mediating role of self-

compassion. Several correction measures were performed, but none of the modified models had an acceptable fit. Feizollahi et al demonstrated a marginal role of self-compassion as a mediator in the relationship between perceived social support and psychosomatic symptoms.²³ More research is needed to examine the relationship of perceived stress and somatic symptoms with the mediating role of self-compassion in medical students. Therefore, it is suggested to conduct more studies to investigate the exact relationship between them and their role in increasing the level of mental health of students, especially medical students.

Conclusion

Based on the study, students at the basic science level, with a history of psychiatric disorder, and at a younger age experienced higher levels of perceived stress. Also, somatic symptom scores were significantly higher in the basic sciences and physiopathology groups. However, self-compassion scores were not significantly different in terms of demographic characteristics. There was a significant positive association between perceived stress and somatic symptoms and a significant negative relationship between somatic symptoms and self-compassion. However, this relationship was not significant between perceived stress and self-compassion. The role of self-compassion as a mediator in the relationship between perceived stress and somatic symptoms was not confirmed.

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Authors' Contribution

Conceptualization: All authors.

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Competing Interests

The authors declare no conflict of interest.

Ethical Approval

The Ethical Committee of Guilan University of Medical Sciences approved this research (code: IR.GUMS.REC. 1401.187).

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