Serial Multiple Mediation Model of Depression, Anxiety and Sleep Quality Between Perceived Stress and Life Satisfaction

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Abstract- Life satisfaction can both affect and be affected by occupational factors in military personnel. Perceived stress is considered an important predictor of life satisfaction. The objective of this study is to evaluate the direct and indirect effects of perceived stress on life satisfaction and the mediating role of depression, anxiety, and sleep quality among Iranian military personnel. In this cross-sectional study, a total of 301 military personnel were investigated by using standard self-report questionnaires, consisting of the Revised Symptom Checklist-90 (SCL-90-R), Pittsburgh Sleep Quality Index (PSQI), Perceived Stress Scale (PSS), and Satisfaction with Life Scale (SWLS) in our study. Data analysis was conducted using descriptive statistics, the Pearson correlation coefficient, ordinary least square regression, and the bootstrap method. The direct effect of perceived stress on life satisfaction was significant. Perceived stress also affects life satisfaction indirectly through single mediation of sleep quality; serial multiple mediations of anxiety as the first and sleep quality as the second mediator; and the serial multiple mediations of depression, anxiety, and sleep quality, as the first to the third mediator, respectively. Lower levels of perceived stress, depression, and anxiety, along with better sleep quality, are correlated to higher levels of life satisfaction in military personnel. There are several points of prevention and intervention in order to increase the life satisfaction of military personnel, which can improve their quality of life and occupational efficiency.

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Keywords: Anxiety; Depression; Life satisfaction; Military; Perceived stress; Sleep quality

Introduction

Life satisfaction refers to a subjective assessment of one's quality of life that is an important component of well-being (1). Lower baseline life satisfaction predicts work disability (2), suicide (3), and all-cause mortality (4). Several factors can influence life satisfaction through a variety of pathways. Perceived stress is a subjective evaluation of an individual of how much stress they are under. The relationship between perceived stress and life satisfaction has been studied in previous studies (5-7). Numerous studies have shown that stress is negatively related to satisfaction with life (5-8). Other factors with potential impact on life satisfaction include demographic characteristics like gender (7) and marital status (9), occupational factors (10), physical health (9), and mental health problems like depression (11), anxiety (11,12), sleep disorders (13,14) and post-traumatic stress disorder (13). Stress may affect life satisfaction through direct influence; or indirectly, through its impact on mediating factors; however, the underlying mechanism behind these relationships remains unclear.

Stress is considered as an underlying factor for many psychological problems. The positive correlation

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between perceived stress and depression was seen in previous studies (15,16). In the study of Liu et al, perceived stress was positively correlated to depression through partial mediation of sleep quality among the elderly in urban communities (16). Also in another study, work-related stress and perceived stress were positively associated with depression (17). Similarly, anxiety has a positive correlation with stress (18,19). Stress can also influence components of sleep quality. According to Aanes *et al*., interpersonal stress was significantly associated with nocturnal sleep problems and daytime sleepiness (20). Also in another study among military personnel, acute stress was positively related to sleep disorders (21). Moreover, sleep quality can also be affected by depression and anxiety. In the study of Ypsilanti et al, higher scores of anxiety and depression were observed among people with insomnia than normal sleepers (22). Depressive mood was also observed to be associated with sleep disorders among the German normal population (23).

Military personnel are at higher risk of mental health problems in contrast to the normal population (24). Moreover, Ikin *et al*., in a large study of Australian veterans, reported a lower life satisfaction compared with similarly aged Australian men (25). Life satisfaction among military personnel can be affected by several job-related factors like job stress, job satisfaction, and physical and mental problems due to occupational factors (9,13).

The aim of this study is to evaluate the relationship between certain psychological factors and satisfaction with life; and how they influence each other in military personnel based on our hypothesized model. Stress as an underlying factor behind depression, anxiety, and sleep quality can mediate its impact through these factors on life satisfaction; however, the exact mechanism is unclear, which is the objective of this study.

Materials and Methods

Participants and study design

This cross-sectional study was conducted on 301 military personnel with various ranks and job classes. The study subjects were randomly selected from four military facilities from January to May 2020 in Iran. Those with a history of current or previous neoplastic disease, history of hospitalization for psychological problems, and the ones who were unwilling to give informed consent were excluded. The study was approved by the ethical committee of Baqiyatallah University of Medical Sciences. Researchers explained the purpose of the study and the anonymity and confidentiality of the data for the study participants. After informed consent obtainment, the subjects were asked to complete a unified self-report questionnaire.

Measurements

Questionnaire

A unified self-report questionnaire was used in our study. The first part of our questionnaire consisted of personal information, including age, gender, marital status, number of children, education level, smoking, and presence of underlying disease.

Symptom checklist-90-revision (SCL-90-R)

The SCL-90-R is a self-report psychometric instrument that is widely used to assess general symptomatology and psychological distress experienced in the past seven days (26). It consists of 90 items rated on a 5-point Likert scale (0=never; 4=very frequently). The items were assigned to 9 domains of psychological symptoms, including somatization (12 items), obsessive-compulsive (10 items), interpersonal sensitivity (9 items), depression (13 items), anxiety (10 items), hostility (6 items), phobic anxiety (7 items), paranoid ideation (6 items) and psychoticism (10 items). The mean score in each domain was calculated along with the three global parameters: 1- Global Severity Index (GSI), the mean score of all 90 items; 2- Positive Symptom Total (PST), number of items with score other than 0; and 3- Positive Symptom Distress Index (PSDI), calculated as GSI divided by PST. Higher scores represent higher levels of distress. The Cronbach reliability coefficient was 0.97 (26). The Persian Version of the SCL-90-R was previously validated (27).

Pittsburgh sleep quality index (PSQI)

The PSQI is a self-report survey for the assessment of sleep quality and patterns experienced in the past month. The questionnaire consists of 18 items on a four-point Likert scale (0 to 3), whereby a higher score reflects the negative extreme. The PSQI contains seven domains of sleep difficulties: subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. A total score of overall sleep quality is ranged from 0 to 21, which is calculated by the sum of the scores of the seven domains. Poor sleep quality is defined as total scores≥5. The survey was validated previously and the Cronbach coefficient of reliability was 0.79 in the Persian version of PSQI used in Iranian population (28).

Perceived stress scale (PSS)

The PSS is a commonly used psychological instrument for assessing the perception of stress in the past month (29). The PSS consists of 14 items on a five-point Likert scale (0=Never to 5=Very often). The scores ranging from 0 to 56, was calculated by reversing the scores of seven positive items and the summing of all scores, of which higher scores indicate more degrees of perceived stress. Scores are categorized as low, moderate and high stress levels with the scores from 1 to 21; 22 to 42; and score of 43 and above respectively. The Cronbach coefficient of reliability for the PSS was 0.86 Alpha (29).

Satisfaction with life scale (SWLS)

The SWLS is an instrument designed to assess the overall satisfaction of an individual with one's life. It consists of five items on a seven–point Likert scale (with 1= strongly disagree to 7= Strongly Agree). The score is obtained by summing of all items, producing scores from 5 to 35, of which higher scores represents more satisfaction with life. The reliability of the SWLS was tested through measuring Cronbach's alpha, which was 0.83 in a study on Iranian population (30). The SWLS was validated through convergent validity with the application of Oxford Happiness Inventory (OHI) and the Beck's Depression Inventory (BDI) (30).

Data analysis

In the assessment of the general characteristics of the respondents, continuous variables were reported as mean±SD and categorical variables were described as frequency and percentages. The mean value and standard deviations of the SCL-90-R, PSQI, PSS and SWLS were calculated. The relationships between study variables were evaluated utilizing the Pearson correlation coefficient. Statistical significance of the tested model was studied using Hayes' approach based on ordinary least-squares regression, and the bootstrap method (31,32). To reduce type one errors due to distribution, non-standardized Beta coefficients were calculated. In the Hayes' approach, the indirect mediating effects of variables upon the bootstrap method is considered significant, when the point estimate of the mediating variable is zero within a 95% bias corrected and accelerated (BCa) confidence interval. As such, significance is reached when a variable has a no-point estimate within the zero-interval. After obtainment of the specific indirect effects of the variables through a contrast test, the variable with a more powerful mediation for the model was selected upon a comparison of mediating variable pairs. The Serial-Multiple Mediation was conducted through PROCESS Macro (Model 6) with bootstrap approach (31,32). All data analysis of the current study was performed using IBM SPSS 21.0. The significance level was considered as $P<0.05$.

Results

Demographic information of subjects

In the current study, a total of 301 subjects were enrolled. Of all, 224 (74.7%) were male, with a mean age of 29.8±9.7 years. Participants were mostly single (188; 62.5%), and among married participants, the majority had two children (43; 39.1%). Also, 214 (71.6%) had academic educational degrees. History of underlying disease was present in 28 participants (9.3%), which includes hypertension, asthma, diabetes mellitus, heart failure, ischemic heart disease, stroke, and multiple sclerosis in 21 (7.0%), seven (2.3%), four (1.3%), two (0.7%), one (0.3%), one (0.3%) and one (0.3%) respectively. History of military combat, military deployment, and physical injury due to military operation was positive in 12 (4.0%), three (1.0%), and seven (2.3%) subjects. The demographic information of subjects was demonstrated in Table 1.

Table 1. Baseline characteristics of the respondents

Age (years)		29.8±9.7
Male		224 (74.7%)*
Marital status	**Single**	188 (62.5%)*
	Married	110 (36.5%)*
	Divorced	3 (1.0%)*
Child number	**No Child**	226 (75.1%)*
	One	22 (7.3%)*
	Two	44 (14.6%)*
	Three	9 (3.0%)*
Education	**Not graduated from high school**	18 (6.0%)*
	High School	67 (22.4%)*
	Associate's degree	27 (9.0%)*
	Bachelor's degree	127 (42.5%)*
	Master's degree	46 (15.4%)*
	Doctoral or higher degree	14 (4.7%)*
Smoking	**Never**	263 (87.4%)*
	Former	29 (9.6%)*
	Current	9 (3.0%)*
	Underlying Disease	28 (9.3%)*

*number (percentage)

SCL-90-R, PSQI, PSS, and SWLS scores

The global severity index (GSI) score of the SCL-90-R was 0.69±0.66 among the population study. Highest score was conceived in Paranoid ideation (0.97±0.81), Obsessive-compulsive (0.83±0.79), Depression

(0.71±0.78) and Somatization (0.71±0.76), respectively. The mean total score obtained from PSQI was 5.90±3.49, and 131 (44.0%) had poor sleep quality. Among domains of sleep disturbances, the highest score was achieved in Sleep duration. The mean PSS score was 24.17±7.66, and 35.2%, 63.8%, and 1.0% were considered as low, moderate, and high-stress levels, respectively. The mean SWLS was 20.66±6.93, from which 8.2% were extremely dissatisfied with life, 11.7% were dissatisfied, 18.6% were slightly dissatisfied, and 28.9%, 23.7%, and 8.9% were neutral, satisfied, and extremely satisfied with their life, respectively. The obtained scores from SCL-90-R, PSQI, PSS, and SWLS are depicted in Table 2.

Table 2. SCL-90-R, PSQI, PSS and SWLS scores

SCL-90-R Domains Score	Mean±SD
Somatization	0.71±0.76
Obsessive–compulsive	0.83±0.79
Interpersonal sensitivity	0.70±0.75
Depression	0.71±0.78
Anxiety	0.63±0.74
Hostility	0.64±0.65
Phobic anxiety	0.45±0.56
Paranoid ideation	0.97±0.81
Psychoticism	0.50±0.62
GSI	0.69±0.66
PST	35.2±24.5
PSDI	1.53±0.58
PSQI Total Score	5.90±3.49
PSS Score	24.17±7.66
SWLS Score	20.66±6.93

Global Severity Index; PSDI, Positive Symptom Distress Index; PSQI, Pittsburgh Sleep Quality Index; PST, Positive Symptom Total; PSS, Perceived Stress Scale; SD, Standard deviation; SWLS, Satisfaction with Life Scale

Indirect effects of perceived stress on life satisfaction

Pearson correlation coefficient values of the study variables are demonstrated in table 3. The obtained data from Pearson correlation analysis indicated that there is a positive significant relationship between perceived stress, depression, anxiety and poor sleep quality. However, negative significant relationship was found between life satisfaction with perceived stress (P<0.001), anxiety (P<0.001), depression (P<0.001) and poor sleep quality (P<0.001) (Table 3).

The obtained findings of multiple mediation analysis are depicted in Figure 1. The direct effect of perceived stress on depression was significant (c=0.055, SE=0.005, t=10.59, P<0.001) while adjusted for age and gender as covariates (Model A). The direct effects of perceived stress (c=0.011, SE=0.003, t=3.38, P<0.001) and depression (c=0.787, SE=0.031, t=25.58, P<0.001) on anxiety also reached the significance level (Model B). In addition, the direct effect of perceived stress on sleep quality (c=0.139, SE=0.029, t=4.80, P<0.001) was at significance level. On the other hand, while the direct effect of anxiety as the first mediating variable and sleep quality as the second mediating variable (c=1.180, SE=0.533, t=2.22, P=0.028) was significant, the effect of depression of sleep quality (c=0.010, SE=0.501, t=0.020, P=0.984) did not reach the significance level (Model C). Among mediating variables, only sleep quality was directly affected life satisfaction (c= -0.299, SE=0.112, t= -2.67, P=0.008), while depression (c= -0.164, SE=0.940, t= -0.175, P=0.761) and anxiety (c=0.458, SE=1.007, t=0.455, P=0.649) had no significant direct effect on life satisfaction (Model D). Perceived stress has significant direct effect on life satisfaction both when entered into the equation along with all variables (c= -0.433, SE=0.057, t= -7.67, P<0.001; Model D) and when only adjusted with age and gender (c= -0.478, SE=0.045, t= -10.54, P<0.001; Model E). All models used to determine the direct effects of variables on each other (models A to E) were adjusted for age and gender and all were seen to be at significance level (P<0.001) with R^2 equal to 0.30, 0.79, 0.25, 0.32 and 0.31 respectively.

Table 4 represents the specific indirect effect of perceived stress of life satisfaction through the mediation of anxiety, depression, and sleep quality and the paired comparison of models. The bootstrapping 95% BCa confidence intervals were calculated based on data obtained from 5000 bootstrap samples (Table 4). The total indirect effect of perceived stress through anxiety, depression, and sleep quality on life satisfaction did not reach the significance level (point estimate= -0.0450; 95% BCa CI [-0.1187, 0.0286]). Among models with one mediating variable, the one with single mediation of sleep quality (model 3) was statistically significant (point estimate= -0.0415; 95% BCa CI [-0.0808, -0.0094]), while models with single mediation of anxiety and depression were not at a significance level, as they were at a zero-point estimate interval within the 95% BCa confidence interval. As shown in Table 4, four models with serial multiple mediations were presented, of which the serial multiple mediations of anxiety and sleep quality (model 6; point estimate= -0.0038; 95% BCa CI [-0.0108, -0.0001]); and depression, anxiety and sleep quality (model 7; point estimate= -0.0153; 95% BCa CI [-0.0383, -0.0007]) were statistically significant, while the other two models were not.

All models of specific indirect effects were compared in pairs in order to determine whether the difference between them is significant and find the stronger model (Table 4). The findings represent that the difference

between model 3 (PSS→PSQI→SWLS) and model 6 (PSS→ANX→PSQI→SWLS) and also the difference between model 3 and model 7 (PSS→DEP→ANX→PSQI→SWLS) was significant, and model 3 is stronger than both models 6 and 7 in relation to mediating power. In the comparison between model 6 and 7, the difference was found to be significant with the stronger mediating power of model 7 in contrast to model 6.

Table 3. Pearson Correlation Coefficient Values Regarding Study Variables

	PSS	Depression	Anxiety	PSQI	SWLS
PSS	---				
Depression	0.52**	---			
Anxiety	0.54**	0.89**	---		
PSQI	0.45**	0.38**	0.42**	---	
SWLS	-0.53**	-0.27**	-0.28**	-0.35**	---

** Correlation is significant at the 0.01 level (2-tailed). PSQI, Pittsburgh Sleep Quality Index; PSS, Perceived Stress Scale; SWLS, Satisfaction with Life Scale

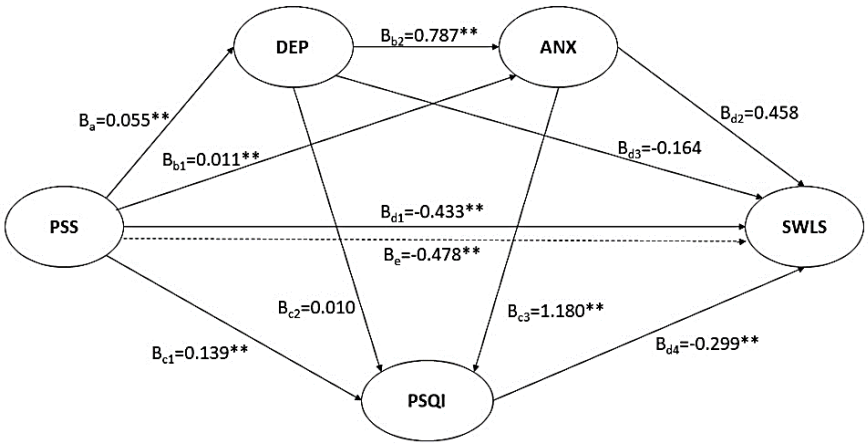

Figure 1. Serial-multiple mediation of depression, anxiety, and sleep quality in the relationship between perceived stress and life satisfaction with non-standardized beta values. ***P*<0.001; ANX, Anxiety; DEP, Depression; PSQI, Pittsburgh Sleep Quality Index; PSS, Perceived Stress Scale; SWLS, Satisfaction with Life Scale

Table 4. Specific Indirect effects of Perceived Stress on Life Satisfaction through Anxiety, Depression and Sleep quality and the comparison between models

	Product of Coefficients		Bootstrapping 95% BCa Confidence Interval	
Effects	**Point Estimate**	**SE**	**Lower**	**Upper**
Total indirect effects	-0.0450	0.0369	-0.1187	0.0286
Model 1: PSS → DEP → SWLS	-0.0090	0.0601	-0.1193	0.1228
Model 2: PSS → ANX → SWLS	0.0049	0.0127	-0.0196	0.0315
Model 3: PSS → PSQI → SWLS	-0.0415	0.0185	-0.0808	-0.0094
Model 4: PSS → DEP → ANX → SWLS	0.0198	0.0480	-0.0811	0.1085
Model 5: PSS → DEP → PSQI → SWLS	-0.0002	0.0088	-0.0172	0.0183
Model 6: PSS → ANX → PSQI → SWLS	-0.0038	0.0028	-0.0108	-0.0001
Model 7: PSS → DEP → ANX → PSQI → SWLS	-0.0153	0.0098	-0.0383	-0.0007

Cont table 4.				
Comparisons				
Model 1 vs. Model 2	-0.0140	0.0707	-0.1447	0.1369
Model 1 vs. Model 3	0.0325	0.0637	-0.0834	0.1742
Model 1 vs. Model 4	-0.0289	0.1038	-0.2174	0.1881
Model 1 vs. Model 5	-0.0089	0.0596	-0.1178	0.1190
Model 1 vs. Model 6	-0.0053	0.0604	-0.1154	0.1263
Model 1 vs. Model 7	0.0062	0.0626	-0.1069	0.1428
Model 2 vs. Model 3	0.0464	0.0230	0.0053	0.0965
Model 2 vs. Model 4	-0.0149	0.0362	-0.0811	0.0622
Model 2 vs. Model 5	0.0051	0.0163	-0.0286	0.0369
Model 2 vs. Model 6	0.0087	0.0131	-0.0153	0.0373
Model 2 vs. Model 7	0.0202	0.0155	-0.0074	0.0546
Model 3 vs. Model 4	-0.0614	0.0521	-0.1611	0.0443
Model 3 vs. Model 5	-0.0413	0.0214	-0.0898	-0.0077
Model 3 vs. Model 6	-0.0377	0.0173	-0.0752	-0.0081
Model 3 vs. Model 7	-0.0263	0.0164	-0.0631	-0.0009
Model 4 vs. Model 5	0.0200	0.0500	-0.0869	0.1123
Model 4 vs. Model 6	0.0236	0.0480	-0.0773	0.1139
Model 4 vs. Model 7	0.0351	0.0483	-0.0658	0.1265
Model 5 vs. Model 6	0.0036	0.0107	-0.0156	0.0279
Model 5 vs. Model 7	0.0036	0.0166	-0.0114	0.0549
Model 6 vs. Model 7	0.0115	0.0075	0.0005	0.0290

ANX, Anxiety; BCa, bias corrected and accelerated; DEP, Depression; PSQI, Pittsburgh Sleep Quality Index; PSS, Perceived Stress Scale; SE, Standard Error; SWLS, Satisfaction with Life Scale

Discussion

In this study, we analyzed the serial multiple mediations of depression, anxiety, and sleep quality in the relationship between perceived stress and satisfaction with life among military personnel in Iran. After analyzing different pathways, our results demonstrated that single mediation of sleep quality; serial multiple mediations of anxiety as the first and sleep quality as the second mediator; and serial multiple mediations of depression, anxiety, and sleep quality, as the first to the third mediating factors respectively, were statistically significant in the relationship between perceived stress and life satisfaction. Also, perceived stress can directly affect life satisfaction. Based on the contrasting pairs of specific indirect effects, single mediation of sleep quality was found to be stronger than the two other models. Also, serial multiple mediations of depression, anxiety, and sleep quality were stronger than serial multiple mediations of anxiety and sleep quality.

In our study, the majority of the participants (63.8%) had moderate levels of perceived stress, along with 1% of high levels of perceived stress. Occupational factors can be an important source of stress in military personnel due to the harsh environment and job characteristics. In the study of Pflanz *et al.*, on the US military personnel, 26% of the participants felt that they were suffering from significant work stress, while 15% reported that work stress-induced significant emotional distress (33). Schilling *et al.*, yielded that military personnel is significantly more likely to report experiencing work stress than the general population (34).

High levels of chronic stress can subject an individual to developing certain mental health problems (35). In our study, perceived stress had a positive correlation with depression, anxiety, and low sleep quality. Perceived stress also directly affects depression, anxiety, and sleep quality. The association between perceived stress and depression/anxiety was observed in previous studies (17-19). Work-related stress also seems to be correlated to depression, which is partially mediated by perceived stress and self-esteem (17). In the study of Liu and colleagues, the mediating role of sleep quality was observed in the relationship between perceived stress and depression (16). The results of our study stated the indirect effect of perceived stress on sleep quality through the mediation of anxiety; however, the mediating role of depression was not significant. In the study of Van Laethem *et al.*, although day-level stress was not directly correlated to sleep quality, it affected sleep quality through the mediation of preservative cognition (36). The direct effect of stress on sleep quality was also presented in previously performed studies (20,21). Although a positive correlation was observed between depression and low sleep quality in our study, the direct effect of depression on sleep quality was not statistically significant. On the contrary, results of other studies suggested the concomitant effect of depression along with

anxiety on sleep quality (22,37). Moreover, Yang *et al*., showed that longer total sleep duration results in lower depression (38). In our study, the direct effect of anxiety on depression was significant. Correspondingly, the study of Calderon showed that depression is a significant predictor of anxiety, along with the partial mediation of sleep problems (39).On the contrary, other studies suggested the opposite association with the effect of anxiety on depression (40,41).

Life satisfaction among military personnel can be different from the normal population due to occupational factors. The results of a previous study demonstrated that life satisfaction among veterans is poor relative to the general population (25). Life satisfaction not only can be affected by mental health problems, but it can also predict mental health in military personnel (42). Perceived stress, physical health and marital status were previously mentioned as predictors of life satisfaction among military personnel (5,9).

The direct effect of perceived stress, as a key variable of our study, on life satisfaction, along with its indirect effect through mediation of depression, anxiety and sleep quality was found to be significant based on our results. In the previous study among Iranian nurses, severe depression and higher levels of anxiety and stress were related to lower scores of SWLS, while gender and marital status had no influence on life satisfaction (11). Results of another study demonstrated the negative correlation of perceived stress and life satisfaction. No effect of age was observed on perceived stress and satisfaction with life scores, while the gender difference was significant in terms of both scores (7). In our study, all models were adjusted for age and gender as potential confounding factors. In the study of Samaranayake and colleagues, anxiety and depression were associated to sleep difficulties and lower life satisfaction (43). In our study, negative correlation between depression/anxiety and life satisfaction was present, although they had no direct effect on life satisfaction. Anxiety affects life satisfaction only through mediation of sleep quality; and depression influences life satisfaction with its impact on anxiety. Zahng *et al*., reported the parallel mediation of sleep quality and depression in the relationship between stress and quality of life (44). On the contrary, another study proclaimed that stress affects depression through mediation of sleep quality (16). Respectively, Zhi *et al.*, reported the direct effect of sleep quality on depression, while depression acts as a mediating factor between sleep quality and life satisfaction (14). Also according to Yang *et al.*, longer sleep duration resulted in lower depression and higher satisfaction with life (38). On the other hand, higher satisfaction with life can result in lower sleep complaints, which is mediated by low emotional and physical exhaustion (45).

This study encountered several limitations. First, our models were based on a cross-sectional study rather than a longitudinal study, so the causal effect cannot be concluded. Second, our data were collected utilizing self-report surveys that limit our objective evaluation ability. Also, the questionnaire was not designed specifically for this study and was a part of a project. Third, with all efforts taken into account that the participants represent the whole population of the Iranian military population, this objective may not be fully achieved due to the existing limitations in sampling methods. In future studies, other potential factors like occupational factors, resilience, and social support should be examined to produce more accurate models.

The findings of the current study contributed to the understanding of the influential mechanism of perceived stress on life satisfaction and the important roles of sleep quality, anxiety, and depression that play in between. There are several points of prevention and intervention in order to increase life satisfaction in military personnel, which can improve their quality of life and occupational efficiency.

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References

1. Jovanović V, Gavrilov-Jerković V. The structure of adolescent affective well-being: The case of the PANAS among Serbian adolescents. J Happiness Stud 2016;17:2097-117.
2. Koivumaa-Honkanen H, Koskenvuo M, Honkanen RJ, Viinamäki H, Heikkilä K, Kaprio J. Life dissatisfaction and subsequent work disability in an 11-year follow-up. Psychol Med 2004;34:221-8.
3. Koivumaa-Honkanen H, Honkanen R, Antikainen R, Hintikka J, Laukkanen E, Honkalampi K, et al. Self-reported life satisfaction and recovery from depression in a 1-year prospective study. Acta Psychiatr Scand 2001;103:38-44.
4. Koivumaa-Honkanen H, Honkanen R, Viinamäki H, Heikkilä K, Kaprio J, Koskenvuo M. Self-reported life

satisfaction and 20-year mortality in healthy Finnish adults. Am J Epidemiol 2000;152:983-91.
5. Lee J, Kim E, Wachholtz A. The effect of perceived stress on life satisfaction : The mediating effect of self-efficacy. Chongsonyonhak Yongu 2016;23:29-47.
6. Shi M, Wang X, Bian Y, Wang L. The mediating role of resilience in the relationship between stress and life satisfaction among Chinese medical students: a cross-sectional study. BMC Med Educ 2015;15:16.
7. Siddiqi FA, Azim ME, Babur MN, Osama M, Waheed A, Memon AR. Psychological Stress and Satisfaction with Life among Physical Therapy Students of Rawalpindi / Islamabad, Pakistan. J Pak Med Assoc 2019;69:973-5.
8. Darling CA, Senatore N, Strachan J. Fathers of children with disabilities: stress and life satisfaction. Stress Health 2012;28:269-78.
9. Mroczek DK, Spiro A, 3rd. Change in life satisfaction during adulthood: findings from the veterans affairs normative aging study. J Pers Soc Psychol 2005;88:189-202.
10. Lambert EG, Jiang S, Liu J, Zhang J, Choi E. A Happy Life: Exploring How Job Stress, Job Involvement, and Job Satisfaction Are Related to the Life Satisfaction of Chinese Prison Staff. Psychiatr Psychol Law 2018;25:619-36.
11. Yazdanshenas Ghazwin M, Kavian M, Ahmadloo M, Jarchi A, Golchin Javadi S, Latifi S, Tavakoli SA, Ghajarzadeh M. The Association between Life Satisfaction and the Extent of Depression, Anxiety and Stress among Iranian Nurses: A Multicenter Survey. Iran J Psychiatry 2016;11:120-7.
12. Yu M, Qiu T, Liu C, Cui Q, Wu H. The mediating role of perceived social support between anxiety symptoms and life satisfaction in pregnant women: a cross-sectional study. Health Qual Life Outcomes 2020;18:223.
13. Seidl JN, Pastorek NJ, Lillie R, Rosenblatt A, Troyanskaya M, Miller BI, et al. Factors related to satisfaction with life in veterans with mild traumatic brain injury. Rehabil Psychol 2015;60:335-43.
14. Zhi TF, Sun XM, Li SJ, Wang QS, Cai J, Li LZ, et al. Associations of sleep duration and sleep quality with life satisfaction in elderly Chinese: The mediating role of depression. Arch Gerontol Geriatr 2016;65:211-7.
15. Wang L, Xu B, Gu Y, Zhu J, Liang Y. The mediating and moderating effects of resilience on the relationship between perceived stress and depression in heroin addicts. J Community Psychol 2019;47:495-503.
16. Liu Y, Li T, Guo L, Zhang R, Feng X, Liu K. The mediating role of sleep quality on the relationship between perceived stress and depression among the elderly in urban communities: a cross-sectional study. Public Health 2017;149:21-7.
17. Lee JS, Joo EJ, Choi KS. Perceived stress and self-esteem mediate the effects of work-related stress on depression. Stress Health 2013;29:75-81.
18. Li M, Wang L. The Associations of Psychological Stress with Depressive and Anxiety Symptoms among Chinese Bladder and Renal Cancer Patients: The Mediating Role of Resilience. PLoS One 2016;11:e0154729 .
19. Peplińska A, Jeżewska M, Leszczyńska I, Połomski P. Stress and the level of perceived anxiety among mariners: the mediating role of marital satisfaction. Int Marit Health 2013;64:221-5.
20. Aanes MM, Hetland J, Pallesen S, Mittelmark MB. Does loneliness mediate the stress-sleep quality relation? The Hordaland Health Study. Int Psychogeriatr 2011;23:994-1002.
21. Zhang QJ, Zhang QL, Sun XY, Zhang LY, Zhang SY, Yao GF, et al. Relationship between acute stress and sleep disorder in grass-root military personnel: mediating effect of social support. Mil Med Res 2014;1:3.
22. Ypsilanti A, Lazuras L, Robson A, Akram U. Anxiety and depression mediate the relationship between self-disgust and insomnia disorder. Sleep Health 2018;4:349-51.
23. Lacruz ME, Schmidt-Pokrzywniak A, Dragano N, Moebus S, Deutrich SE, Möhlenkamp S, et al. Depressive symptoms, life satisfaction and prevalence of sleep disturbances in the general population of Germany: results from the Heinz Nixdorf Recall study. BMJ Open 2016;6:e007919 .
24. Bergman BP, Mackay DF, Smith DJ, Pell JP. Long-term mental health outcomes of military service: national linkage study of 57,000 veterans and 173,000 matched nonveterans. J Clin Psychiatry 2016;77:793-8.
25. Ikin JF, Sim MR, McKenzie DP, Horsley KW, Wilson EJ, Harrex WK, et al. Life satisfaction and quality in Korean War veterans five decades after the war. J Epidemiol Community Health 2009;63:359-65.
26. Derogatis LR, Cleary PA. Confirmation of the dimensional structure of the SCL-90: A study in construct validation. J Clin Psycol 1977;33:981-9.
27. Bahrami H. Mental Disorders in Male Prisoners as Compared to Normal Population. Iran J Psychiatry Behav Sci 1999;5:37-45.
28. Afkham Ebrahimi A, Bandi G, Salehi M, Tafti K, Vakili Y, Farsi A. Sleep parameters and the factors affecting the quality of sleep in patients attending selected clinics of Rasoul-e-Akram hospital. Razi J Med Sci 2008;15:31-8.
29. Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. J Health Soc Behav 1983;24:385-96.
30. Bayani AA, Koocheky AM, Goodarzi H. The reliability and validity of the satisfaction with life scale. Sci J Manag Syst 2007;3:259-65.

31. Hayes A. PROCESS: A versatile computational tool for observed variable mediation, moderation, and conditional process modeling 1. Psychology 2012.
32. Hayes AF. Introduction to mediation, moderation, and conditional process analysis: A regression-based approach: Guilford publications, 2017.
33. Pflanz S, Sonnek S. Work stress in the military: prevalence, causes, and relationship to emotional health. Mil Med 2002;167:877-82.
34. Shilling S, Brackbill RM. Occupational health and safety risks and potential health consequences perceived by US workers, 1985. Public Health Rep 1987;102:36-46.
35. Marin MF, Lord C, Andrews J, Juster RP, Sindi S, Arsenault-Lapierre G, et al. Chronic stress, cognitive functioning and mental health. Neurobiol Learn Mem 2011;96:583-95.
36. Van Laethem M, Beckers DG, van Hooff ML, Dijksterhuis A, Geurts SA. Day-to-day relations between stress and sleep and the mediating role of perseverative cognition. Sleep Med 2016;24:71-9.
37. Loizou M, Petkari E. Do male university students sleep well when they feel well? Exploring the role of depression and anxiety as mediators. Psychol Health Med 2019;24:951-61.
38. Yang SJ, Cha HS. Retrospective cohort study on Korean adolescents' sleep, depression, school adjustment, and life satisfaction. Nurs Health Sci 2018;20:422-30.
39. Calderon C, Carmona-Bayonas A, Hernandez R, Castelo B, Varma S, Donnay O, et al. Incidence of sleep problems and their mediating role on depression and anxious preoccupation in patients with resected, non-advanced cancer: data from NEOcoping study. Clin Transl Oncol 2019;21:1104-7.
40. Wang T, Li M, Xu S, Jiang C, Gao D, Wu T, et al. The Factorial Structure of Trait Anxiety and Its Mediating Effect Between Mindfulness and Depression. Front Psychiatry 2018;9:514.
41. Huang HM, Lai JH, Huang TW. Mediating effects of depression on anxiety and leisure constraints in patients with breast cancer. BMC Womens Health 2019;19:141.
42. Soltani MA, Karaminia R, Hashemian SA. Prediction of war veteran's mental health based on spiritual well-being, social support and self-efficacy variables: The mediating role of life satisfaction. J Edu Health Promot 2014;3:57.
43. Samaranayake CB, Arroll B, Fernando AT, 3rd. Sleep disorders, depression, anxiety and satisfaction with life among young adults: a survey of university students in Auckland, New Zealand. N Z Med J 2014;127:13-22.
44. Zhang H, Zhang Q, Gao T, Kong Y, Qin Z, Hu Y, et al. Relations between Stress and Quality of Life among Women in Late Pregnancy: The Parallel Mediating Role of Depressive Symptoms and Sleep Quality. Psychiatry Investig 2019;16:363-9.
45. Brand S, Beck J, Hatzinger M, Harbaugh A, Ruch W, Holsboer-Trachsler E. Associations between satisfaction with life, burnout-related emotional and physical exhaustion, and sleep complaints. World J Biol Psychiatry 2010;11:744-54.