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The relationship between dispositional gratitude and quality of life: The mediating role of perceived stress and mental health

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ABSTRACT

Even though there is a great deal of research showing that being grateful plays an important role in maintaining one's quality of life and well-being, the mechanisms of this relationship remain unclear. Therefore, the aim of the current study was to investigate the role of perceived stress and mental health in the relationship between dispositional gratitude and quality of life, both uniquely and in-sequence (a serial two-mediator model: gratitude-stress-mental health-quality of life mediation model). Three-hundred and fifteen male Iranian soldiers completed the Gratitude Questionnaire, the WHO Quality of Life Assessment, the General Health Questionnaire, and the Perceived Stress Scale. The data were analyzed by Structural Equation Modeling using the maximum likelihood estimation and Bootstrap estimation method (k = 10,000). The results indicated that perceived stress and mental health, together and uniquely, partially mediated the relationship between dispositional gratitude and quality of life. Perceived stress also mediated the relationship between gratitude and mental health. Moreover, the serial two-mediator model which was used to examine the relationship between gratitude and quality of life through perceived stress and mental health, in sequence, was supported. It can be concluded that gratitude not only has direct effects on quality of life, but also has indirect effects through perceived stress and mental health.

1. Introduction

1.1. Gratitude and its outcomes

Gratitude can be defined as a habitual focusing on and appreciating the positive aspects of life (Van Dusen, Tiamiyu, Kashdan, & Elhai, 2015; Wood, Froh, & Geraghty, 2010). Gratitude is considered a positive psychological trait, being an orientation towards the positive aspects in the world (Wood, Maltby, Gillett, Linley, & Joseph, 2008).

Conceptually, gratitude should be expected to lead to improved well-being (Wood, Joseph, & Maltby, 2008). In the last two decades, a large body of evidence has found that gratitude is negatively associated with general anxiety (McCullough, Emmons, & Tsang, 2002), depression (Lin, 2015; Tulbure, 2015), negative affect (Eaton, Bradley, & Morrissey, 2014), high-risk behaviors (Ma, Kibler, & Sly, 2013), suicide ideation (Stockton, Tucker, Kleiman, & Wingate, 2016), PTSD symptoms (Van Dusen et al., 2015), and neuroticism personality (Wood, Joseph, & Maltby, 2008), and gratitude positively related to well-being, including better physical health (Hill, Allemand, & Roberts, 2013), life satisfaction (Chen, Wu, & Chang, 2017; Szcześniak & Soares, 2011), positive affect (Eaton et al., 2014), hope and personal growth (Loo, Tsai, Raylu, & Oei, 2014), forgiveness (Eaton et al., 2014), self-esteem (Lin, 2015), quality of sleep (Wood, Joseph, Lloyd, & Atkins, 2009), self-efficacy (Mills et al., 2015), vitality and subjective happiness (McCullough et al., 2002), and subjective well-being and psychological well-being (Bhullar, Surman, & Schutte, 2015; Lin, 2016).

Healthy adaptive responses and reactions to life in general, and to difficult challenging situations in particular, can lead to peace of mind, happiness, general health, and satisfactory relationships (Emmons & Shelton, 2002). Individuals with more gratitude express being more satisfied with their life and having greater potential to experience positive emotions (McCullough, Tsang, & Emmons, 2004). They also feel much more hopeful about their future, which in turn can lead to better heath (Krause, Emmons, & Ironson, 2015). Even though there is such a large body of research showing that being more grateful is associated with better health, particularly mental health (Hill et al., 2013) and

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quality of life (Eaton et al., 2014; Toussaint et al., 2017; Yun & Wee, 2016), it is not fully understood how gratitude supports such positive outcomes. As Wood et al. (2010) have suggested, more research is needed to establish the different mechanisms through which gratitude relates to health outcomes. The purpose of this study was therefore to examine the potential mediating roles of perceived stress and mental health, together and uniquely, in the relationship between gratitude and improved quality of life.

Several studies have tested potential mediating roles of psychological constructs in the relationship between gratitude and quality of life, well-being, and health. Eaton et al. (2014) found that increased positive affect mediates the relationship between gratitude and patients' quality of life. In another study, social support and coping style were found to partially mediate the relationship between gratitude and well-being (Lin, 2016). Another study indicated that self-esteem partially mediated the relationship between gratitude and well-being (Lin, 2015). In another study, gratitude and grit were found to indirectly buffer suicide risk over time, through a mechanism of increased meaning in life (Kleiman, Adams, Kashdan, & Riskind, 2013). In addition, Lin (2015) showed that self-esteem and psychological well-being fully mediated the relationship between gratitude and depression. In another study, religiosity motivation was found to mediate the relationship between gratitude and depression (Tulbure, 2015). Finally, psychological health, health-related activities, and willingness to seek help for health worries were found to mediate the relationship between gratitude and physical health (Hill et al., 2013). In summary, although there has been a reasonable amount of research testing the mediating roles of various psychological constructs in the gratitude and health outcomes relationship, the role of stress has received little attention.

1.2. Stress as a mechanism through which gratitude relates to health outcomes

Individuals are confronted with innumerable challenging situations and stressors during the course of their lives, which can often have a negative effect on their health (Weinstein, Brown, & Ryan, 2009). However, there are remarkable inter-individual and intra-individual variations in responses to such life events (Larsen, 2000). Gratitude as a psychological trait may act as a protective factor concerning such challenging life events. In this regard, research has shown that gratitude is negatively related to perceived stress (Lee et al., 2018; Wood, Joseph, & Linley, 2007). Moreover, in two studies using a full cross-lagged panel design, structural equation modeling supported a direct model whereby gratitude was associated with lower levels of stress and with better well-being. Moreover, research has shown that gratitude leads to declining levels of stress over time (Wood, Joseph, & Maltby, 2008; Wood, Maltby, et al., 2008).

1.3. Stress, mental health, and quality of life

Generally, stress can be defined as an expected threat to one's well-being (Ulrich-Lai & Herman, 2009). Stressors may be real or imaginary yet play an important role in health and illness (De Vibe, Bjørndal, Tipton, Hammerstrøm, & Kowalski, 2012). Stressors may operate as causal factors in various diseases, especially clinical depression, cardiovascular disease, HIV/AIDS, and cancer (Cohen, Janicki-Deverts, & Miller, 2007). In fact, stress and physical well-being complaints are strongly related (Wood et al., 2010). Stressful events can cause pathogenesis of physical disease by generating negative affect which in turn may affect biological processes and behavioral patterns that increase the risk of diseases (Cohen, Kessler, & Gordon, 1995). On the other hand, an ability to decrease stress is considerably important for better health (Hoge et al., 2017).

Quality of life and wellness refer to positive subjective states against illness and are multidimensional, including physical, psychological, social, and spiritual (Meiselman, 2016; Siegrist & Junge, 1989). Non-physical factors (e.g., well-being) play a very important role in quality of life (Bernard et al., 2017). Vulnerability to stress, on the other hand, is negatively related to quality of life (Nelas et al., 2016).

A high incidence of stress has been found to be a strong predictor of poor health (Feng et al., 2015; Valikhani, Abbasi, Radman, Goodarzi, & Moustafa, 2018; Valikhani, Goodarzi, & Hashemi, 2017). Higher levels of stress, for example, are related to lower levels of psychological health (Edman et al., 2017), and extended exposures to life stressors are related to more depression symptoms (Seib et al., 2014). Stress and poor general health, which are positively related to each other, are negatively related to all aspects of quality of life (Alexopoulos, Palatsidi, Tigani, & Darviri, 2014). A systematic literature review of 13 studies examining the relationship between stress and quality of life among university students shows that stress is related to poorer quality of life by exacerbating various aspects of physical and mental health (Ribeiro et al., 2017). That is why in the current study we tested the serial two-mediator model (gratitude-stress-mental health-quality of life mediation model) to investigate whether perceived stress and mental health, in sequence, mediate the relationship between gratitude and quality of life. The adverse effects of stress on quality of life are not only relevant to psychological well-being, but also to biological well-being. For example, reductions in stress are associated with reductions in cortisol levels as related to a higher quality of life (Carlson, Speca, Patel, & Goodey, 2004).

When considering quality of life, it is important to include the individual's general state of health (AhmadiGatab, 2011). Individuals who have more general health problems, for example, have a lower level of quality of life (Rakrava, Omranifard, Ebrahimi, Atapour, & Mortazavi, 2015). General health is strongly related to physical health-related quality of life (Namdar, Naghizadeh, Zamani, Yaghmaei, & Sameni, 2017). Good mental health is positively correlated with quality of life (Moi & Nilsen, 2012). Psychiatric disorders may affect patients' quality of life (Annagür, Uguz, Apiliogullari, Kara, & Gunduz, 2014). In addition, individuals who have poor mental health (i.e., depression, anxiety, and stress) experience less quality of life (Bujang et al., 2015).

1.4. The current study

The study population was soldiers. Research shows that suicide rates are high in military settings (Lubell & Vetter, 2006), where soldiers experience high levels of stress and mood fluctuations (Martin, Williamson, Alfonso, & Ryan, 2006), and PTSD symptoms and depression (Biggs et al., 2016). Additional research shows that more than half of Iranian soldiers (53.9%) have poor physical health (Mirghafourvand, Mohammadi, Effati Daryani, Khavoshi, & Zarei, 2015) and that 51.6% of Iranian soldiers are suspected of having a mental disorder (Rajabi, Narimani, & Basari, 2013). Other studies show that prevalence rates of depression and anxiety among Iranian soldiers are 75% and 64%, respectfully (Hobbi, Malmir, Zare, & Hobbi, 2014). In general, research shows that soldiers have poorer mental health and a lower quality of life (Liang, Gan, & Liu, 2012). Hence, this is a population in need of more research examining factors that can support their quality of life and mental health (Zhang et al., 2008).

Using structural equation modeling, this study therefore examined the potential mediating roles of perceived stress and mental health in the relationship between dispositional gratitude and quality of life among Iranian soldiers. We examined the following primary aims in the conceptualized model: 1) whether perceived stress uniquely (independent of mental health) mediates the relationship between gratitude and quality of life, 2) whether mental health uniquely (independent of perceived stress) mediates the relationship between gratitude and quality of life, 3) whether perceived stress mediates the relationship between gratitude and mental health, and 4) a serial two-mediator model (gratitude → stress → mental health → quality of life) in which the relationship between gratitude and quality of life through perceived stress and mental health, in sequence, was tested. As

discussed above, the conceptualized model of this study is supported by existing literature (e.g., Emmons & McCullough, 2003; Wood, Joseph, & Maltby, 2008; Wood, Maltby, et al., 2008).

2. Methods

2.1. Participants and procedures

The sample consisted of 315 male soldiers recruited from four military centers located in Tehran province, Iran. Soldiers' mean age was 23.85 years (SD = 2.94). All were between 18 and 33 years of age. Regarding marital status, 274 were single, and 31 were married (10 were unrecorded). Regarding their educational status, 34 had a high-school degree, 76 had a diploma, 63 had associate degree, 109 had a bachelor's degree, and 30 had a master's degree (three were unrecorded).

After receiving permission, soldiers who volunteered to participate in the research were gathered in a class and received questionnaire packets containing the GQ-6, WHOQOL-BREF, PSS-10, and GHQ-12 (described below). Participants were told that participation was completely voluntary. They also were ensured about the confidentiality of the data. Questionnaires were distributed among participants, who were instructed in how to give their responses for each questionnaire. The average completion time for the questionnaires was approximately 15 min. The study was approved by the Ethics Committee of Baqiyatallah University of Medical Sciences.

2.2. Measures

2.2.1. Gratitude Questionnaire (GQ-6)

The GQ-6, designed by McCullough et al. (2002), assesses dispositional gratitude using 6 items with a 7-point Likert scale (1 = *Strongly Disagree* to 7 = *Strongly Agree*). Using confirmatory factor analysis (CFA), McCullough et al. (2002) showed that the GQ-6 yields one-single factor that shows high-internal consistency (α = 0.82). In Iran, in order to assess the psychometric properties of GQ-6, a study was carried out on college students and reported that GQ-6 is well-validated. In addition, CFA confirmed a one-single factor of GQ-6 and that its coefficient alpha was acceptable (α = 0.71; Lashani, Shairi, & Panahi Talestani, 2014).

2.2.2. WHO Quality of Life Assessment (WHOQOL-BREF)

WHOQOL-BREF is a short form of WHOQOL-100 developed by WHOQOL Group (1998) and is applicable to various cultures (WHOQOL Group, 1996). WHOQOL-BREF includes 26 items that are rated on a 5-point Likert scale. Accompanied by the total score of quality of life, four domains which are related to quality of life are assessed: physical health, psychological health, social relationships, and environment. WHOQOL-BREF has a good discriminant validity, content validity, internal consistency, and test-retest reliability (WHOQOL Group, 1998). In Iran, Nedjat, Montazeri, Holakouie, Mohammad, and Majdzadeh (2008) showed that WHOQOL-BREF has an acceptable reliability and validity.

2.2.3. General Health Questionnaire (GHQ-12)

In order to screen mental disorders, the GHQ-12 designed by Goldberg and Williams (1988) was used. GHQ-12 includes 12 items rated on a 4-point Likert scale (0 = *Not at all* to 4 = *Much more than usual*), which assesses severity of mental problems in recent several weeks. A high score represents poor health. A study on 421 adult outpatients in Germany reported high internal consistency for GHQ-12 (α = 0.91; Schrnitz, Kruse, & Tress, 1999). In Iran, psychometric properties of GHQ-12 were assessed by Montazeri et al. (2003) in a study of 748 young people (between 18 and 25 years of age), and the results showed that GHQ-12 is well-validated with a Cronbach alpha coefficient of 0.87.

2.2.4. Perceived Stress Scale (PSS-10)

PSS-10 was designed by Cohen and Williamson (1988) and is a popular tool to assess psychological stress. It is used to determine the degree to which individuals believe that their life events were unpredictable, uncontrollable, and unexpected in the past month (Lee, 2012). PSS-10 includes 10 items which are rated on a 5-point Likert scale (0 = *Never* to 4 = *Very Often*). Its Cronbach alpha coefficient is 0.78 in an adult American population (Cohen & Williamson, 1988). In Iran, the Cronbach alpha coefficient of the long version of PSS-10 (i.e., PSS-14) was 0.76 (Safaei & Shokri, 2014).

2.3. Statistical analyses

The first approach to the data analysis was to examine whether perceived stress and mental health mediated the relationship between dispositional gratitude and quality of life, both uniquely and in-sequence. Towards this end, a two-step measurement model procedure recommended by Anderson and Gerbing (1988) was used, which examined associations between latent variables and their respective indicators. A structural model via maximum likelihood estimations was then tested if the measurement model was indeed accepted. Given that the GQ-6 gratitude questionnaire consists of only six items and therefore controls for potential inflated measurement error, it was used to determine the latent construct of gratitude. Five- and four-item parcels using random assignment method were created for stress and mental health, respectively. The quality of life latent variable was identified using its subscales. The measurement model consisted of four latent factors and 19 observed variables.

The following goodness of fit indices were used to evaluate the goodness of fit of the model: Chi-square/df ratio (χ^2/df $\leq$ 5.0 = adequate data-model fit; Wheaton, Muthen, Alwin, & Summers, 1977); the Comparative Fit Index (CFI; Bentler, 1990) and the Goodness of Fit Indicator (GFI; Hu & Bentler, 1995) $\geq$0.90 = adequate and $\geq$0.95 = good data-model fit; the Root Mean Square Error of Approximation $\leq$0.08 = adequate and $\leq$0.05 = close data-model fit (RMSEA; Browne & Cudeck, 1993).

In order to determine the significance of the mediating effects of perceived stress and mental health, the Bootstrap estimation procedure (using the Monte Carlo method with 95% bias corrected bootstrapped confidence interval method) generated 10,000 bootstrapping resamples from the original data set (N = 315) by random sampling (MacKinnon, Lockwood, & Williams, 2004).

Prior to conducting any of the structural equation models, outliers and normality of the data were analyzed for all variables. There were no identified outliers (z = $\leq$ $\pm$ 3) and the normality of the distribution, which was tested by skewness and kurtosis values, showed that all variables were normally distributed ($\leq$ $\pm$ 2). Moreover, mean imputation using SPSS was used to replace missing data. All analyses were performed by SPSS 21.0 and AMOS 24.0.

3. Results

3.1. Correlational analysis

Descriptive statistics, Cronbach's alpha coefficients, and correlations for all of the study variables are presented in Table 1.

3.2. Measurement model

The measurement model consisted of four latent factors and 19 observed variables. An initial test of the measurement model did not provide an adequate fit to the data: χ^2 = 424.241, df = 146, p < .001, CMIN/DF = 2.906, CFI = 0.927, GFI = 0.874, RMSEA = 0.078. According to the modification index, the three error terms of stress and one error term of gratitude were allowed to be correlated. The results indicated that the measurement model with the above correlated error

Table 1
Descriptive statistics and zero-order correlations for all measures (N = 315).

Variables	Mean	SD	α	1	2	3	4
1. Gratitude	4.95	1.17	0.81	–			
2. Perceived Stress	1.91	0.82	0.87	−0.53	–		
3. Mental Health[a]	1.48	0.55	0.85	−0.55	0.77	–	
4. Quality of Life	3.16	0.72	0.94	0.68	−0.73	−0.73	–

[a] High scores on the variable mean poor mental health. α = Cronbach's alpha. All correlation coefficients are significant at the 0.001 level (2-tailed).

terms improved and fit the data well: $\chi^2 = 304.268$, df = 142, $p < .001$, CMIN/DF = 2.143, CFI = 0.957, GFI = 0.909, RMSEA = 0.060. All factor loadings for the indicators of the latent variables were significant ($p < .001$), signifying that all the latent factors were well represented by their respective indicators. All the inter-correlations among the latent variables were significantly correlated in conceptually expected ways ($p < .001$).

3.3. Structural model

As shown in Fig. 1, the standardized direct effects indicated that there were negative significant relationships between gratitude with perceived stress ($\beta = -0.61$, $p < .001$) and poor mental health ($\beta = -0.14$, $p = .010$), perceived stress with quality of life ($\beta = -0.36$, $p = .002$), and poor mental health with quality of life ($\beta = -0.26$, $p = .027$). However, there were positive significant relationships between gratitude with quality of life ($\beta = 0.40, p < .001$), and perceived stress with poor mental health ($\beta = 0.81, p < .001$). The fit indices for this model were the same as those which were reported above for the measurement model and revealed that the model provided a good data-model fit. There was significant mediation overall (estimate = 0.433, SE = 0.033, 95% IC [0.372–0.500]) and total indirect effects (estimate = 0.213, SE = 0.027, 95% IC [0.165–0.272]). The overall model explained 84% of the variance in quality of life, and the total standardized effect of gratitude on quality of life was 0.79 (see Table 2). Because the direct link between gratitude and quality of life was found to be significant, the partially mediated model was supported.

The mediated effects were then decomposed into four components in which each indirect effect was analyzed independently. First, perceived stress uniquely mediated the relationship between gratitude and quality of life (estimate = 0.121, SE = 0.045, 95% IC [0.040–0.217]). As gratitude increased, perceived stress decreased; and in turn quality of life increased. Second, mental health uniquely mediated the relationship between gratitude and quality of life (estimate = 0.021, SE = 0.014, 95% IC [0.001–0.057]), suggesting that increased gratitude led to a decrease in poor mental health, which in turn led to an increase in quality of life.

Table 2
Bootstrapping indirect effects and 95% confidence intervals (CI) for the model.

Model pathways	Estimate	SE	95% IC	
			Lower	Upper
Gratitude → Stress → Quality of life	0.121	0.045	0.040	0.217
Gratitude → Mental health → Quality of life	0.021	0.014	0.001	0.057
Gratitude → Stress → Mental health	−0.605	0.081	−0.780	−0.465
Gratitude → Stress → Mental health → Quality of life	0.072	0.038	0.003	0.154
Total Indirect	0.213	0.027	0.165	0.272
Total	0.433	0.033	0.372	0.500

Third, perceived stress mediated the relationship between gratitude and mental health (estimate = −0.605, SE = 0.081, 95% IC [−0.780 to −0.465]). As gratitude increased, perceived stress decreased and in turn poor mental health decreased. Gratitude and perceived stress, together, accounted for 82% variance in mental health, and the total standardized effect of gratitude on mental health was −0.64.

Finally, we examined whether perceived stress and mental health would operate in-sequence to mediate the relationship between gratitude and quality of life. Gratitude influenced perceived stress, which influenced mental health, which influenced quality of life. Thus, this three-path mediation model was significant (estimate = 0.072, SE = 0.038, 95% IC [0.003–0.154]).

4. Discussion

The aim of the present study was to examine the relationship between gratitude and quality of life through the potential mediation of perceived stress and/or mental health. The structural equation modeling results demonstrated that perceived stress and mental health, together and uniquely, partially mediated the relationship between gratitude and quality of life. The findings also indicated that perceived stress partially mediated the relationship between gratitude and mental health. Finally, the serial two-mediator model indicated that gratitude is related to quality of life through perceived stress and mental health, in sequence.

The findings also showed that gratitude has a significant direct effect on quality of life, poor mental health, and perceived stress. These results are consistent with previous studies showing that gratitude is positively correlated with quality of life (e.g., Eaton et al., 2014; Toussaint et al., 2017) and negatively correlated with poor mental health (e.g., Eaton et al., 2014; Hill et al., 2013) and perceived stress (Lee et al., 2018; Wood, Joseph, & Maltby, 2008; Wood, Maltby, et al., 2008).

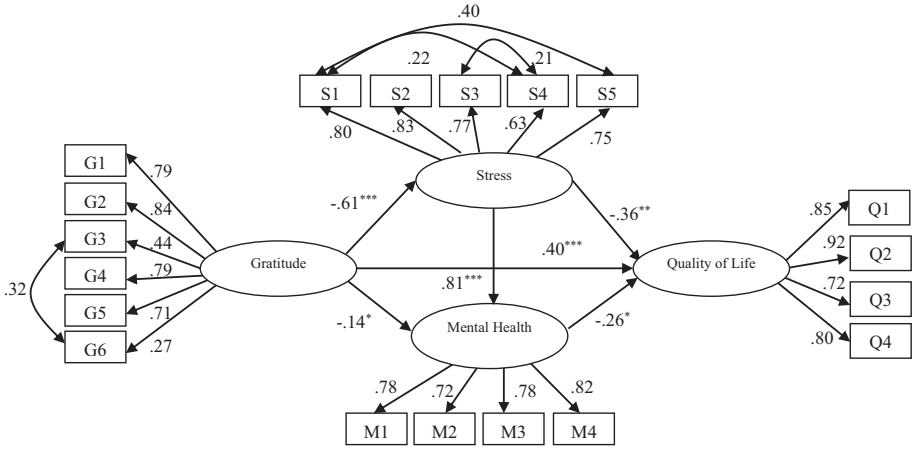

Fig. 1. The mediation model (N = 315). *Note:* Factors loadings are standardized and significant at the 0.001 level. G1–G6 = items of gratitude, S1–S5 = five parcels of perceived stress, M1–M4 = four parcels of mental health, and Q1–Q4 = four sub-scales of quality of life (physical health, psychological health, social relationships, and environment, respectively).
$^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$.

Individuals, particularly soldiers, are faced with many demands and challenges which can negatively affect their own health and well-being (Larsen, 2000; Weinstein et al., 2009). In this regard, gratitude is a character strength (Schueller, 2012) and is a positive psychological trait which is related to well-being in various populations (Mills et al., 2015). Gratitude seems to provide for a positive perception of life and satisfaction with life (Szcześniak & Soares, 2011). In fact, individuals who are grateful are more satisfied with their lives and more able to experience positive emotions (McCullough et al., 2004), and are also hopeful about the future which in turn brings about better health (Krause et al., 2015).

The structural equation modeling results demonstrated that perceived stress uniquely and partially mediated the relationship between gratitude and quality of life, and gratitude and mental health. Moreover, the model accounted for 82% and 84% variance in mental health and in quality of life, respectively, suggesting that a substantial proportion of mental health and quality of life are explained by increased gratitude and decreased perceived stress. Perceived stress partially played a mediating role in the relationship between gratitude and quality of life (independent of mental health), and in the relationship between gratitude and poor mental health. This suggests that gratitude leads to a lower level of perceived stress, which influences soldiers' quality of life and mental health. These results are in line with previous studies which have shown that gratitude is negatively correlated with stress and poor mental health and positively correlated with quality of life, and that stress is also negatively correlated with quality of life (Lee, Kim, Cho, Ahn, & Kim, 2014; Wu, Lee, Hsu, Huang, & Bai, 2014) and positively correlated with poor mental health (Alexopoulos et al., 2014; Edman et al., 2017). Together, these findings support that stress has an important role in the relationship between gratitude and health outcomes. In fact, Wood et al. (2010) claimed that as stress relates to various health problems, gratitude may relate to health outcomes through the mechanism of stress, a claim supported by our findings. Overall, these results supported the model, suggesting how important gratitude is for soldiers' mental health and quality of life, which are two significant concerns in this population.

The study also showed that poor mental health uniquely and partially mediated the relationship between gratitude and quality of life (independent of perceived stress), suggesting that gratitude decreases soldiers' poor mental health which in turn increases their quality of life. One of the four domains of quality of life is psychological health (WHOQOL Group, 1998) which is directly related to mental health; and its other domains, namely, physical health, social relationships, and environment, can indirectly be affected by one's mental health conditions. That is, and as noted in the Introduction, an individual's psychological conditions can play an important role in their quality of life (Alexopoulos et al., 2014). Gratitude provides a positive outlook on life that can be contrasted with a depressive orientation (Wood, Joseph, & Maltby, 2008; Wood, Maltby, et al., 2008) and may therefore help people to experience positive emotions (McCullough et al., 2002) which then serve to buffer tendencies towards poor mental health. In fact, theoretically, the relationship between gratitude and a sense of well-being is logical. Experiencing gratitude, thankfulness, and appreciation can cultivate positive emotions which in turn make a contribution to our health (Sansone & Sansone, 2010), which in turn improves our quality of life.

Finally, the structural equation modeling in which gratitude related to quality of life through perceived stress and mental health, in sequence, was supported, suggesting that gratitude influenced perceived stress, which influenced mental health, which in turn influenced quality of life. Better coping with stress is more likely to be developed when gratitude is present (McCullough et al., 2004). Appreciative responses to life events are adaptive strategies in which individuals interpret their daily experiences positively (Emmons & McCullough, 2003), which makes them experience less stress. As previously noted, stress is a serious threat to one's health (Ulrich-Lai & Herman, 2009) and may cause physical and psychological diseases (Cohen et al., 2007). On the other hand, an improved coping strategy with stress is related to better mental health (Hoge et al., 2017). Health and wellness play very important roles in personal satisfaction and enhanced quality of life (Abdollahi & Khan, 2015). Consequently, gratitude can decrease one's stress, which in turn leads to increased mental health, which in turn leads to improved quality of life. In fact, gratitude, or being grateful, is an attitude and lifestyle (Tulbure, 2015) which make individuals pay attention to positive aspects of life and events. This approach to life can reduce the stress individuals may experience in their lives (Cheng, Tsui, & Lam, 2015), and less or a lack of acute and chronic stress prevents symptoms and mental disorders, which has a positive effect on improving quality of life.

In recent years, researchers have been attracted to exploring malleable psychosocial factors that improve individuals' mental health and well-being (Mandal, Arya, & Pandey, 2012). In this regard, the model proposed in this paper has a number of potential intervention points for increasing soldiers' mental health and quality of life. Accordingly, one method is to increase their gratitude. Gratitude is a malleable characteristic (Emmons & McCullough, 2003) which can be cultivated, and its training and interventions are inexpensive and simple (Mills et al., 2015). Gratitude has individual and social outcomes (Emmons & Shelton, 2002), and well-being can be improved by cultivating simple gratitude exercises (Wood et al., 2010). Therefore, applying gratitude training and exercises to soldiers' daily programs can be beneficial. There are many ways to develop one's gratitude, including a gratitude diary intervention, gratitude listing, counting blessings, meditating on gratitude, practicing saying “thank you”, writing thank you notes, and praying about gratitude (Bono & McCullough, 2006). Another approach suggested by this study is to use techniques and interventions to decrease soldiers' perceived stress. However, the former method is a viable way to enhance individuals' well-being and decrease their psychological problems, not only because its interventions are simple and acceptable but also because it provides individuals with an attitude and lifestyle which can change their approach to and understanding of life in general and even negative events in particular. Hence, the gratitude method can last for a lifetime.

Some limitations of the current study should be considered. First, the research design of the study was cross-sectional, which makes it impossible to infer casual relationships among the variables. Therefore, future studies should apply advanced research methods, including longitudinal and experimental research. Another potential limitation that may bias the findings is that the data relied on only self-reported tools. In the future, multiple methods, including interviews and observations to collect data, may decrease such bias. Finally, the study group included only male soldiers, as in Iran women are not allowed to serve in the military. We therefore cannot generalize the findings to female populations in general and female soldiers in particular.

Despite these limitations, this study makes several important contributions to the literature. Firstly, the study cohort of soldiers represents a unique population in the gratitude literature. The findings demonstrate that gratitude has not only a direct impact on health outcomes and quality of life in soldiers, but it also has an indirect relationship to better mental health and quality of life through reducing perceived stress. Moreover, the results show that perceived stress and mental health not only together and uniquely, but also in-sequence play a mediating role in the relationship between gratitude and quality of life. That is, gratitude has at least partial effects on quality of life through perceived stress and mental health independently, together, and in sequence. This study also showed that stress can act as a viable mediator through which gratitude is related to negative and positive health outcomes. Therefore, it seems that stress is a primary mechanism through which gratitude is related to health outcomes. In addition, Seligman and Csikszentmihalyi (2000) claimed that positive psychology researchers have shown that there are human strengths that act as buffers against mental disorders. To this end, clinical experts need to

know that it is important to reinforce clients' strengths rather than only addressing their weaknesses. In this regard, science and clinical applications that rely on this approach may have direct effects on alleviating many emotional disorders. As gratitude is a character strength (Peterson, 2006) and positive trait (Mills et al., 2015), it directly relates to "positive psychology". It can be concluded that our findings support the positive psychology theory (Seligman, 2002) about preventing and treating mental disorders, suggesting that addressing and working on human positive traits can have a beneficial effect not only on decreasing mental disturbances but also on increasing well-being.

Conflict of interest statement

The authors declare that they have no conflict of interest.

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Ethical approval

The study was approved by the Ethics Committee of Baqiyatallah University of Medical Sciences.

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