Perceived stress mediates the association between perceived control and emotional distress: The moderating role of psychological resources and sex differences

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A R T I C L E I N F O

A B S T R A C T

Studies have confirmed that perceived control is strongly negatively correlated with emotional distress. However, few studies have explored whether perceived stress plays a potential mediating role in this relationship and whether the association between perceived stress and emotional distress is moderated by psychological resources, such as self-esteem and social support. Furthermore, it is unclear whether there are sex differences in the moderating effects of psychological resources on emotional distress. A total of 951 healthy adults (51.84% females) from different regions of mainland China participated in the study and completed questionnaires in early December 2022, when prevention and control policies concerning COVID-19 in China underwent rapid change. Perceived control negatively correlated with emotional distress, and perceived stress mediated the association between perceived control and emotional distress. In addition, both internal (i.e., self-esteem) and external psychological resources (i.e., social support) moderated the association between perceived stress and emotional distress, and the positive correlation between perceived stress and emotional distress was higher in individuals with low social support (and self-esteem) than in those with high social support (and self-esteem). We found sex differences in the moderating roles of psychological resources. Specifically, self-esteem had a moderating effect on both men and women, whereas social support had a moderating effect only on women. These findings improve understanding of the relationship between perceived control and emotional distress and suggest that intervention programs should be designed to target men and women differently.

1. Introduction

Emotional distress, including depression and anxiety, poses a serious threat to mental health (Scott et al., 2007). A recent meta-analysis showed that the pooled prevalence of depression and anxiety in the global population was 31.4% and 31.9 %, respectively (Wu et al., 2021). Exploring the key psychological factors affecting emotional distress has become an important research direction (Liang et al., 2022). One major factor affecting emotional distress is perceived control, which is defined as the belief that events and conditions in one's life are controllable by one's own actions, rather than being a consequence of luck or chance (Beck et al., 2017; Glavin and Schieman, 2014; Wallston et al., 1987). Environmental uncertainty can affect perceived control (Mittal and Griskevicius, 2014). From November to December 2022, following the

relaxation of many prevention and control policies relating to the COVID-19 pandemic, the Chinese public experienced a change in their environment, moving from lockdown to opening up. During this period, dramatic changes in the external environment exposed people to many uncertainties, which were likely to have affected their perceived control. This situation offers a unique opportunity to investigate the relationship between perceived control and emotional distress. Previous studies have confirmed that perceived control can predict emotional distress (Hou et al., 2022; Glavin and Schieman, 2014; Keeton et al., 2008; Precht et al., 2021). A lack of perceived control can also increase perceived stress (Diehl and Hay, 2010; Rezaei and Mousanezhad Jeddi, 2020), which may, in turn, lead to emotional distress (Besharat et al., 2020; Shi et al., 2020; Spada et al., 2008). However, few studies have examined the mediating role of perceived stress on the relationship between

perceived control and emotional distress. Moreover, in daily life, it is common when facing stress for some people to cope with it positively and effectively, whereas others may have difficulty coping with it and experience emotional distress (Jaremka et al., 2013; O'Connor et al., 2012). Certain protective factors are important, such as psychological resources, which refer to psychological entities that are either valued in their own right or that act as a means to obtain valued ends (Hobfoll, 2002). Based on previous studies (Hsu and Tung, 2010; Shani-Sherman et al., 2019), we divided psychological resources into two categories and explored the moderating effects of internal and external psychological resources on the relationship between perceived control and emotional distress. We also explored for the first time whether there are sex differences in the moderating effects of different psychological resources. This study is intended to improve understanding of the relationship between perceived control and emotional distress as well as provide an essential basis for developing intervention strategies to reduce emotional distress.

1.1. The association between perceived control and emotional distress

Learned helplessness theory (Maier and Seligman, 1976) states that maladapted perceived control can reduce people's propensity to engage in problem-solving activities and elicit emotional distress. Previous studies have shown a negative relationship between perceived control and emotional distress across different groups, including prepubertal children (Rodriguez et al., 2019), parents during the first year of parenthood (Keeton et al., 2008), and medical workers during the COVID-19 pandemic (Hou et al., 2022). Moreover, a meta-analysis revealed moderately strong relationships between perceived control and emotional distress across 18 cultural contexts, although these correlations were weaker in collectivist societies than in individualist societies (Cheng et al., 2013). Although these studies have highlighted that perceived control is related to emotional distress, it is pivotal to determine the possible mechanism of this association for understanding the relationship between the two variables.

1.2. Perceived stress as a potential mediator

Perceived stress may mediate the relationship between perceived control and emotional distress. According to the cognitive appraisal theory of stress (Folkman et al., 1986), belief in environmental control is an essential factor affecting perceived stress. Greater perceived control reduces perceived stress from life events and also acute stress hypothalamic-pituitary-adrenal (HPA) axis responses in laboratory settings. Diehl and Hay (2010) found that greater perceived control could reduce perceived stress levels from life events. People with greater perceived control cope with stress with more positive cognitive strategies, using categorizing strategies in word list recall for example (Lachman and Andreoletti, 2006), and exhibit fewer negative emotions (Neupert et al., 2007). Furthermore, higher perceived control could buffer psychological and physiological reactivity to acute stress induced in laboratory conditions (Wen and Sin, 2022).

Perceived stress may lead to emotional distress. Yan et al. (2021) found that higher perceived stress was associated with greater emotional distress, including depression and anxiety, during the COVID-19 pandemic. Similar results have been reported in other studies (Besharat et al., 2020; Shi et al., 2020; Spada et al., 2008). Although much research has been conducted on the relationship between perceived control and perceived stress, and between perceived stress and emotional distress, relatively few studies have investigated the relationships among these three constructs together. Therefore, we aimed to address this research gap and determine whether perceived stress mediates the relationship between perceived control and emotional distress.

1.3. The moderating role of psychological resources and sex differences

This study also focused on identifying protective factors that could alleviate emotional distress, which is critical for developing effective intervention strategies. Psychological resources valued in their own right (internal resources) include individual characteristics, aptitudes, and abilities, whereas resources to obtain valued ends (external resources) can include financial status or social support (Shani-Sherman et al., 2019). This study selected self-esteem and social support as internal and external psychological resources, respectively. Self-esteem as an internal psychological resource (Battle et al., 1988; Sowislo and Orth, 2013) and social support as an external psychological resource (Eldelekl, 2006; Zhou et al., 2013) can effectively relieve emotional distress.

Although perceived stress is strongly associated with emotional distress such as anxiety and depression, different individuals' emotional responses vary even under the same stress conditions (O'Connor et al., 2012). This indicates that some variables may moderate the association between perceived stress and emotional distress. One study in which self-esteem was manipulated through personality feedback found that participants with high self-esteem had lower anxiety levels than those with low self-esteem when faced with stressful stimuli (Greenberg et al., 1992). In addition, Wang et al. (2014) revealed that social support moderated the association between stress and depression. Perceived stress was a stronger predictor of depression in those with lower social support than in those with higher social support. Based on these findings, this study examined whether internal (i.e., self-esteem) and external (i.e., social support) psychological resources moderated the association between perceived stress and emotional distress.

Furthermore, men have higher self-esteem than women (Kling et al., 1999; Bleidorn et al., 2015), while women have higher levels of social support (Siddiqui et al., 2019). Significant sex-based differences have been observed in the effects of self-esteem and social support on mental health. Bolognini et al. (1996) found that self-esteem has a greater influence on depressive mood in girls than in boys. Similarly, women are more easily influenced by social support than men in terms of depressogenic effects (Kendler et al., 2005), symptoms of depression (Landman-Peeters and Hartman, 2005; Dalgard et al., 2006), and symptoms of anxiety (Siddiqui et al., 2019). Therefore, there may be sex differences in the moderating effects of social support and self-esteem as psychological resources that moderate the association between perceived stress and emotional distress.

1.3.1. The present study

This study aimed to explore: (1) whether the association between perceived control and emotional distress can be partially explained by perceived stress, (2) whether self-esteem and social support can moderate the association between perceived stress and emotional distress, and (3) whether the moderating effects of these two psychological resources differ between the sexes. This study collected data during rapid changes in China's prevention and control policies concerning COVID-19. A moderated mediation model and multigroup analysis were developed to address these research questions. This study was guided by the following hypotheses:

Hypothesis (H)1. Perceived stress mediates the relationship between perceived control and emotional distress.

H2. As two psychological resources, high levels of self-esteem and social support weaken the association between perceived stress and emotional distress compared to low levels of social support and self-esteem;

H3. There is a sex difference in the moderating effect of internal and external psychological resources. Specifically, compared with males, the moderating effects of both self-esteem and social support are stronger in females.

Notably, the current study collected data to test the research

hypotheses between December 3 and December 7, 2022, when prevention and control policies concerning the COVID-19 pandemic in China underwent rapid change, becoming much less restrictive. As shown in Fig. 1, from November 11 to November 30, the Chinese government successively issued measures to moderate its pandemic policies, including adjusting the risk-area classification method and COVID testing procedures. Between December 3 and December 7, the requirement for COVID tests was canceled as well as health code inspections, and China emerged from lockdown. During this period, the Chinese public received an unprecedented amount of information from various sources about these changes. People were faced with many uncertainties, such as whether their health and that of their families could be subsequently guaranteed and how their lives might be affected. Such uncertainty was likely to have affected people's perceived control. Therefore, this situation offers a unique opportunity to investigate the relationship between perceived control and emotional distress.

2. Material and methods

2.1. Participants

In this study, 1287 participants from 31 provinces or administrative areas in China completed an online questionnaire. To ensure data quality, we embedded two quality check items (i.e., please select the last option for this question) in the survey and used these items to exclude inattentive respondents. Using correct answers to both check items as inclusion criteria, 1056 questionnaires were selected (82.13% effective response rate). Next, according to age (18–50 years old) and health status (those infected with COVID-19 were excluded), we selected 951 healthy adult participants (458 men and 493 women), with a mean age of 24.62 (standard deviation [SD] = 6.05), and with the mean age of the men being 24.52 ± 5.73 and that of the women being 24.72 ± 6.34, with no significant difference ($t = -0.50$, $p > 0.05$). Most participants (91.69%, n = 872) had at least a college degree, and nearly half of them (50.60%, n = 481) were college students.

2.2. Procedures

All questionnaires were conducted between December 3 and December 7, 2022. Specifically, we spread the questionnaire link generated by the "Questionnaire Star" through social software such as WeChat and Weibo. All questionnaires were filled out voluntarily and anonymously and submitted and recovered upon completion. It took approximately 15 min to complete all questions. Each participant received 8 yuan (approximately US$ 1.2) after completing the questionnaire. All materials and procedures were approved by the Research Ethics Committee of the local university (IRB No. H23008).
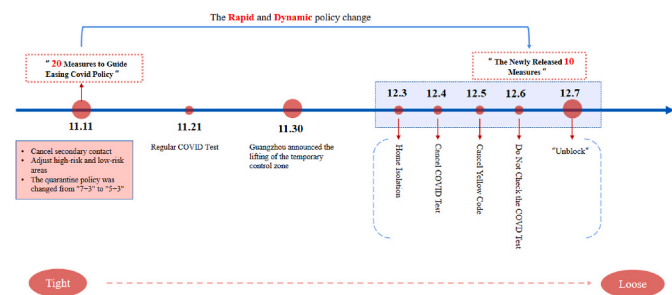

Fig. 1. Timeline related to policies and events during the survey.
Note. Tight: there are many strict rules governing people's behavior; Loose: gradually loosen or even remove constraints on people's behavior.

2.3. Measures

2.3.1. Perceived control

The Chinese version of the 15-item General Domain Sense of Control Scale (Shen and Cai, 2010) was used to measure perceived control, with sample items such as, "In my life, I can choose and make decisions about important things." Responses were rated on a 7-point Likert-type scale, ranging from 1 (never) to 7 (always). A higher total score for all questions indicated greater perceived control. In this study, the Cronbach's α coefficient was 0.92.

2.3.2. Perceived stress

The Chinese version of the 10-item Perceived Stress Scale, based on Cohen et al. (1983), was used to measure perceived stress, with sample items such as, "In the last month, how often have you found that you could not cope with all the things that you had to do?" Participants rated the items on a 5-point Likert scale, ranging from 1 (never) to 5 (very often), with higher scores indicating higher perceived stress. In this study, the Cronbach's α was 0.75.

2.3.3. Emotional distress

The Chinese version of the 21-item Depression Anxiety and Stress Scale (Gong et al., 2010) consists of three subscales: depression, anxiety, and stress. Each subscale contains seven items. We used the depression and anxiety subscales, with sample items such as, "I feel blue and depressed." Responses were rated on a 4-point Likert-type scale, ranging from 0 (not like me at all) to 3 (completely like me), with higher scores indicating more severe depressive or anxiety symptoms. The Cronbach's α of the depression and anxiety subscales in this study were 0.93 and 0.95, respectively. The average score of the two subscales was calculated to indicate emotional distress.

2.3.4. Self-esteem

The Chinese version of the 10-item Rosenberg Self-Esteem Scale based on Rosenberg (1965) was used to measure self-esteem, with sample items such as, "I'm positive about myself." Responses were rated on a 4-point Likert-type scale, ranging from 1 (strongly disagree) to 4 (strongly agree). A higher total score for all questions indicated a higher level of self-esteem. In this study, the Cronbach's α coefficient was 0.90.

2.3.5. Perceived social support

The Chinese version of the 12-item Perceived Social Support Scale (Yan and Zheng, 2006) was used to measure perceived social support, which includes 12 items rated from 1 (strongly disagree) to 7 (strongly agree), with higher scores indicating higher perceived social support. Sample items included, for example, "There are some people in my life who care about my feelings." The Cronbach's α in the present study was 0.94.

2.4. Data analysis

First, descriptive statistics and Pearson's correlation analyses were performed using IBM SPSS Statistics 22.0 software. Second, model 4 of PROCESS macro was used to examine the mediation model. Third, we used IBM AMOS 24 to test the moderated mediating models and then conducted a multigroup analysis to determine whether these models differed across sexes. The multigroup analysis method in this study consisted of three steps: (1) testing the acceptability of the fitting indices of the moderated mediation model in male and female groups (comparative fit index [CFI] > 0.90, Tucker-Lewis index [TLI] > 0.90, root mean square error of approximation [RMSEA] <0.1) (Hu and Bentler, 1999); (2) comparing two models for group differences: the restricted model with all factor loadings estimated to be equal across groups, and the unrestricted model with all factor loadings estimated to be free; and (3) performing a Wald test if the two models showed significant differences to identify specific paths that differed by group.

3. Results

3.1. Preliminary analysis

3.1.1. Common methodology bias test

Common methodology bias, in which the use of the same measurement instrument results in spurious common variations between traits, is commonly found in data measured using self-report scales. Harman's single-factor analysis was used to test for common methodological biases. It uses exploratory factor analysis (EFA) to examine the extent to which a method factor explains the common variance in all items across traits in a study (Podsakoff et al., 2003). The greater the variance explained by a method factor, the more severe is the bias. In this study, the results showed that 12 factors with initial trait roots greater than 1 were detected, and the variance explained by the first factor was 26.60%, which was less than the critical value of 40% (Podsakoff et al., 2003). Therefore, there was no significant methodological bias.

3.1.2. Descriptive statistics and correlations for all variables

Table 1 shows the means, standard deviations, and Pearson correlations for all the variables. We compared the male and female scores for these variables using an independent sample t-test. The results showed that men scored significantly higher than women on perceived control, whereas women scored higher on perceived stress. There were no significant differences between men and women in self-esteem, social support, depression, anxiety, or emotional distress. Additionally, Pearson's correlations showed that perceived control was negatively and significantly correlated with perceived stress, depression, anxiety, and emotional distress, but positively and significantly correlated with self-esteem and social support. Perceived stress was positively and significantly correlated with depression, anxiety, and emotional distress but negatively and significantly correlated with self-esteem and social support. Depression, anxiety, and emotional distress were negatively and significantly correlated with self-esteem and social support. The correlation patterns provided preliminary support for subsequent model tests.

3.2. Mediation analysis

The mediating effect of perceived stress was examined by controlling for age and sex (H1). The results showed that a lower level of perceived control significantly predicted higher emotional distress ($\beta = -0.26$, $p < 0.001$). Lower perceived control was also a predictor of higher perceived stress ($\beta = -0.66$, $p < 0.001$). When controlling for perceived control, higher perceived stress predicted higher emotional distress ($\beta = 0.42$, $p < 0.001$). Bootstrapping indicated that the mediating effect of perceived stress was significant (ab $= -0.27$; bootstrap 95% confidence interval [CI] $= [-0.32, -0.23]$), accounting for 51% of the total effect. Taken together, perceived stress mediated the relationship between perceived control and emotional distress (Fig. 2).
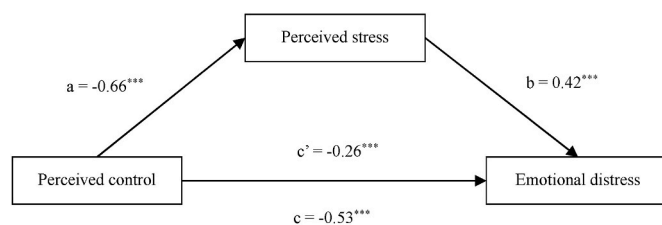

Fig. 2. The mediating role of perceived stress between perceived control and emotional distress.
Note. c' = direct effect coefficient, c = total effect coefficient; ***$p < 0.001$.

3.3. Moderated mediation analysis

Self-esteem and social support were added as the moderating variables to the above mediation model to test the moderated mediating model (H2), and the model fit index was good ($\chi^2/df = 5.00$, CFI = 0.99, TLI = 0.97, RMSEA = 0.07). Specifically, all path coefficients are shown in Table 2 (total sample) and Fig. 3a, which provided a moderated partial mediation model. The interaction between perceived stress and self-esteem significantly predicted emotional distress ($\beta = -0.08$, $t = -3.45$, $p < 0.05$), suggesting that self-esteem moderated the association between perceived stress and emotional distress. Simple slope tests (Fig. 3b) suggested that the slope (the association between perceived stress and emotional distress) for individuals with low self-esteem (Mean - 1SD; Bsimple $= 0.42$, $t = 10.44$, $p < 0.001$) was larger than that for individuals with high self-esteem (Mean + 1SD; Bsimple $= 0.25$, $t = 5.84$, $p < 0.001$). The same result was observed when social support was used as a moderating variable. The interaction between perceived stress and social support significantly predicted emotional distress ($\beta = -0.07$, $t = -3.40$, $p < 0.05$), suggesting that social support moderated the association between perceived stress and emotional distress. Simple slope tests (Fig. 3c) suggested that the slope for individuals with low social support (Mean - 1SD; Bsimple $= 0.55$, $t = 11.47$, $p < 0.001$) was larger than that for individuals with high social support (Mean + 1SD; Bsimple $= 0.28$, $t = 6.50$, $p < 0.001$). These results suggest that both self-esteem and social support moderated the association between perceived stress and emotional distress.

3.4. Multigroup analysis

A multigroup analysis was performed to test whether the moderated mediation model differed by sex (H3).

First, the moderated mediating models of male and female participants were tested. The results showed that the models showed adequate fit both in males ($\chi2/df = 2.64$, CFI = 0.99, TLI = 0.98, RMSEA = 0.06) and females ($\chi2/df = 5.20$, CFI = 0.98, TLI = 0.94, RMSEA = 0.09).

Second, a multigroup analysis method was used to set up equivalent models to test whether there were differences between the models in terms of sex. The results showed that each index both in the unconstrained model ($\chi2/df = 3.91$, CFI = 0.98, TLI = 0.96, RMSEA = 0.06)

Table 1
Pearson correlations for all study variables, and the independent sample t-test of variables between different sexes.

	1	2	3	4	5	6	7	8	All ($M\pm SD$)	Male ($M\pm SD$)	Female ($M\pm SD$)	t
1 Age	–								24.62 ± 6.05	24.52 ± 5.73	24.72 ± 6.34	−0.50
2 PC	0.16***	–							5.04 ± 0.90	5.14 ± 0.92	4.95 ± 0.86	3.40***
3 PS	−0.18***	−0.68***	–						1.72 ± 0.74	1.63 ± 0.72	1.81 ± 0.75	−3.78***
4 SE	0.10**	0.56***	−0.50***	–					3.09 ± 0.68	3.12 ± 0.74	3.07 ± 0.63	1.15
5 SS	0.01	0.53***	−0.44**	0.42***	–				5.52 ± 1.05	5.57 ± 1.06	5.48 ± 1.03	1.41
6 De	−0.11***	−0.53***	0.57***	−0.51***	−0.49***	–			1.54 ± 1.41	1.62 ± 1.53	1.46 ± 1.29	1.76
7 An	−0.07*	−0.47***	0.53***	−0.47***	−0.40***	0.86***	–		1.54 ± 1.37	1.61 ± 1.47	1.48 ± 1.28	1.55
8 ED	−0.07**	−0.52***	0.57***	−0.51***	−0.46***	0.97***	0.97***	–	1.54 ± 1.35	1.62 ± 1.45	1.47 ± 1.23	1.71

Note. PC = Perceived control; PS = Perceived stress; SE = Self-esteem; SS = social support; De = Depression; An = Anxiety; ED = Emotional distress. M = Mean, SD = Standard Deviation. **$p < 0.01$, ***$p < 0.001$.

Table 2
The regression coefficients of moderated mediating model in different samples.

Variables	Total sample				Male				Female			
	Model1(PS)		Model2(ED)		Model1(PS)		Model2(ED)		Model1(PS)		Model2(ED)	
	β	t	β	t	β	t	β	t	β	t	β	t
Age	−0.01	−3.18**	0	0.43	0	−1.28	0	0.13	−0.02	−22.96*	0	0.33
PC	−0.66	−27.06***	−0.08	−2.10*	−0.65	−20.36***	−0.10	−2.35*	−0.66	−17.64***	−0.12	−2.62**
PS			0.34	9.85***			0.34	5.99***			0.34	8.21***
SE			−0.23	−7.59***			−0.29	−6.45***			−0.16	−3.89***
SS			−0.17	−5.45***			−0.20	−4.17***			−0.12	−3.00**
SE × PS			−0.08	−3.45***			−0.09	−4.21*			−0.06	−4.21*
SS × PS			−0.07	−3.40***			0.01	0.89			−0.13	−6.28***

Note. PC = Perceived control; PS = Perceived stress; ED = Emotional distress; SE = Self-esteem; SS = social support. *$p < 0.05$; **$p < 0.001$; ***$p < 0.001$.
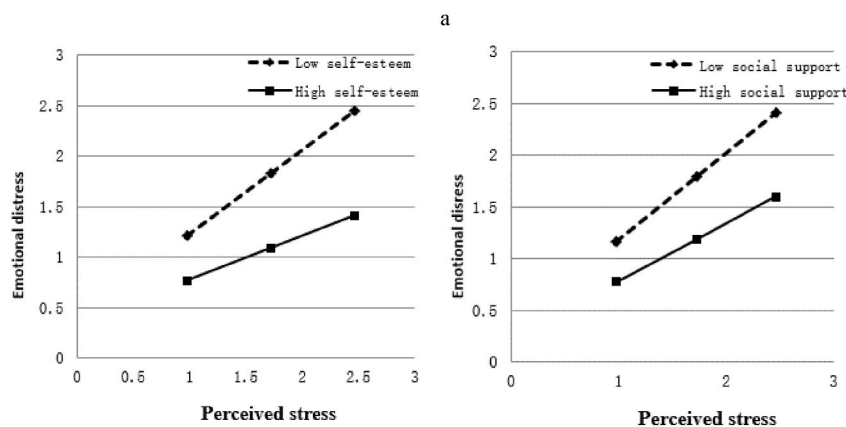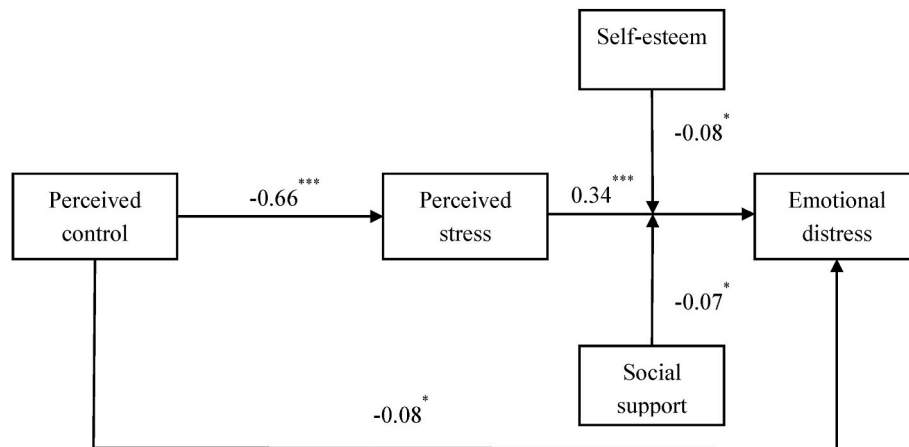

Fig. 3. Moderated mediation analysis. *Note.* *$p < 0.05$; ***$p < 0.001$.

and the structure weights model ($\chi2/df = 3.22$, CFI = 0.98, TLI = 0.97, RMSEA = 0.05) fitted well, and that the structure weights model fitted better than the unconstrained model ($\Delta\chi2 = 10.53$, $\Delta df = 5$, $p < 0.05$). This indicated that the models varied in terms of sex and that further comparison of these path coefficients was required.

Third, a Wald test was performed to compare the path coefficients between sexes. There was a significant sex difference only in the path coefficient between the interaction of social support × perceived stress and emotional distress ($\beta_{male} = 0.01$, $\beta_{female} = −0.13$, $p < 0.001$) (see Table 2 and Fig. 4a). Specifically, in the prediction of perceived stress on emotional distress, the moderating effect of social support was not significant in males (Fig. 4b), whereas social support significantly reduced the effect of perceived stress on depression and anxiety in females (Fig. 4c). There were no sex differences in any of the other path coefficients (Table 3).

4. Discussion

Depression and anxiety are two typical types of emotional distress that significantly threaten mental health. This study tested a series of hypotheses by collecting data in the context of rapidly changing COVID-19 pandemic policies in China, to help determine the relationship between perceived control and emotional distress and the relevant mechanisms. Rapid policy changes are likely to generate a strong sense of uncertainty among people, such as worrying about whether they and their families will be infected by the virus because of the loosening of restrictions, and whether they can work and study as before. In a short period, the extent of perceived control may decrease, whereas perceived stress and emotional distress may increase significantly. Against this background, the present study explored the relationship between perceived control and emotional distress, to supplement and extend
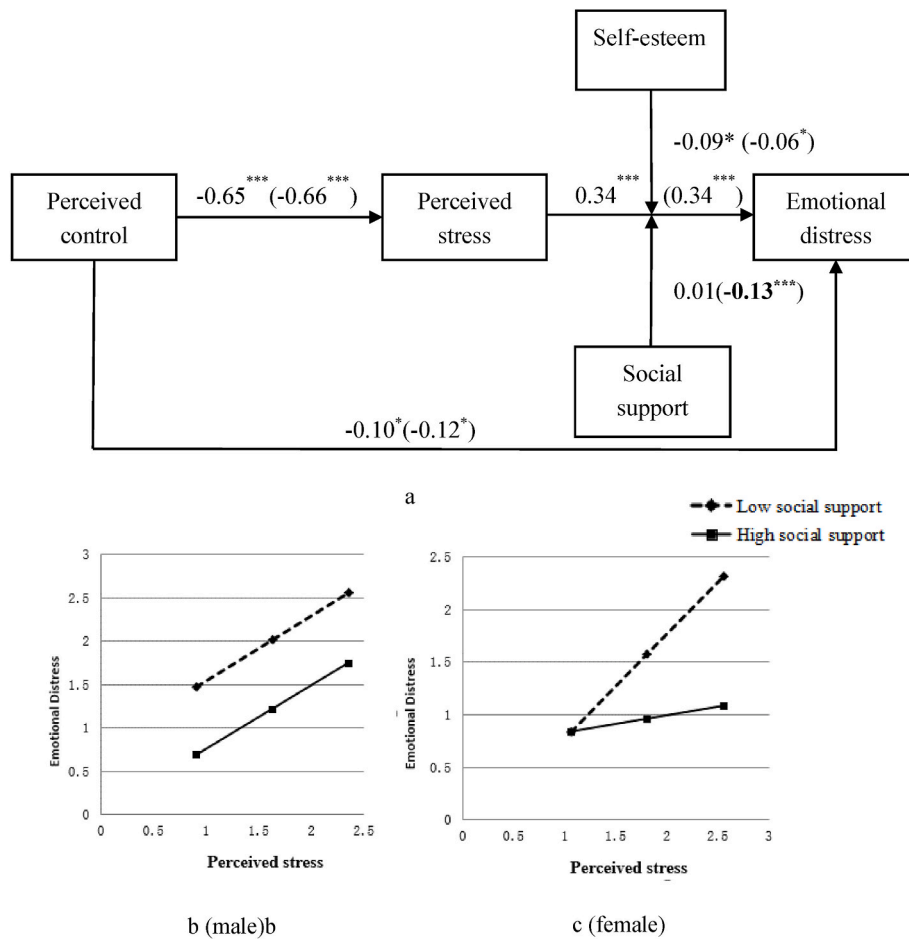
Fig. 4. Path coefficients of the moderated mediation model in different sexes. In figure a, path coefficients of male and female are positioned outside and inside the parentheses, respectively. Values and lines in bold indicate significant differences in path coefficients between male and female groups. *$p < 0.05$; ***$p < 0.001$.

Table 3
Comparison of path coefficients in different sexes.

Dependent variable	Paths	Male		Female		p
		β	S.E.	β	S.E.	
Emotional distress	PC→PS	−0.65	0.02	−0.66	0.05	0.78
	PS→ED	0.34	0.05	0.34	0.04	0.99
	PC→ED	−0.10	0.06	−0.12	0.04	0.48
	SE × PS→ED	−0.09	0.03	−0.06	0.02	0.27
	SS × PS→ED	0.01	0.04	−0.18	0.03	<0.001

Note. PC = Perceived control; PS = Perceived stress; ED = Emotional distress; SE = Self-esteem; SS = social support.

previous studies.

The main findings were as follows. Perceived stress mediated the association between perceived control and emotional distress. Both self-esteem and social support moderated the association between perceived stress and emotional distress, and the positive correlation between perceived stress and emotional distress was higher in individuals with low social support (and self-esteem) than in those with high social support (and self-esteem). Sex differences were observed in the moderating role of psychological resources. Specifically, self-esteem had a moderating effect on both men and women, whereas social support had a moderating effect only on women.

The results of this study showed that the association between perceived control and emotional distress could be partially explained by perceived stress. According to the cognitive appraisal theory of stress, perceived control and stress are closely related, and belief in environmental control is an important factor that affects perceived stress (Folkman et al., 1986). Individuals who lack perceived control experience greater stress (Diehl and Hay 2010; Rezaei and Mousanezhad Jeddi, 2020; Neupert et al., 2007). When people suffer from stress caused by a lack of perceived control, they are unable to deal effectively with the challenging events they face; thus, a range of emotional disturbances may occur (Besharat et al., 2020; Spada et al., 2008).

Our study showed that both self-esteem and social support moderated the association between perceived control and emotional distress. Self-esteem can weaken people's emotional distress related to perceived stress. Many studies have found that higher levels of perceived stress are associated with lower self-efficacy (Varghese et al., 2015). This means that, when people face high-stress life events, they may lower their evaluation of their abilities, which could lead to emotional distress (Jackson et al., 2014). The negative effect of stress on ability evaluation may be influenced by self-esteem. Individuals with high self-esteem are more confident in their abilities and optimistic about their performance in future tasks (Crocker and Park, 2004). In addition, when people fail to cope with stressful events, those with high self-esteem tend to display more self-protection and attribute failure to external factors, which can reduce emotional distress caused by failure to some extent (Fitch, 1970). These characteristics of high self-esteem may help buffer the emotional distress related to stress.

Furthermore, social support can weaken emotional distress related to perceived stress. First, the buffering model in social support theory proposes that the perception of available support leads to an appraisal of potentially threatening situations as less stressful. This means that social support can reduce the effects of stressful life events on mental health

through either the supportive actions of others (e.g., advice and reassurance) or the belief that support is available (Lakey and Cohen, 2000). Second, social support can elicit positive emotions including happiness (Lakey, 2013), hope (Xiang et al., 2020), and optimism (Karademas, 2006), which can reduce stress-related emotional distress.

This study found, for the first time, that there are sex differences in the protective effects of self-esteem and social support on mental health when people face stressful events. While there were no sex differences in relation to self-esteem, social support only weakened the association between perceived stress and emotional distress in women and had no effect on men. According to social role theory (Eagly and Wood, 2012), the sociocultural environment and innate biological factors together determine the different manifestations of sex differences in different fields. In both Eastern and Western cultures, women are commonly believed to have more interpersonal sensitivity and be more likely to establish close interpersonal relationships with family and friends, which foster feelings of social support. By contrast, the social environment encourages men to cultivate "self-reliance" (Eagly and Wood, 2012). Consequently, men are often less able to express and feel emotions and prefer to solve problems on their own. Additionally, findings on self-identity suggest that men identify themselves through separation and independence from others in order to demonstrate their worth and abilities, whereas women identify themselves by making connections and seeking intimacy with others (Hodgson and Fischer, 1979). Furthermore, clear sex differences have been identified in coping strategies. Women are more likely to cope with emotions and turn to others for help, whereas men tend to use problem-coping strategies when faced with stress and obstacles (Kelly et al., 2008; Meléndez et al., 2012; Tamres et al., 2002). These findings help explain why there appear to be sex differences in relation to social support.

4.1. Limitations and future directions

First, the cross-sectional design precludes causal analysis. Future research could explore the causal relationships between variables using a longitudinal tracking design. Second, psychological resources are valued differently according to cultural backgrounds. External psychological resources, such as family support, are highly valued in collectivist cultures such as China, whereas internal psychological resources, including ability and good personality characteristics, are more highly valued in individualistic cultures such as the United States (Hobfoll, 2002). Further research is needed to confirm whether the findings of this study apply in the context of an individualistic culture. In addition, whether culture and gender/sex jointly affect the role of psychological resources is a more complex question that requires further research. Third, only self-esteem and social support were considered. Future studies should explore additional psychological resources that can buffer emotional distress.

4.2. Implications

First, the likelihood of emotional distress in the daily lives of individuals can be reduced by engaging in activities that promote a sense of control, such as physical activity (Precht et al., 2021), mindfulness (Fatemi and Langer, 2016), regular daily activities (Tighe et al., 2015), and planning behavior (Claessens et al., 2004). Second, in situations with a low sense of control, such as high-load work or studies, psychological resources can alleviate potentially negative effects. Third, while women benefit from both internal and external psychological resources, men need to be encouraged to use external psychological resources such as social support more extensively.

5. Conclusion

Perceived control negatively correlated with emotional distress, and perceived stress mediated the association between perceived control and emotional distress. In addition, both internal (i.e., self-esteem) and external psychological resources (i.e., social support) moderated the association between perceived stress and emotional distress, and the positive correlation between perceived stress and emotional distress was higher in individuals with low social support (and self-esteem) than in those with high social support (and self-esteem). Sex differences were found. Specifically, self-esteem had a moderating effect on both men and women, whereas social support had a moderating effect only on women. This study helps researchers better understand the relationship between perceived control and emotional distress. Furthermore, intervention programs should be designed to target men and women in different ways.

Author contributions

Shuai Wang: Conceptualization, Methodology, Formal analysis, Investigation, Writing- Original draft preparation, Writing - Review & Editing. Jiwen Li: Conceptualization, Investigation, Formal analysis. Xiaolin Zhao: Conceptualization, Investigation, Formal analysis. Meijun Zhou: Investigation, Formal analysis. Yajie Zhang: Investigation, Formal analysis. Lihan Yu: Investigation, Formal analysis. Zijian Yang: Investigation, Formal analysis. Juan Yang: Conceptualization, Writing - Review & Editing, Supervision, Funding acquisition.

Declaration of competing interest

The authors declare that there are no conflict of interests, we do not have any possible conflicts of interest.

References

Battle, J., Jarratt, L., Smit, S., Precht, D., 1988. Relations among self-esteem, depression and anxiety of children. Psychol. Rep. 62, 999–1005. https://doi.org/10.2466/pr0.1988.62.3.999.

Beck, B., Di Costa, S., Haggard, P., 2017. Having control over the external world increases the implicit sense of agency. Cognition 162, 54–60. https://doi.org/10.1016/j.cognition.2017.02.002.

Besharat, M.-A., Khadem, H., Zarei, V., Momtaz, A., 2020. Mediating role of perceived stress in the relationship between facing existential issues and symptoms of depression and anxiety. Iran. J. Psychiatry 15, 80–87. https://doi.org/10.18502/ijps.v15i1.2442.

Bleidorn, W., Arslan, R.C., Denissen, J.J.A., Rentfrow, P.J., Gebauer, J.E., Potter, J., Gosling, S.D., 2015. Age and gender differences in self-esteem—a cross-cultural window. J. Pers. Soc. Psychol. 111, 396–410. https://doi.org/10.1037/pspp0000078.

Bolognini, M., Plancherel, B., Bettschart, W., Halfon, O., 1996. Self-esteem and mental health in early adolescence: development and gender differences. J. Adolesc. 19, 233–245. https://doi.org/10.1006/jado.1996.0022.

Cheng, C., Cheung, S.F., Chio, J.H., Chan, M.-P.S., 2013. Cultural meaning of perceived control: a meta-analysis of locus of control and psychological symptoms across 18 cultural regions. Psychol. Bull. 139, 152–188. https://doi.org/10.1037/a0028596.

Claessens, B.J.C., Eerde, W.V., Rutte, C.G., Roe, R.A., 2004. Planning behavior and perceived control of time at work. J. Organ. Behav. 25, 937–950. https://doi.org/10.1002/job.292.

Cohen, S., Kamarck, T., Mermelstein, R., 1983. A global measure of perceived stress. J. Health Soc. Behav. 24, 385–396. https://doi.org/10.2307/2136404.

Crocker, J., Park, L.E., 2004. The costly pursuit of self-esteem. Psychol. Bull. 130, 392–414. https://doi.org/10.1037/0033-2909.130.3.392.

Dalgard, O.S., Dowrick, C., Lehtinen, V., Vazquez-Barquero, J.L., Casey, P., Wilkinson, G., Ayuso-Mateos, J.L., Page, H., Dunn, G., 2006. Negative life events, social support and gender difference in depression. Soc. Psychiatr. Psychiatr. Epidemiol. 41, 444–451. https://doi.org/10.1007/s00127-006-0051-5.

Diehl, M., Hay, E.L., 2010. Risk and resilience factors in coping with daily stress in adulthood: the role of age, self-concept incoherence, and personal control. Dev. Psychol. 46, 1132–1146. https://doi.org/10.1037/a0019937.

Eagly, A.H., Wood, W., 2012. Social role theory. In: Handbook of Theories of Social Psychology. SAGE Publications Ltd, 1 Oliver's Yard, 55 City Road, London EC1Y 1SP United Kingdom, pp. 458–476. https://doi.org/10.4135/9781446249222.n49.

Eldelekl, J., 2006. The relationship between the perceived social support and the level of depression and anxiety in university students. Kuram Ve Uygulamada Egitim Bilim 6, 742–752.

Fatemi, S.M., Langer, E.J., 2016. Perceived control and mindfulness. In: Reich, J.W., Infurna, F.J. (Eds.), Perceived Control. Oxford University Press, pp. 131–146. https://doi.org/10.1093/acprof:oso/9780190257040.003.0006.

Fitch, G., 1970. Effects of self-esteem, perceived performance, and choice on causal attributions. J. Pers. Soc. Psychol. 16, 311–315. https://doi.org/10.1037/h0029847.

Folkman, S., Lazarus, R.S., Dunkel-Schetter, C., DeLongis, A., Gruen, R.J., 1986. Dynamics of a stressful encounter: cognitive appraisal, coping, and encounter outcomes. J. Pers. Soc. Psychol. 50, 992–1003. https://doi.org/10.1037/0022-3514.50.5.992.

Glavin, P., Schieman, S., 2014. Control in the face of uncertainty: is job insecurity a challenge to the mental health benefits of control beliefs? Soc. Psychol. Q. 77, 319–343. https://doi.org/10.1177/0190272514546698.

Gong, X., Xie, X., Xu, R., Luo, Y., 2010. Psychometric Properties of the Chinese Versions of DASS-21 in Chinese College Students. Chin. J. Clin. Psychol. 18, 443–446. https://doi.org/10.16128/j.cnki.1005-3611.2010.04.020.

Greenberg, J., Solomon, S., Pyszczynski, T., Rosenblatt, A., Burling, J., Lyon, D., Simon, L., Pinel, E., 1992. Why do people need self-esteem? Converging evidence that self-esteem serves an anxiety-buffering function. J. Pers. Soc. Psychol. 63, 913–922. https://doi.org/10.1037/0022-3514.63.6.913.

Hu, L.T., Bentler, P.M., 1999. Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. Struct. Equ. Model. 6 (1), 1–55. https://doi.org/10.1080/10705519909540118.

Hobfoll, S.E., 2002. Social and psychological resources and adaptation. Rev. Gen. Psychol. 6, 307–324. https://doi.org/10.1037/1089-2680.6.4.307.

Hodgson, J.W., Fischer, J.L., 1979. Sex differences in identity and intimacy development in college youth. J. Youth Adolesc. 8, 37–50. https://doi.org/10.1007/BF02139138.

Hou, Y., Hou, W., Zhang, Y., Liu, W., Chen, A., 2022. Relationship between working stress and anxiety of medical workers in the COVID-19 situation: a moderated mediation model. J. Affect. Disord. 297, 314–320. https://doi.org/10.1016/j.jad.2021.10.072.

Hsu, H.-C., Tung, H.-J., 2010. What makes you good and happy? Effects of internal and external resources to adaptation and psychological well-being for the disabled elderly in Taiwan. Aging Ment. Health 14, 851–860. https://doi.org/10.1080/13607861003800997.

Jackson, T., Wang, Yalei, Wang, Yang, Fan, H., 2014. Self-efficacy and chronic pain outcomes: a meta-analytic review. J. Pain 15, 800–814. https://doi.org/10.1016/j.jpain.2014.05.002.

Jaremka, L.M., Lindgren, M.E., Kiecolt-Glaser, J.K., 2013. Synergistic relationships among stress, depression, and troubled relationships: insights from psychoneuroimmunology. Depress. Anxiety 30, 288–296. https://doi.org/10.1002/da.22078.

Karademas, E.C., 2006. Self-efficacy, social support and well-being. Pers. Indiv. Differ. 40, 1281–1290. https://doi.org/10.1016/j.paid.2005.10.019.

Keeton, C.P., Perry-Jenkins, M., Sayer, A.G., 2008. Sense of control predicts depressive and anxious symptoms across the transition to parenthood. J. Fam. Psychol. 22, 212–221. https://doi.org/10.1037/0893-3200.22.2.212.

Kelly, M.M., Tyrka, A.R., Price, L.H., Carpenter, L.L., 2008. Sex differences in the use of coping strategies: predictors of anxiety and depressive symptoms. Depress. Anxiety 25, 839–846. https://doi.org/10.1002/da.20341.

Kendler, K.S., Myers, J., Prescott, C.A., 2005. Sex differences in the relationship between social support and risk for major depression: a longitudinal study of opposite-sex twin pairs. Am. J. Psychiatr.

Kling, K.C., Hyde, J.S., Showers, C.J., Buswell, B.N., 1999. Gender differences in self-esteem: a meta-analysis. Psychol. Bull. 125, 470–500. https://doi.org/10.1037/0033-2909.125.4.470.

Lachman, M.E., Andreoletti, C., 2006. Strategy use mediates the relationship between control beliefs and memory performance for middle-aged and older adults. J. Gerontol. B Psychol. Sci. Soc. Sci. 61, P88. https://doi.org/10.1093/geronb/61.2.P88. –P94.

Lakey, B., 2013. Perceived Social Support and Happiness: the Role of Personality and Relational Processes. Oxford University Press. https://doi.org/10.1093/oxfordhb/9780199557257.013.0062.

Lakey, B., Cohen, S., 2000. Social support theory and measurement. In: Cohen, S., Underwood, L.G., Gottlieb, B.H. (Eds.), Social Support Measurement and Intervention. Oxford University Press, pp. 29–52. https://doi.org/10.1093/med:psych/9780195126709.003.0002.

Landman-Peeters, K.M.C., Hartman, C.A., 2005. Gender differences in the relation between social support, problems in parent-offspring communication, and depression and anxiety. Soc. Sci. Med. 60, 2549–2559. https://doi.org/10.1016/j.socscimed.2004.10.024.

Liang, K., Huang, L., Qu, D., Bu, H., Chi, X., 2022. Self-compassion predicted joint trajectories of depression and anxiety symptoms during the COVID-19 pandemic: a

five-wave longitudinal study on Chinese college students. J. Affect. Disord. 319, 589–597. https://doi.org/10.1016/j.jad.2022.09.078.

Maier, S.F., Seligman, M.E.P., 1976. Learned helplessness: theory and evidence. J. Exp. Psychol. Gen. 105, 3–46. https://doi.org/10.1037/0096-3445.105.1.3.

Meléndez, J.C., Mayordomo, T., Sancho, P., Tomás, J.M., 2012. Coping strategies: gender differences and development throughout life span. Span. J. Psychol. 15, 1089–1098. https://doi.org/10.5209/rev_SJOP.2012.v15.n3.39399.

Mittal, C., Griskevicius, V., 2014. Sense of Control Under Uncertainty Depends on People's Childhood Environment: A Life History Theory Approach. J. Pers. Soc. Psychol. 107, 621–637. https://doi.org/10.1037/a0037398.

Neupert, S.D., Almeida, D.M., Charles, S.T., 2007. Age differences in reactivity to daily stressors: the role of personal control. J. Gerontol. 62, P216–P225. https://doi.org/10.1093/geronb/62.4.P216.

O'Connor, S.S., Zatzick, D.F., Wang, J., Temkin, N., Koepsell, T.D., Jaffe, K.M., Durbin, D., Vavilala, M.S., Dorsch, A., Rivara, F.P., 2012. Association between posttraumatic stress, depression, and functional impairments in adolescents 24 months after traumatic brain injury. J. Trauma Stress 25, 264–271. https://doi.org/10.1002/jts.21704.

Podsakoff, P.M., MacKenzie, S.B., Lee, J.-Y., Podsakoff, N.P., 2003. Common method biases in behavioral research: a critical review of the literature and recommended remedies. J. Appl. Psychol. 88, 879–903. https://doi.org/10.1037/0021-9010.88.5.879.

Precht, L.-M., Margraf, J., Stirnberg, J., Brailovskaia, J., 2021. It's all about control: sense of control mediates the relationship between physical activity and mental health during the COVID-19 pandemic in Germany. Curr. Psychol. https://doi.org/10.1007/s12144-021-02303-4.

Rezaei, A., Mousanezhad Jeddi, E., 2020. Relationship between wisdom, perceived control of internal states, perceived stress, social intelligence, information processing styles and life satisfaction among college students. Curr. Psychol. 39 (3), 927–933. https://doi.org/10.1007/s12144-018-9804-z.

Rodriguez, C.M., Pu, D.F., Foiles, A.R., 2019. Cognitive-affective pathways to child depressive and anxious symptoms: role of children's discipline attributions. Child Psychiatr. Hum. Dev. 50, 163–171. https://doi.org/10.1007/s10578-018-0831-7.

Rosenberg, M., 1965. Society and the adolescent self-image. Princeton University Press. Schmeichel, Princeton, NJ.

Scott, K.M., Bruffaerts, R., Tsang, A., Ormel, J., Alonso, J., Angermeyer, M.C., Benjet, C., Bromet, E., De Girolamo, G., De Graaf, R., Gasquet, I., Gureje, O., Haro, J.M., He, Y., Kessler, R.C., Levinson, D., Mneimneh, Z.N., Oakley Browne, M.A., Posada-Villa, J., Stein, D.J., Takeshima, T., Von Korff, M., 2007. Depression–anxiety relationships with chronic physical conditions: results from the World Mental Health surveys. J. Affect. Disord. 103, 113–120. https://doi.org/10.1016/j.jad.2007.01.015.

Shani-Sherman, T., Dolgin, M.J., Leibovitch, L., Mazkereth, R., 2019. Internal and external resources and the adjustment of parents of premature infants. J. Clin. Psychol. Med. Settings 26, 339–352. https://doi.org/10.1007/s10880-018-9583-6.

Shen, Z., Cai, T., 2010. Reviston of the General Domain Sense and Modes of Control Scale. China J. Health Psychol. 18, 361–363. https://doi.org/10.13342/j.cnki.cjhp.2010.03.036.

Shi, J., Huang, A., Jia, Y., Yang, X., 2020. Perceived stress and social support influence anxiety symptoms of Chinese family caregivers of community-dwelling older adults: a cross-sectional study. Psychogeriatrics 20, 377–384. https://doi.org/10.1111/psyg.12510.

Siddiqui, R.S., Jahangir, D.A.A., Hassan, D.A., 2019. Gender differences on perceived social support and psychological distress among university students. Global Manag. J. Acad. Corp Stud. 9, 210–223.

Sowislo, J.F., Orth, U., 2013. Does low self-esteem predict depression and anxiety? A meta-analysis of longitudinal studies. Psychol. Bull. 139, 213–240. https://doi.org/10.1037/a0028931.

Spada, M.M., Nikčević, A.V., Moneta, G.B., Wells, A., 2008. Metacognition, perceived stress, and negative emotion. Pers. Indiv. Differ. 44, 1172–1181. https://doi.org/10.1016/j.paid.2007.11.010.

Tamres, L.K., Janicki, D., Helgeson, V.S., 2002. Sex differences in coping behavior: a meta-analytic review and an examination of relative coping. Pers. Soc. Psychol. Rev. 6, 2–30. https://doi.org/10.1207/S15327957PSPR0601_1.

Tighe, C.A., Dautovich, N.D., Allen, R.S., 2015. Regularity of daily activities buffers the negative impact of low perceived control on affect. Motiv. Emot. 39, 448–457. https://doi.org/10.1007/s11031-014-9456-8.

Varghese, R.P., Norman, T.S.J., Thavaraj, S., 2015. Perceived stress and self efficacy among college students: a global review. SSRN Electron. J. 5, 15–24. https://doi.org/10.2139/ssrn.2703908.

Wallston, K.A., Wallston, B.S., Smith, S., Dobbins, C.J., 1987. Perceived control and health. Curr. Psychol. 6, 5–25. https://doi.org/10.1007/BF02686633.

Wang, X., Cai, L., Qian, J., Peng, J., 2014. Social support moderates stress effects on depression. Int. J. Ment. Health Syst. 8, 41. https://doi.org/10.1186/1752-4458-8-41.

Wen, J.H., Sin, N.L., 2022. Perceived control and reactivity to acute stressors: variations by age, race and facets of control. Stress Health 38, 419–434. https://doi.org/10.1002/smi.3103.

Wu, T., Jia, X., Shi, H., Niu, J., Yin, X., Xie, J., Wang, X., 2021. Prevalence of mental health problems during the COVID-19 pandemic: a systematic review and meta-analysis. J. Affect. Disord. 281, 91–98. https://doi.org/10.1016/j.jad.2020.11.117.

Xiang, G., Teng, Z., Li, Q., Chen, H., Guo, C., 2020. The influence of perceived social support on hope: a longitudinal study of older-aged adolescents in China. Child. Youth Serv. Rev. 119, 105616 https://doi.org/10.1016/j.childyouth.2020.105616.

Yan, L., Gan, Y., Ding, X., Wu, J., Duan, H., 2021. The relationship between perceived stress and emotional distress during the COVID-19 outbreak: effects of boredom

proneness and coping style. J. Anxiety Disord. 77, 102328 https://doi.org/10.1016/j.janxdis.2020.102328.

Zhou, X., Zhu, H., Zhang, B., Cai, T., 2013. Perceived social support as moderator of perfectionism, depression, and anxiety in college students. Soc. Behav. Personal. Int. J. 41, 1141–1152. https://doi.org/10.2224/sbp.2013.41.7.1141.

Yan, B., Zheng X., 2006 Researches into Relations among Social support Self-esteem and Subjective Wel- l being of College Students. Psychol. Dev. Edu. 22, 60-64. doi: 0. 16187/ j. cnki. issn1001- 4918. 2006. 03. 011.