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Dispositional mindfulness mediates the relationship between conscientiousness and mental health-related issues in adolescents during the COVID-19 pandemic

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ABSTRACT

The COVID-19 pandemic is seriously affecting the mental health of adolescents and triggering a series of mental health-related issues. The present study investigates the relationships between conscientiousness, dispositional mindfulness (DM), and adolescents' mental health-related issues including anxiety, depression, and perceived stress during this time. In this study, after obtaining informed consent from participants' parents, 5994 Chinese adolescents voluntarily and anonymously completed an online survey. Conscientiousness was found to be negatively associated with anxiety, depression, and perceived stress. It was found to be positively associated with DM, which, in turn, negatively predicts anxiety, depression, and perceived stress. Conscientiousness is thus related to mental health-related issues, and this relationship is mediated by DM. This mediation effect is stronger in females than in males. These findings provide new and strong evidence for the protective role of conscientiousness and DM in adolescents' mental health-related issues during the COVID-19 pandemic.

1. Introduction

The COVID-19 outbreak has inflicted both physical harm and mental stress on the public (Ahmad et al., 2020). Globally, the pandemic has seriously threatened individual mental health. At the same time, it has also triggered a range of mental health-related issues in adults, such as anxiety, depression, and stress (Nikčević et al., 2021; Santabárbara et al., 2021; Yan et al., 2021), which have severely affected people's work and daily life. Adolescents are in a particularly sensitive period for their physical and mental development (Yurgelun-Todd, 2007) and they are more vulnerable to the negative influence of COVID-19 (Magson et al., 2021; Varma et al., 2021). COVID-19 results in high levels of psychological distress in adolescents (Z. Ma et al., 2021; Pizarro-Ruiz & Ordóñez-Camblor, 2021). Moreover, adolescents' levels of vigor significantly decrease and tension levels obviously increase during the COVID-19 pandemic (Green et al., 2021). Although some positive disease containment measures have been implemented by governments to protect their physical and mental health, they are still concerned about becoming infected with COVID-19. This causes a series of mental health-related issues, such as anxiety, depression, sleep disorders, and post-traumatic stress symptoms (L. Ma et al., 2021). Therefore, it is essential to investigate the impact of COVID-19 on adolescents' mental health as well as its protective factors that are not fully understood.

Certain aspects of personality-particularly conscientiousness-play a vital causal role in fostering health and longevity (Friedman & Kern, 2014). Conscientiousness refers to the qualities of being prudent, dependable, well-organized, and persistent. Previous research has revealed that highly conscientious individuals are protected against the detrimental effects of anxiety, depression, and perceived stress (Kotov et al., 2010; Tran et al., 2020). Moreover, recent work has examined the protective role of conscientiousness in the mental health-related issues of adults during the COVID-19 pandemic (Nikčević et al., 2021; Rettew et al., 2021). However, less attention has been given to the specific issue of whether conscientious adolescents can better handle mental health-related issues when facing the COVID-19 pandemic.

One possible reason for the relationship between conscientiousness

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and mental health-related issues is that conscientious individuals have better emotional regulation skills (Friedman & Kern, 2014), and this, in turn, improves their mental health (Berking & Wupperman, 2012). In other words, emotional regulation may mediate the relationship between conscientiousness and mental health-related issues. Dispositional mindfulness (DM), the ability to focus one's attention on experience in the present moment (Baer et al., 2004), is particularly important in this regard. The core of this ability is attention and awareness of what happens in the present (Baer, 2007; Brown & Ryan, 2003), which are also crucial components of emotional regulation (Hayes & Feldman, 2004). DM has indeed been shown to enhance emotional regulation (Guendelman et al., 2017). Due to the strong overlap between DM and emotional regulation, we hypothesize that DM, much like emotion regulation, may mediate the relationship between conscientiousness and mental health-related issues.

Although no prior studies have directly examined whether DM plays a mediating role in the relationship between conscientiousness and mental health-related issues, there is some empirical evidence that indirectly supports this idea. Investigations of the association between conscientiousness and DM have consistently found that conscientiousness has a positive and strong association with DM (Giluk, 2009; Hanley & Garland, 2017). The consistency of these results may be the result of similarities between conscientiousness and DM (Hanley & Garland, 2017) in that the two constructs are characterized by deliberateness rather than impulsiveness or habit (Giluk, 2009). Numerous studies have also found that DM is an indispensable protective factor in mental health-related issues (Enkema et al., 2020; Ma & Siu, 2020). Specifically, DM has been found to negatively predict anxiety, depression, and other mental health issues. Moreover, such associations have also been found to hold in adolescents (Liu et al., 2020; Yuan & Liu, 2019). These two facts- that conscientiousness is associated with DM, and that DM is associated with mental health- would seem to imply that DM could play a mediating role between conscientiousness and mental health-related issues.

The role of gender in mental health has also been extensively studied. Gender differences in psychological stress, emotional reactions, and behavioral responses to the COVID-19 pandemic have been reported in recent studies (Santabárbara et al., 2021; Yan et al., 2021) in which it has been found that females generally show more anxiety, depression, and psychological stress than males in the face of the pandemic. Furthermore, no prior study has examined whether gender moderates the associations between conscientiousness and DM.

Based on these considerations, we proposed a moderated mediation model to provide a full understanding of the relationship between conscientiousness, DM, mental health-related issues, and gender during the COVID-19 pandemic, which informs the corresponding hypotheses. The hypotheses were as follows: (1) conscientiousness has a positive relationship with DM; (2) conscientiousness and DM are negatively associated with adolescents' mental health-related issues; (3) DM mediates the relationship between conscientiousness and mental health-related issues and this mediation effect is moderated by gender.

2. Methods

2.1. Participants and procedure

A priori power analysis using G*Power 3.1 revealed that a minimum of 550 participants would be needed to detect small-sized effects (f^2 = 0.02) in a multiple linear regression model with a significance level of 0.05 and power of 0.80 (Faul et al., 2009). To provide greater generalizability, data collection was stopped after the maximum sample size was recruited. A total of 6364 Chinese junior middle school students were recruited from 10 junior middle schools in a city of Guangxi Province, China. All participants completed a series of measures online using the Wenjuanxing platform, which allows us to conduct an online survey and recruit participants. Before the actual survey administration, informed consent was obtained from participants' parents. A web link to our questionnaire survey was sent via mobile phone to participants' parents, and then all participants completed this survey using their parents' mobile phones. Participants were told that they were voluntarily and anonymously participating in a survey on mental health-related issues, which was approved by their schools and used to assess their psychological health status during the COVID-19 pandemic. They were also told that they could withdraw from the study at any time without consequence. In the present study, participants were not offered payment for their participation. Participants' demographic information except their name was collected, such as gender, age, grade, and school. 370 respondents were excluded because they had an abnormal completion time (i.e. extremely long or short) or missing data. The final number of participants retained by the present study was 5994 (51.4% females; M_{age} = 14.37, SD = 0.96, range: 12–16 years). The grade level of the participants ranged from grade 7 to grade 9 (39.32%, 7th grade; 32.65%, 8th grade; 28.03%, 9th grade). The study was approved by the Ethics Committee of the School of Education Science at Minnan Normal University.

2.2. Measures

2.2.1. Conscientiousness

Conscientiousness was measured by the conscientiousness subscale of the Chinese version of the NEO-Five Factor Inventory (NEO-FFI) (Yao & Liang, 2010), adapted from the work of Costa and McCrae (1992). The conscientiousness scale contained 12 items (e.g., "I am good at making plans and following through with them,") each of which was rated on a 5-point scale from 0 = *strongly disagree* to 4 = *strongly agree*, with four reverse-scored items. Higher scores indicate a higher level of conscientiousness. The Cronbach's alpha was 0.89 in the present study. Estimates of validity using the goodness-of-fit indices of one factor were good, χ^2 = 1479.51, $p < 0.001$, RMSEA = 0.07, SRMR = 0.02, CFI = 0.97, NNFI = 0.96.

2.2.2. Dispositional mindfulness

DM was measured by the Chinese version of the Mindful Attention Awareness Scale (MAAS) (Deng et al., 2012), adapted from the work of Brown and Ryan (2003). This scale consisted of 15 items (e.g., "I find it difficult to stay focused on what is happening in the present,") each of which was rated on a 6-point Likert scale from 1 = *almost always* to 6 = *almost never*. Higher scores indicate higher levels of attention and awareness. The Cronbach's alpha was 0.94 in the present study. Estimates of validity were good, χ^2 = 3600.69, $p < 0.001$, RMSEA = 0.08, SRMR = 0.04, CFI = 0.93, NNFI = 0.92.

2.2.3. Mental health-related issues

Mental health-related issues were assessed through measures of anxiety, depression, and perceived stress (Tran et al., 2020). Anxiety and depression were measured with the anxiety and depression subscales of the Chinese version of the Symptom Checklist 90 Scale (SCL-90) (Wang, 1984), adapted from Derogatis and Cleary (1977). The two subscales consisted of 10 items (e.g., "Suddenly scared for no reason") and 13 items (e.g., "Feeling low in energy or slowed down") respectively. Each item was rated on a 5-point Likert scale from 0 = *not at all* to 4 = *extremely*. Perceived stress was measured by the Chinese version of the 10-item Perceived Stress Scale (PPS-10) (Meng et al., 2020), adapted from the work of Cohen et al. (1983). The PSS-10 consisted of 10 items (i.e., "In the last month, how often have you felt nervous and stressed?"). Each item was rated on a 5-point Likert scale, ranging from 0 = *never* to 4 = *very often*. Higher scores in the three scales indicated higher levels of anxiety, depression, and perceived stress. The Cronbach's alphas of the three scales were 0.92, 0.94, and 0.86, respectively. The estimates of validity of the three scales were good (anxiety: χ^2 = 1670.74, $p < 0.001$, RMSEA = 0.09, SRMR = 0.03, CFI = 0.96, NNFI = 0.95; depression: χ^2 = 2913.22, $p < 0.001$, RMSEA = 0.09, SRMR = 0.03, CFI = 0.94, NNFI

= 0.93; perceived stress: $\chi^2 = 534.88$, $p < 0.001$, RMSEA = 0.06, SRMR = 0.04, CFI = 0.98, NNFI = 0.97).

3. Results

The means, standard deviations, and correlations between variables are shown in Table 1. Three models were tested using conditional process modeling with the observed variables (Hayes, 2018). PROCESS Model 59 was used to test the hypothesized moderated mediation model with 10,000 bootstrap samples. Conscientiousness (X), DM (M), gender (W; male = 1, female = 0), age (Covariate), and one of the mental health-related issues (including anxiety, depression, and perceived stress; Y) were entered into Model 59 (Hayes, 2018). For this and the subsequent study, unstandardized path coefficients are reported in the main text and all tables and figures.

3.1. Dispositional mindfulness

The results indicate that conscientiousness and gender significantly and positively predict DM ($B = 0.83$, $SE = 0.02$, $p < 0.001$; $B = 0.07$, $SE = 0.02$, $p = 0.006$; respectively). The interaction between conscientiousness and gender is not associated with DM ($B = -0.01$, $SE = 0.03$, $p = 0.78$). In each model, the results for all predictors of DM were the same. All path results are shown in Fig. 1.

3.2. Anxiety

Conscientiousness, DM, and gender were found to significantly and negatively predict anxiety ($B = -0.12$, $SE = 0.01$, $p < 0.001$; $B = -0.21$, $SE = 0.01$, $p < 0.001$; $B = -0.18$, $SE = 0.01$, $p < 0.001$; respectively). The interaction between DM and gender is positively associated with anxiety ($B = 0.13$, $SE = 0.01$, $p < 0.001$; see Fig. 2A). Regardless of whether the participant were male or female, DM was found to significantly and negatively predict anxiety (female: $B = -0.27$, $SE = 0.01$, $p < 0.001$; male: $B = -0.15$, $SE = 0.01$, $p < 0.001$). Moreover, at -1 *SD* of DM, females were found to show more anxiety than males (-1 *SD*: $B = -0.33$, $SE = 0.02$, $p < 0.001$), but at $+1$ *SD* of DM, there is no significant gender difference ($B = -0.02$, $SE = 0.02$, $p = 0.327$). Importantly, the index of moderated mediation was significant (*index* = 0.11, $SE = 0.02$; 95% CI = [0.07, 0.14]), suggesting that females ($B = -0.22$, $SE = 0.01$, 95% CI = [−0.25, −0.20]) show stronger mediation effects than males ($B = -0.12$; $SE = 0.01$; 95% CI = [−0.14, −0.10]). The other direct effects and interaction effects were not significant (*ps* > 0.05).

3.3. Depression

Conscientiousness, DM, and gender were all found to significantly and negatively predict anxiety ($B = -0.13$, $SE = 0.01$, $p < 0.001$; $B = -0.21$, $SE = 0.01$, $p < 0.001$; $B = -0.18$, $SE = 0.01$, $p < 0.001$; respectively). The interaction between conscientiousness and gender is positively associated with anxiety ($B = 0.04$, $SE = 0.02$, $p = 0.043$). Regardless of whether the participant were male or female, conscientiousness was found to significantly and negatively predict depression (female: $B = -0.15$, $SE = 0.01$, $p < 0.001$; male: $B = -0.11$, $SE = 0.01$, $p < 0.001$). Similarly, the interaction between DM and gender is also significant ($B = 0.13$, $SE = 0.01$, $p < 0.001$; see Fig. 2B). DM was found to negatively predict depression, to a degree that varies with gender (female: $B = -0.28$, $SE = 0.01$, $p < 0.001$; male: $B = -0.15$, $SE = 0.01$, $p < 0.001$). Moreover, at -1 *SD* of DM, females were found to show more depression than males (-1 *SD*: $B = -0.34$, $SE = 0.02$, $p < 0.001$), but at $+1$ *SD* of DM, there is no significant gender difference ($B = -0.02$, $SE = 0.02$, $p = 0.343$); this parallels the result found for anxiety. Importantly, the index of moderated mediation was once again found to be significant (index = 0.11, $SE = 0.02$; 95% CI = [0.07, 0.14]), suggesting that females ($B = -0.23$, $SE = 0.01$, 95%*CI* = [−0.26, −0.20]) show stronger mediation effects than males ($B = -0.12$; $SE = 0.01$; 95% CI = [−0.14, −0.11]). The other direct effects and interaction effects were not significant (*ps* > 0.05).

3.4. Perceived stress

Conscientiousness was found to positively predict perceived stress ($B = 0.06$, $SE = 0.01$, $p < 0.001$), while DM and gender negatively predict perceived stress ($B = -0.24$, $SE = 0.01$, $p < 0.001$; $B = -0.22$, $SE = 0.02$, $p < 0.001$; respectively). The interaction between conscientiousness and gender is positively associated with perceived stress ($B = 0.07$, $SE = 0.03$, $p = 0.013$). Conscientiousness was found to positively predict perceived stress in the male group ($B = 0.10$, $SE = 0.02$, $p < 0.001$), but not in the female group ($B = 0.03$, $SE = 0.02$, $p = 0.149$). The interaction between DM and gender is positively associated with perceived stress ($B = 0.06$, $SE = 0.02$, $p = 0.002$; see Fig. 2C). DM significantly and negatively predicts perceived stress in both the male ($B = -0.21$, $SE = 0.01$, $p < 0.001$) and female ($B = -0.27$, $SE = 0.01$, $p < 0.001$) groups. At the same time, females were found to perceive more stress than males at different levels of DM, i.e. at -1 *SD* ($B = -0.31$, $SE = 0.02$, $p < 0.001$) vs. $+1$ *SD* ($B = -0.13$, $SE = 0.02$, $p < 0.001$), much as was found for anxiety and depression. Importantly, the index of moderated mediation was found to be significant here as well (index = 0.05, $SE = 0.02$; 95% CI = [0.01, 0.09]), suggesting once again that females ($B = -0.22$, $SE = 0.01$, 95% CI = [−0.25, −0.19]) show stronger indirect effects than males ($B = -0.17$; $SE = 0.01$; 95% CI = [−0.20, −0.15]). The other direct effects and interaction effects were not significant (*ps* > 0.05).

4. Discussion

The COVID-19 pandemic has caused a series of mental health-related issues in adolescents. The present study examines adolescents' mental health-related issues and their relationships to conscientiousness, DM, and gender. Four primary findings were observed. First, conscientiousness and DM showed a positive correlation with each other and both are

Table 1
Means, standard deviations, and correlations of conscientiousness, mindfulness, and mental health-related issues ($N = 5994$).

	1	2	3	4	5	6	7
1. Conscientiousness	1						
2. Mindfulness	0.54***	1					
3. Anxiety	−0.38***	−0.49***	1				
4. Depression	−0.39***	−0.50***	0.99***	1			
5. Perceived stress	−0.15***	−0.35***	0.57***	0.56***	1		
6. Gender	0.03*	0.05***	−0.17***	−0.17***	−0.17***	1	
7. Age	−0.05***	−0.03*	0.06***	0.06***	0.03	0.04**	1
M	3.38	4.26	1.40	1.41	2.19	–	14.37
SD	0.74	1.14	0.59	0.60	0.73	–	0.96

* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

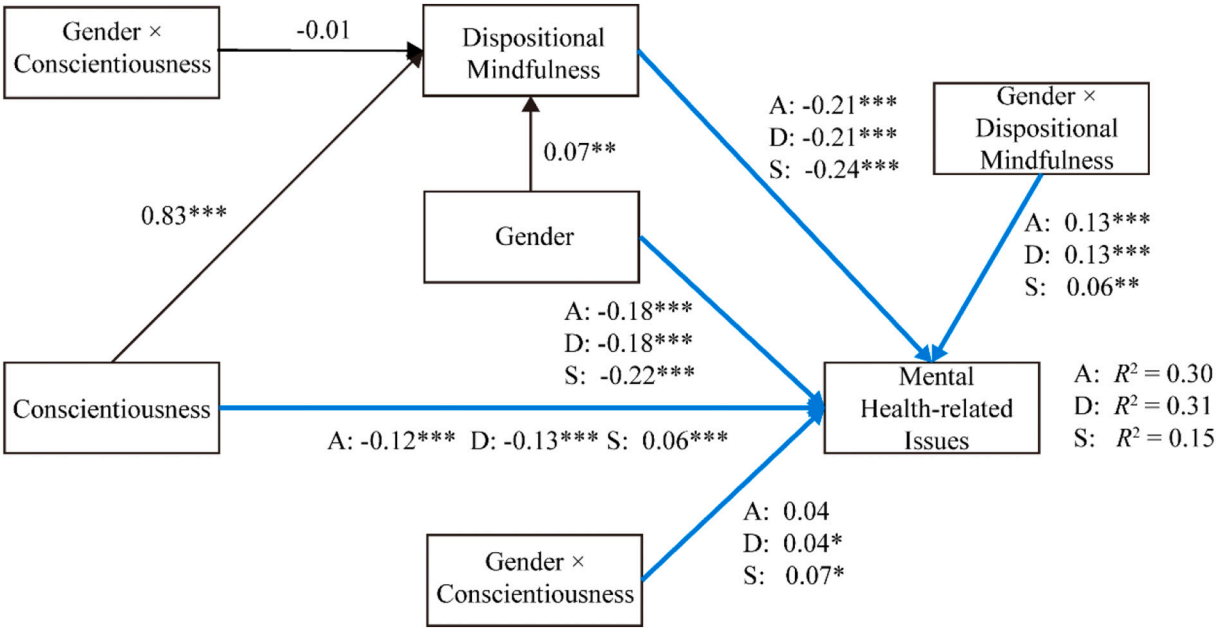

Fig. 1. Statistical form of the moderated mediation model with unstandardized path coefficients. The bold blue lines represent path coefficients that vary according to each mental health-related issues measure: Anxiety (A), Depression (D), and Perceived Stress (S). Black lines represent unvarying results. Age was included in this model but is not shown for clarity. R^2 represents the proportion of the variance for each mental health-related issues measure that is explained by all predictors and interactions in each model. Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

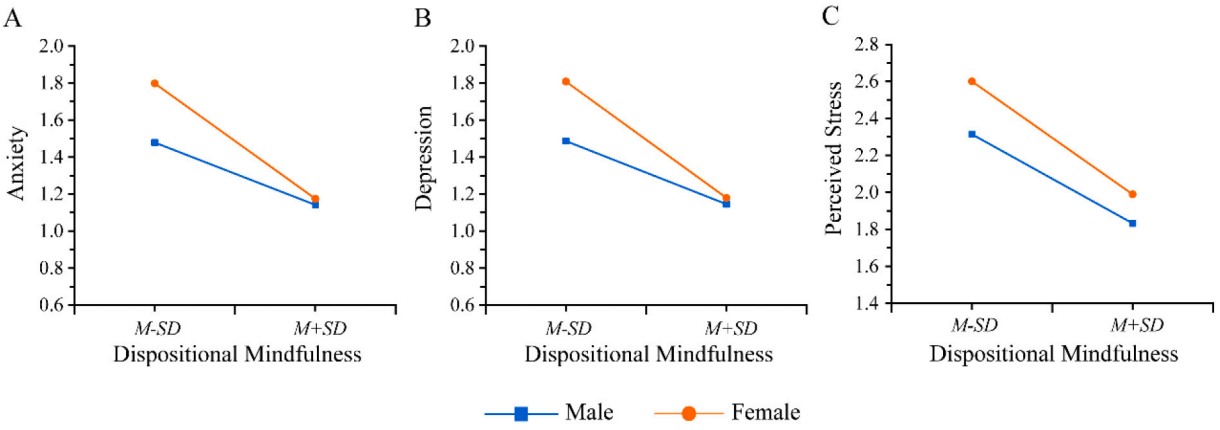

Fig. 2. Gender as a moderator of the effects of dispositional mindfulness on each mental health-related issues measure: Anxiety (A), Depression (B), and Perceived Stress (C). (Note: This figure also shows dispositional mindfulness as a moderator of the effects of gender on each mental health-related issues measure.)

important predictors of adolescents' mental health-related issues. Second, conscientiousness exerts its influence on mental health-related issues in part through the mediating effect of DM. Third, females were found to face more mental health-related issues (i.e., anxiety, depression, and perceived stress) than males; these gender differences mainly manifested in individuals at a low level of DM. Fourth, in the moderated mediation model, conscientiousness was found to predict DM, while gender moderates the effect of DM on mental health-related issues; females showed stronger indirect effects than males.

Prior studies have found a negative association between conscientiousness and mental health-related issues (Kotov et al., 2010; Nikčević et al., 2021; Tran et al., 2020), in that conscientiousness negatively predicts anxiety and depression. Our findings further demonstrate this association in adolescents. Our study also shows that, conversely, conscientiousness can lead to psychological problems: we found that conscientious individuals perceive more stress, which is inconsistent with previous studies (Luo & Roberts, 2015; Rettew et al., 2021) in which conscientiousness was found to be a protective factor against perceived stress. This would seem to indicate that conscientiousness is a risk factor for stress levels during the COVID-19 pandemic. We also found that the association between conscientiousness and perceived stress only exists in males and not in females. The gender difference in this association may be attributable to gender differences in coping strategies for stress (Beck et al., 2016), in that females show more support-seeking behavior than males. However, we recognize that after controlling for DM, it can be seen that the association between conscientiousness and perceived stress changes from negative to positive. Moreover, the direct effects between conscientiousness and perceived stress are positive while their indirect effects via DM are negative, suggesting that DM may act as a suppressor in this relationship (Mackinnon et al., 2000).

Prior studies have found that conscientiousness is positively associated with DM (Giluk, 2009; Hanley & Garland, 2017). The present research replicated this finding and additionally found that DM

negatively predicts anxiety, depression, and perceived stress, consistent with prior studies (Enkema et al., 2020; Ma & Siu, 2020). This indicates that DM plays an important protective role in people's mental health. One major reason for such an association is that DM is closely coupled to emotional regulation, which improves an individual's mental health. Moreover, DM has stronger direct effects on female mental health-related issues than on male mental health-related issues. In addition, the finding that females have more mental health-related issues than males mostly appears in the low level of DM. In short, conscientiousness and DM account for mental health-related issues.

Furthermore, our findings indicate that DM partially mediates the relationship between conscientiousness and mental health-related issues. Conscientiousness thus predicts mental health-related issues both directly, as described above, and also indirectly via DM. This finding can be explained by the overlap of DM with emotional regulation, which accounts for the relationship between conscientiousness and mental health-related issues (Friedman & Kern, 2014). The present research extends this finding. Conscientious individuals show a high level of DM, which in turn decreases their anxiety, depression, and perceived stress. Importantly, the moderated mediation analyses show that this mediation effect is stronger in females than in males. In the present research, the gender differences in the mediation effect are attributed to the gender differences in mental health-related issues, by which females generally show more mental health-related issues than males. Thus, the protective effects of conscientiousness and DM on mental health-related issues are more pronounced in females than in males.

There are some possible limitations to this study. First, we assume that DM acts in its role of emotional regulation because they share a core of attention and awareness. However, it is regrettable that emotional regulation as such was not measured in the present research. It is, therefore, necessary to examine simultaneously the roles of DM and emotional regulation in that relationship. Second, the present research is correlational and thus cannot draw definitive causal conclusions. It would be informative to examine the causal relationship between the studied variables using a longitudinal study. Third, the MAAS used in the current study has a single-factor structure, which only allows investigation of mechanisms involving a specific aspect of mindfulness, namely acting with awareness (Coffey & Hartman, 2008). Psychometric research has established that mindfulness is a multidimensional construct with five distinct facets: observing, describing, acting with awareness, non-reacting, and non-judging (Baer et al., 2006). Thus, the other facets of mindfulness may be considered in future research. Finally, this study used a sample of Chinese adolescents. Therefore, the generalizability of the findings to other populations is unknown. Future research would do well to examine the generalizability of our findings to other countries.

In conclusion, the present research examined adolescents' mental health-related issues and their associations with conscientiousness and DM during the COVID-19 pandemic. The findings indicate that the effect of conscientiousness on adolescents' mental health-related issues is positive and significant, and DM as a mediator explains that relationship. Moreover, such associations between the variables are stronger in females than in males. This work contributes to our understanding of the effect of COVID-19 on the mental health-related issues of adolescents from the perspective of personality and individual differences.

Ethical approval

This study was approved by the Ethics Committee of the School of Education Science at Minnan Normal University (MNNUPSY202003005) and in accordance with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Open practices statements

The data sets analyzed during the current study are available from the corresponding author on reasonable request.

CRediT authorship contribution statement

Tiantian Liu: Conceptualization, Methodology, Formal analysis, Writing – original draft, Visualization. **Zhenliang Liu:** Conceptualization, Methodology, Formal analysis, Writing – original draft, Visualization. **Lijia Zhang:** Conceptualization, Software, Investigation. **Shoukuan Mu:** Conceptualization, Methodology, Investigation, Resources, Data curation, Writing – review & editing, Supervision, Project administration, Funding acquisition.

Declaration of competing interest

None.

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