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Family functioning and mental health among secondary vocational students during the COVID-19 epidemic: A moderated mediation model

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ABSTRACT

With the global outbreak of COVID-19, people are facing great physical and mental stress, and mental health problems are becoming increasingly prominent. Some theories emphasize the role of family in people's mental health, but the association between family functioning and mental health and the mediating and moderating mechanisms underlying this relation have not been extensively researched. This study examined whether loneliness mediates the relation between family functioning and mental health and, if so, whether this mediating effect is moderated by hope. A total of 5783 Chinese secondary vocational students completed measures of family adaptability and cohesion, loneliness, mental health, and hope. The results indicated that family functioning had a significant and positive predictive effect on the mental health of the students and that this relationship was partially mediated by loneliness. Further, hope moderated the relationship between family functioning and loneliness. Specifically, the relationship between family functioning and loneliness was significant for students with both high and low levels of hope. The current study contributes to a better understanding of the influence of family functioning on mental health, especially during trying times such as the COVID-19 epidemic.

1. Introduction

A coronavirus disease 2019 (COVID-19) epidemic has been spreading in China and other parts of the world since December 2019 (Cao et al., 2020). A series of measures taken in China have resulted in great achievements, and China has gradually entered a stable period of epidemic prevention and control (Liu et al., 2020). However, the epidemic not only carried risk of death from the viral infection but also wrought unbearable psychological pressure on the people in China and the rest of the world (Duan & Zhu, 2020; Xiao, 2020). Empirical studies have shown that after crises such as negative life events, sudden accidents, and infectious diseases (Buzohre et al., 2018), the groups affected by the events are likely to experience anxiety, depression, and other psychological problems (Wang et al., 2020). Due to the rapid and complicated characteristics of information dissemination in the era of internet media, students' ability to identify reliable information is imperfect (Wang et al., 2020). Further, many school sessions have been delayed due to the epidemic, which places additional pressure on students (Wang et al., 2020). There have been reports of the psychological impact of this epidemic on the general public, patients, medical staff, children, college students, and older adults (Chen et al., 2020; Li et al.,

2020b; Yang et al., 2020), but no detailed study on the mental health status of secondary vocational students facing the epidemic has been conducted to date.

Secondary vocational students refer to the group of students who enter secondary vocational schools to learn vocational skills after graduating from middle schools (Dong et al., 2020). As a special group of teenagers, they have both the typical psychological characteristics of teenagers and their own unique characteristics (He, 2017). For example, in terms of academics, poor awareness and lack of motivation to learn often lead them to academic failure, which in turns lowers their self-esteem; at the same time, they have to face the pressure of choosing a career and employment too early (Xu, 2016) and subject to multiple pressures from family, school, and society (Dong et al., 2020). Empirical studies have shown that the circumstances of these students has led to higher rates of depression (46.5%) and suicidal ideation (14.3%) among them compared with other groups of teenagers (Dong et al., 2014; Yu et al., 2017). However, most studies examining mental health status among students target young people attending ordinary middle schools (Gao & Zhang, 2011; Zhou, 2013), and little attention has been paid to secondary vocational students. This study aims to address this gap by examining the factors influencing secondary vocational students' mental

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health, which will provide a theoretical basis for mental health interventions and a reference for education on mental health in secondary vocational schools, especially during the COVID-19 epidemic.

Factors influencing mental health have been discussed from different perspectives. Many theories emphasize the important role of the family in adolescent mental health (Wang et al., 2017). For example, according to the family systems theory, at the macro level, functioning of the whole family system plays an important role in the growth of a child, and the better the family functioning, the healthier the child is physically and mentally (Beavers & Hampson, 2000). Children growing up in an environment with good family functioning (e.g., open communication) have high levels of mental health (Cheng et al., 2019). Conversely, many psychological problems are caused by poor family functioning (e.g., low support). Zargar et al. (2007) have indicated that there is a significant relationship between poor family functioning and anxiety, sleep disorders, and depression. Therefore, family functioning is an important factor contributing to individuals' mental health.

While positive family functioning is an important condition for the maintenance of an individual's mental health, it is also closely related to loneliness (Xin & Chi, 2003). Xin and Chi (2003) proposed that when family members lack intimate emotions and effective communication and family management is chaotic, children are likely to experience loneliness within the family context. This suggests that poor family functioning may lead to an extreme sense of loneliness (Yang et al., 2011). However, a good family environment and high family cohesion can effectively decrease individual loneliness (Johnson et al., 2001). Studies have shown that loneliness is associated with poorer physical and mental health (Richard et al., 2017), such as depression and anxiety (Hawkey & Cacioppo, 2010; McIntyre et al., 2018), thus demonstrating the close relationship among family functioning, loneliness, and mental health.

With the rise of positive psychology, hope has gained attention as a protective factor for suicide prevention (Grewal & Porter, 2007; Stewart et al., 2015). Hope is defined as "the perceived capability to derive pathways to desired goals and motivate oneself via agency thinking to use those pathways" (Snyder, 2002, p. 287). Individuals with a high level of hope tend to overcome their negative thoughts in a positive way, become motivated to pursue goals, and thus reduce their level of social anxiety; conversely, those with low levels of hope may give up and abandon the pursuit of goals, thus increasing their level of social anxiety (Fang & Sun, 2018) and loneliness. Studies have found that an increase in the level of hope can reduce the adverse effects of stressful life events on the subjective well-being of adolescents (Yarcheski et al., 2011). Thus, hope may influence the relationship between family environment and loneliness.

The purpose of present study is to examine how family functioning impacts secondary vocational students' mental health mediated by loneliness and the moderating role of hope during the COVID-19 epidemic.

1.1. Family functioning and mental health

Family functioning refers to the effectiveness of members of the family system in emotional connection, family rules, family communication, and coping with external events (Olson et al., 1983). The McMaster model of family functioning (Miller et al., 2000) and the process model of family functioning (Skinner et al., 2000) propose that the better the family functioning, the better the physical and mental health status of the family members. Family functioning forms the basis for the realization of the healthy development of family members' body and mind and their relationship with society, which is closely related to the mental health of adolescents (Shek, 2002). Following the circumplex model, the low levels of flexibility in the family are related to self-reported depression, negative moods, and anxiety symptoms (Fresco et al., 2006).

Empirical studies have shown that poorer family functioning (e.g.,

high conflict, low support) is associated with emotional problems such as anxiety and depression (Auerbach & Ho, 2012; Knappe et al., 2009; Rodriguez et al., 2014); conversely, a more positive family environment (e.g., open communication, low conflict) can support youths' healthy adjustment (Conger & Conger, 2002; Grant et al., 2006; Rodriguez et al., 2014) and is associated with fewer psychological problems (Bahremand et al., 2014; Wiegand-Grefe et al., 2019). A study on female secondary vocational students also showed that family functioning is positively related to their mental health (Li & Li, 2018), and effective communication and division of family roles among family members have a significant effect on levels of mental health (Ye & Zou, 2009).

1.2. The mediating role of loneliness

Adolescence is a high-risk period for the development of loneliness, and the experience of loneliness is more common among adolescents than in any other age group (Zhang, 2012). Previous studies have explored the influencing factors of loneliness from different perspectives, such as environmental and individual factors (Sharabi et al., 2012). Since the family is the main context for individual growth and socialization, which are crucial to the individual's physiological and psychological development, improving family functioning can alleviate the experience of loneliness (Liu & Zeng, 2019). Family functioning is therefore one of the factors influencing individual loneliness, with lower levels of family functioning predicting higher levels of loneliness (Sharabi et al., 2012). Studies with children (Sharabi et al., 2012), high school students (Zhang, 2012), college students (Wang et al., 2019), and older adults (Wang et al., 2011) have shown that family functioning is significantly and negatively correlated with loneliness.

Increasing evidence suggests that loneliness is a major risk factor for physical and mental illness in later life (Ong et al., 2015). It is associated with negative mental health outcomes (Heinrich & Gullone, 2006; Victor & Yang, 2012) such as anxiety, depression, suicidality, and reduced positive emotions, as well as physiological changes (Beutel et al., 2017; Wang et al., 2018). A study on middle school students revealed that loneliness is significantly related to mental health status; that is, more severe loneliness is associated with poorer psychological status (Sun et al., 2014). Moreover, longitudinal studies have identified loneliness as a risk factor for mental health challenges such as depression and anxiety (Lim et al., 2016).

When investigating the variable of adolescent loneliness, researchers often treat loneliness as a mediating variable (Zhou et al., 2019). Studies have found that family functioning has a direct predictive effect on loneliness (Xin & Chi, 2003), and long-term or severe loneliness may lead to frustration, mania, and other emotional disorders (Zhang et al., 2010), which seriously affect individuals' mental health.

1.3. The moderating role of hope

With the development of positive psychology and increasing attention to the role of positive psychological factors, hope is considered an important positive psychological quality (Zhang & Chen, 2013) and resource for individuals (Feldman & Snyder, 2005). Some studies have reported that loneliness can be reduced by changing participants' perceptions of their sense of control over events and aspects of their life regarding their health, emotions, pleasures, and functionality (Cacioppo et al., 2015). This indicates that personal traits can play an important role in alleviating loneliness. Generally, individuals with high hope can more easily form specific and feasible routes to achieve goals and are also effective at preparing alternative routes compared to individuals with low hope; at the same time, when encountering hardships or feeling pressure in the process of pursuing goals, individuals with high levels of hope usually have positive self-dialogue, tend to regard setbacks as opportunities for growth, and have sufficient perseverance to overcome setbacks (Snyder et al., 2002).

Studies have found that the negative impact of stressful life events on

the subjective well-being of adolescents was reduced with an increase in hope (Marques et al., 2011); likewise loneliness in children caused by psychological abuse was also reduced (Luo & Zhang, 2020). A high level of hope also plays a protective role in alleviating psychological distress (Berendes et al., 2010) and reducing the level of irritability (Kwon, 2000). Overall, individuals with a high level of hope have a higher sense of self-efficacy, are more inclined to feel support and security, and are more likely to cooperate with others and receive help from others (Fang & Sun, 2018), which can also serve to reduce their loneliness.

1.4. The present study

The aims of the current study are to examine: (a) whether loneliness will mediate the relationship between family functioning and mental health; and (b) whether hope will moderate the association between family functioning and loneliness (Fig. 1). Based on previous studies, the following hypotheses are proposed:

Hypothesis 1. Loneliness will mediate the relationship between family functioning and mental health.

Hypothesis 2. Hope will moderate the association between family functioning and loneliness.

2. Methods

2.1. Participants

The study was conducted in early May 2020. Secondary vocational students were recruited for the study using convenience sampling methods. During the COVID-19 epidemic, secondary vocational students stayed at home. We collected research data through an online crowdsourcing platform in China, which functions like the Amazon Mechanical Turk. Students voluntarily participated in the questionnaire survey by accessing a website provided to them by their teachers, and received no reward for their participation. A total of 6000 secondary vocational students in China completed our survey, of which 217 participant responses were invalid, and 5783 were valid (96.38%). Data were invalid primarily because the participants did not answer carefully, such as the answers to all items followed a regular pattern or were the same. Demographic characteristics of respondents are presented in Table 1.

2.2. Measures

2.2.1. Family functioning

We assessed family functioning using the Family Adaptability and Cohesion Scale (FACES II-CV) developed by Olson et al. (1982). The Chinese version of this scale was revised developed by Fei et al. (1991). There are 60 items on the scale and it includes two dimensions: cohesion and adaptability, with 30 items on each subscale. Each dimension is divided into two parts: the actual family situation and the ideal family situation. Participants rated the level of family adaptability and cohesion on a Likert scale ranging from 1 (*never*) to 5 (*always*). Participants rated their actual feelings and ideal situations of cohesion and

Table 1
Demographics of the study's participants ($N = 5783$).

Demographic variables		<i>n</i>	%
Gender	Male	3513	60.75
	Female	2270	39.25
Residence	City or township	1373	23.74
	Rural	4410	76.26
Education level of father	Primary school and below	2293	39.65
	Middle school	2724	47.10
	High school	556	9.61
	Bachelor's degree and above	210	3.63
Education level of mother	Primary school and below	3722	64.36
	Middle school	1662	28.74
	High school	307	5.31
	Bachelor's degree and above	92	1.59

adaptability. The absolute value of the difference between actual feelings and the ideal situation scores was expressed as the degree of dissatisfaction with family cohesion and adaptability. The greater the difference, the greater the dissatisfaction. In this study, the internal consistency α coefficient for the FACES scale was 0.97.

2.2.2. Mental health

We assessed mental health using the Mental Health of Middle School Students scale developed by Wang et al. (1997). There are 60 items on the scale. The scale includes 10 dimensions, namely: obsession, paranoia, hostility, interpersonal sensitivity, depression, anxiety, learning stress, maladjustment, emotional instability, and psychological imbalance. Each dimension contains six items. Participants rated their mental health scores on a Likert scale ranging from 1 (*never*) to 5 (*seriousness*). The higher the score, the more serious the individual's mental health problems. In this study, the internal consistency α coefficient for the mental health scale was 0.98.

2.2.3. Hope

We assessed hope with the hope scale developed by Snyder et al. (1991). The Chinese version of the hope scale was revised by Shi and Tian (2009). There are 12 items on the scale, with 4 items on each of two dimensions: pathway thinking and agency thinking. The other four goal-related items are mainly used to divert the participants' attention and are not included in the total score. Participants rated their levels of hope on a Likert scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*). In this study, the internal consistency α coefficient for the hope scale was 0.86.

2.2.4. Loneliness

We assessed loneliness using the UCLA Loneliness Scale (third version) developed by Russell and Peplau (Wang et al., 1999). The scale consists of 20 items. Participants rated their levels of loneliness on a Likert scale ranging from 1 (*never*) to 4 (*always*), including 10 reverse-scored items. The higher the total score, the more serious was the individual's problem of loneliness. In this study, the internal consistency α coefficient for the UCLA Loneliness Scale was 0.84.

2.3. Data analysis

Data were analyzed using SPSS25. First, the invalid data (i.e., participants with regular and the same answers) were deleted after examining the frequency analysis. Second, the common method bias test and Pearson correlations were conducted among the variables. Finally, the PROCESS Macro for SPSS (Model 4) was used to test the mediating role of loneliness, and Model 7 was used to test the moderating role of hope in the relationship between family functioning and loneliness based on the bias-corrected percentile bootstrap method (5000 samples; Hayes, 2013). We also controlled for the demographic variables in the analysis, such as gender, grade, residence, and education level of father and mother (Li & Li, 2018; Sharabi et al., 2012; Tan & Zhong, 2003).

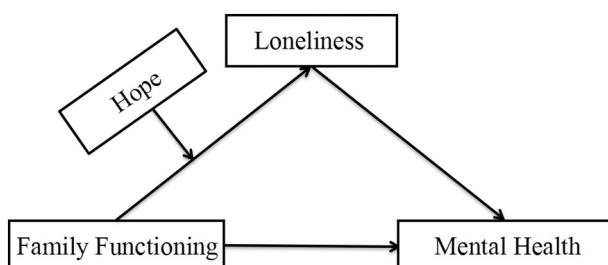


Fig. 1. The proposed moderated mediation model.

3. Results

3.1. Common method bias test

As the research data were obtained using a self-report questionnaire, there was a possibility of a common method bias problem (Campbell & Fiske, 1959). According to previous studies (Podsakoff et al., 2003), the Harman single factor test is used to examine common method bias. The results showed that the KMO value was 0.97 ($p < 0.001$), indicating that the data were suitable for factor analysis. There were 14 factors with eigenvalues greater than 1, and the first factor showed a variance of 22.78%, which did not reach the criterion of 40%. Therefore, there was no serious common method bias problem in this study.

3.2. Descriptive statistics and correlations

Table 2 presents the means, standard deviations, and correlations among the study variables. An analysis of the correlations reveals that lower levels of family functioning are positively related to loneliness ($r = 0.162, p < 0.01$) and mental health problems ($r = 0.219, p < 0.01$), and negatively correlated with hope ($r = -0.032, p < 0.05$). The results also indicate that loneliness is correlated positively to mental health problems ($r = 0.578, p < 0.01$). In addition, hope is negatively correlated to loneliness ($r = -0.240, p < 0.01$) and mental health problems ($r = -0.137, p < 0.01$).

3.3. Testing the moderated mediation model

To examine the moderated mediation, we referred to the procedure proposed by Preacher et al. (2007). First, we adopted the SPSS PROCESS Macro Model 4 (Hayes, 2013) to test whether loneliness served as a mediator in the relationship between family functioning and mental health. The results are shown in Table 3. After controlling for the effect of participants' demographics (i.e., gender, residence, and parents' education level), family functioning significantly predicted mental health (Model 1: $\beta = 0.009, p < 0.001$) and loneliness (Model 2: $\beta = 0.105, p < 0.001$). Moreover, loneliness significantly predicted mental health (Model 3: $\beta = 0.036, p < 0.001$), and the direct association between family functioning and mental health remained significant (Model 3: $\beta = 0.005, p < 0.001$). The bias-corrected percentile bootstrap analyses showed that loneliness had a significant partially mediating effect between family functioning and mental health (indirect effect = 0.004, Boot SE = 0.001, 95% CI = [0.003, 0.005]), and the proportion of the mediating effect to the total effect was 44.444%. Therefore, Hypothesis 1 was supported.

Second, we adopted the SPSS PROCESS Macro Model 7 (Hayes, 2013) to test moderated mediation. According to previous study (Preacher et al., 2007), we tested four conditions: (a) effect of family functioning on mental health; (b) interaction between family functioning and hope in predicting loneliness; (c) effect of loneliness on mental health; and (d) different conditional indirect effects of family functioning on hope, via loneliness, across low and high levels of hope.

Table 2
Descriptive statistics and correlations between variables.

Variable	M	SD	1	2	3	4	5	6	7
1. Gender	1.39	0.49	1						
2. Residence	1.76	0.43	-0.010	1					
3. Education level of father	1.77	0.77	-0.042**	-0.256**	1				
4. Education level of mother	1.44	0.67	-0.025	-0.350**	0.456**	1			
5. Family functioning	10.39	13.03	0.111**	0.001	-0.016	-0.022	1		
6. Loneliness	42.77	8.75	0.056**	0.015	-0.037**	-0.055**	0.162**	1	
7. Mental health	1.64	0.57	0.115**	-0.026*	-0.001	-0.028**	0.219**	0.578**	1
8. Hope	22.45	5.44	-0.002	-0.060**	0.053**	0.051**	-0.032*	-0.240**	-0.137**

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

The results are shown in Table 4. Family functioning had a positive predictive effect on mental health ($\beta = 0.005, p < 0.001$); the product (interaction term) of family functioning and hope had a significant predictive effect on loneliness ($\beta = -0.005, p < 0.001$); and loneliness had a positive predictive effect on mental health problem ($\beta = 0.036, p < 0.001$). These results supported conditions (a), (b), and (c), respectively.

To better explain the nature of the interaction effect between family functioning and hope, we divided hope into high and low groups by adding or subtracting a standard deviation from the mean and conducting a simple slope test (Fig. 2). The results indicated that family functioning significantly predicted loneliness where there was high-level hope, medium-level hope, and low-level hope, but the predictive function of family functioning for loneliness was stronger for secondary vocational students with low levels of hope ($b_{simple} = 0.126, t = 11.110, p < 0.001$) than for secondary vocational students with medium ($b_{simple} = 0.097, t = 11.343, p < 0.001$) and high levels of hope ($b_{simple} = 0.068, t = 5.395, p < 0.001$). Moreover, the bias-corrected percentile bootstrap analyses further showed that the indirect effect of family functioning on mental health via loneliness was moderated by hope. Specifically, for secondary vocational students with high, medium, and low levels of hope, the conditional indirect effect between family functioning and mental health was significant ($\beta = 0.002, 95\% CI = [0.004, 0.006]$; $\beta = 0.004, 95\% CI = [0.003, 0.004]$; $\beta = 0.005, 95\% CI = [0.001, 0.003]$; respectively), thus supporting condition (d). In sum, these results indicate that hope moderates the relationship between family functioning and mental health via loneliness. Therefore, Hypothesis 2 was supported.

4. Discussion

We examined the effect of family functioning on the mental health of secondary vocational students, as well as the role of loneliness and hope in the relationship between family functioning and mental health. Our findings indicate that secondary vocational students' family functioning had a significant predictive effect on their mental health, and loneliness partially mediated the positive relationship between family functioning and mental health. Furthermore, the relationship between family functioning and loneliness was moderated by hope.

4.1. The effect of family functioning on mental health

Our results showed that secondary vocational students' family functioning had a positive predictive effect on their mental health; that is, the good family functioning were associated with better mental health. This is consistent with findings from previous studies (Bahreman et al., 2014; Cheng et al., 2019; Knappe et al., 2009; Li & Li, 2018; Rodriguez et al., 2014; Wiegand-Grefe et al., 2019; Zargar et al., 2007). The results support the McMaster model of family functioning (Miller et al., 2000) and the process model of family functioning (Skinner et al., 2000). Both theories propose that the physical and mental health and emotional problems of individuals are directly affected by the process of

Table 3
Testing for mediation effect.

Predictors	Model 1 (mental health)		Model 2 (loneliness)		Model 3 (mental health)	
	β	<i>t</i>	β	<i>t</i>	β	<i>t</i>
Gender	0.106***	7.08	0.652**	2.791	0.082***	6.656
Residence	-0.049**	-2.605	-0.090	-0.314	-0.045**	-2.938
Education level of father	0.012	1.083	-0.146	-0.873	0.017	1.905
Education level of mother	-0.034	-2.710	-0.606**	-3.068	-0.012	-1.189
Family functioning	0.009***	16.212	0.105***	11.989	0.005***	11.309
Loneliness					0.036***	51.753
<i>R</i> ²	0.058		0.030		0.357	
<i>F</i>	71.316***		36.038***		533.373***	

** *p* < 0.01.
*** *p* < 0.001.

Table 4
Testing for the moderated mediation effect.

Predictors	Model 1 (Loneliness)			Model 2 (Mental health)		
	β	<i>SE</i>	<i>t</i>	β	<i>SE</i>	<i>t</i>
Gender	0.647**	0.227	2.851	0.082***	0.012	6.656
Residence	-0.294	0.278	-1.056	-0.045**	0.015	-2.938
Graduation level of father	-0.047	0.163	-0.292	0.017	0.009	1.905
Graduation level of mother	-0.554**	0.192	-2.891	-0.012	0.011	-1.189
Family functioning	0.097***	0.009	11.343	0.005***	0.001	11.309
Hope	-0.382***	0.020	-18.747			
Family functioning × hope	-0.005***	0.002	-3.461			
Loneliness				0.036***	0.001	51.753
<i>R</i> ²	0.086			0.357		
<i>F</i>	77.915***			533.373***		

Note: × represents the interaction item of family functioning and hope.
** *p* < 0.01.
*** *p* < 0.001.

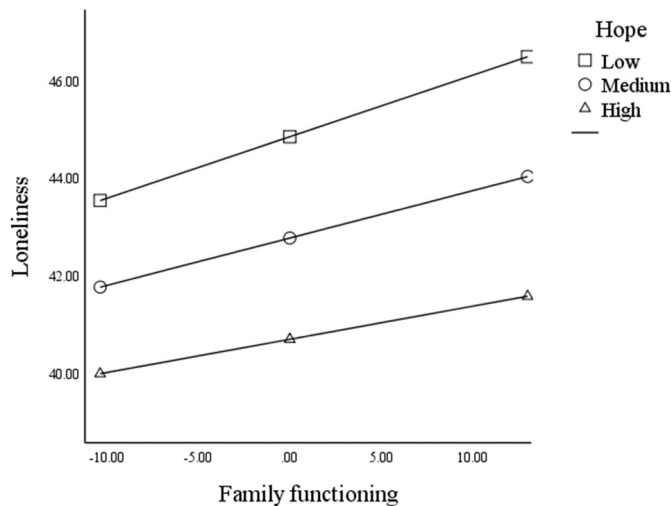


Fig. 2. Simple slopes analysis of hope as a moderator in the association between family functioning and loneliness.

achieving various functions of the family system, and the smoother the process of achieving family functioning, the better the physical and mental health status of the family members; on the contrary, psychological problems can easily arise among family members (Fang et al., 2004). Our results also support the idea of the circumplex model, which proposes that low levels of family functioning are related to less psychological problems (Fresco et al., 2006).

The McMaster model of family functioning assumes that the basic function of the family is to provide certain environmental conditions for the healthy development of family members in physiology, psychology,

and sociality (Fang et al., 2004). Family factors are closely related to people’s mental health, especially during the COVID-19 epidemic, as the family is the main place for secondary vocational students to live and study, and good family functioning helps to relieve anxiety and restlessness, and fosters better coping with learning and life events, and thus improves their mental health. Conversely, poor family functioning can increase people’s psychological problems (such as anxiety and depression). This indicates that secondary vocational students are more likely to have psychological problems in situations of poor family functioning.

4.2. The moderated mediation effect

Our results showed that loneliness plays a mediating role in the relationship between family functioning and mental health of secondary vocational students; that is, family functioning can indirectly affect the level of mental health of secondary vocational students through loneliness. This provides a new perspective to explain why and how family functioning could exert an effect on secondary vocational students’ mental health. Many studies have found that family functioning is significantly related to loneliness (Sharabi et al., 2012; Wang et al., 2011; Wang et al., 2019). This indicates that family functioning is an important factor affecting the loneliness of secondary vocational students. Poor family functioning may lead to a lack of interpersonal skills, ineffective communication and emotional problems within the family, and more obstacles in interpersonal communication, which leads to forming unsatisfactory interpersonal relationships and experiencing more loneliness (Yang et al., 2011). Further, the more severe the loneliness, the lower the level of individuals’ mental health (Yin & Deng, 2019). For example, studies have shown that higher levels of loneliness are associated with higher levels of depression and paranoia among students (Mcintyre et al., 2018). However, with good family functioning, secondary vocational students actively communicate with their families and support and encourage each other. Compared to their peers

with poor family functioning, they experience less loneliness, and thus their mental health is better.

In addition, our results also showed that hope moderates the relationship between family functioning and loneliness. With high and low levels of hope, the family functioning of secondary vocational students has a significant predictive effect on loneliness. With an increase in the level of hope, the predictive effect of family functioning on loneliness weakened. These findings suggest that high hope contributes to reducing the experience of loneliness. Individuals with high levels of hope obtain the benefits derived by finding multiple pathways to their desired goals and this can motivate them to achieve those goals, as well as stay on task and attend to the appropriate cues (Snyder, 2002). Compared with secondary vocational students with low hope, secondary vocational students with high hope can positively cope with learning and life, have confidence in the future and work hard, and hence, experience less loneliness.

4.3. Limitations and future research

Although the findings supported the study hypotheses, this study has some limitations as well. First, the study design was cross-sectional and, thus, it cannot well explain the causal relationship between the variables. Second, the beta coefficients were relatively low in the present study, which may affect the representativeness of the research results. However, although the coefficients were low, they were statistically significant, which indicates that the relationships identified between variables exists. Third, this study focused on secondary vocational students at home during the COVID-19 epidemic. Fourth, this study mainly discussed the influencing path of family factors on the mental health of secondary vocational students, but the influencing mechanisms of mental health are complex and include other factors not addressed in this study.

Considering the above limitations, directions for future research can be identified. First, the moderated mediation model should be examined using a longitudinal study design; findings from such a study could be useful in improving students' mental health levels during the epidemic. Second, research should focus on the mental health problems of secondary vocational students on their return to school and the mechanisms that influence their mental health after their return. Third, future research should explore the influencing factors of mental health from multiple perspectives, such as individual and school factors. Studies have found that cognitive emotion regulation strategies can effectively predict the degree of anxiety and depression in individuals (Garnefski & Kraaij, 2006), indicating that an individuals' emotional regulation abilities have a predictive effect on their mental health. Furthermore, on the basis of relevant research, intervention research can be conducted on the mental health of secondary vocational students in the future. For example, Li et al. (2020a) believe that family is an important factor affecting individuals' mental health level during an epidemic, and individuals with higher family satisfaction and a more harmonious family atmosphere also have a higher mental health index; therefore, interventions targeted at family functioning for individuals with psychological discomfort during the epidemic can be conducted to improve their mental health level. This is of great theoretical and practical significance for improving students' mental health level.

Despite these limitations, the current study makes several contributions. First, from a theoretical perspective, this study extends previous research by confirming the mediating role of loneliness and the moderating role of hope in the relationship between family functioning and mental health. This contributes to understanding why and how family functioning could exert an effect on the secondary vocational students' mental health. Second, from a practical perspective, our findings may help in designing effective psychological interventions aimed at improving family functioning and hope to prevent and reduce secondary vocational students' loneliness and mental health problems, thus improving education and teaching and students' academic

performance during the COVID-19 epidemic. Moreover, the study also provides empirical support for the work of mental health professionals. They can help students improve the relationship between family members from the perspective of family, which is conducive to the healthy development of students and the reduction of psychological problems.

5. Conclusion

In summary, this study is not only of great significance to understanding how family functioning affects the mental health of secondary vocational students, but also plays a reference role for interventions in secondary vocational students' mental health. It suggests that family functioning can not only directly impact the mental health of secondary vocational students, but also influence it through the mediating effect of loneliness. The findings also suggest that hope moderates the mediating role of loneliness in the relationship between family functioning and the mental health of secondary vocational students.

CRedit authorship contribution statement

Pan Yun: Conceptualization; Funding acquisition; Investigation; Project administration; Resources; Supervision; Writing-review & editing.

Yang Zhongping: Conceptualization; Data collection; Formal analysis; Investigation; Methodology; Supervision; Validation; Visualization; Roles/Writing-original draft; Writing-review & editing.

Han Xiaohong: Conceptualization; Data collection; Investigation; Methodology; Supervision; Validation; Visualization.

Qi Shisan: Conceptualization; Resources; Supervision.

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