The role of alexithymia in the mental health problems of home-quarantined university students during the COVID-19 pandemic in China

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ABSTRACT

Objective: While it is well known that mental health problems are common consequences of deadly pandemics, the association with alexithymia is less clear. This study examined this association in an evaluation of home-quarantined university students during the 2019/2020 COVID-19 pandemic in China.

Methods: In total, 2501 home-quarantined students from six southwest Chinese universities completed the following questionnaires: the 20-item Toronto Alexithymia Scale (TAS-20), the Posttraumatic Stress Disorder Checklist-Civilian Version (PCL−C), and the Patients Health Questionnaire-9 (PHQ-9), after which structural equation modeling (SEM) and mediation analyses were employed to extract and evaluate the possible associations.

Results: It was found that participants with probable depression or PTSD also reported more severe alexithymia features, such as difficulties in identifying feelings (DIF) or describing feelings (DDF). Alexithymia was also found to partially mediate the effect of number of exposures on mental health problems.

Conclusion: These results suggested that implementing strategies to assist young people identify and deal with their own emotions and those of others could prevent or mitigate the mental health problems associated with deadly pandemic events. However, future longitudinal studies are needed to examine the specific involvement of DIF or DDF in people with mental health problems.

1. Introduction

The 2019 coronavirus outbreak (COVID-19) in late December 2019 in Wuhan, China, was a public health crisis that caused widespread panic and mental health problems in the general population (Wang et al., 2020). Official Chinese statistical records stated that by May 15, 2020, a total of 84,465 people had been infected, of which 4644 had died. However, outside China, 2,517,043 people had been infected and > 298,404 had died.

Mental health problems and particularly posttraumatic stress disorder (PTSD) and depression have long been associated with exposure to traumas (Bibi, Blackwell, & Margraf, 2019; Howard, Karatzias, Power, & Mahoney, 2017; Howell, Miller-Graff, Schaefer, & Scrafford, 2017), such as natural disasters (Blanc, Bui, Mouchenik, Derivois, & Birmes, 2015; Lowe, Bonumwezi, Valdespino-Hayden, & Galea, 2019; Zhou & Wu, 2019), interpersonal traumas (Fowler, Allen, Oldham, & Frueh, 2013; Nishith, Mechanic, & Resick, 2000) and deadly pandemics

(Mak et al., 2010; Wang et al., 2020; Xiang et al., 2020). Recent studies also found that psychological problems, such as PTSD, anxiety, and depression were prevalent in health workers (Siyu et al., 2020), college students (Huang & rong Liu, 2020), and the general population (Sun et al., 2020) during the COVID-19 outbreak in China.

Epidemiological research suggests that some people may experience these psychological problems in the first stage of trauma, which can place a substantial strain on families and local communities as they work to rebuild their lives (Xie, Wu, & Shen, 2019; Zhou & Wu, 2019). However, the underlying mechanism for the transition from trauma to mental health problems remains unclear.

One key issue in this transition may be deficiencies in emotional identification and expression or alexithymia (Paivio & McCulloch, 2004; Zou et al., 2016), which is a condition related to three state-dependent emotional identification and expression deficiencies (Hendryx, Haviland, & Shaw, 1991): difficulty identifying feelings (DIF), difficulty describing feelings (DDF), and externally oriented

thinking (EOT) (Sifneos, 1991; Taylor, 1994). People with severe alexithymia have an inability to cognitively process and verbalize their emotions and a weakened ability to symbolically fantasize and think (Taylor, 1984). These deficiencies result in an inability to regulate emotions and associated responses, which in turn can predispose people to both psychological and somatic symptoms. Previous studies have found that trauma can predict impairments in emotional awareness and expression (alexithymia) (Kench & Irwin, 2000) and alexithymia has also been closely associated with several psychopathological symptoms (Aricak & Ozbay, 2016; Hendryx et al., 1991; Perry & Hayaki, 2014; Westwood, Kerr-Gaffney, Stahl, & Tchanturia, 2017). However, the role alexithymia plays in post-traumatic mental health problems is still unclear and more detailed research is required to elucidate the possible associations.

To date, there have been no studies on the associations between alexithymia and trauma reactions in people exposed to COVID-19 in China. Further, the results in other trauma-related studies on the associations between mental health problems and alexithymia or its subcategories (DIF, DDF, and EOT) have been inconsistent. Of these three alexithymia factors, for instance, some studies found that the DIF in depression patients was strongly associated with their current psychopathologies, and that both DDF and EOT had marginally significant influences (Conrad, Wegener, Imbierowicz, Liedtke, & Geiser, 2009; Grabe, Spitzer, & Freyberger, 2004). However, other studies found that depression was significantly associated only with DDF (Leweke, Leichsenring, Kruse, & Hermes, 2012) or with both DIF and EOT (Luca, Luca, & Calandra, 2013). These initial studies indicated that alexithymia and its DIF, DDF, and EOT factors appeared to be potential risk factors for mental health problems. However, more research is needed to determine whether the relationships between trauma exposure and PTSD or depression can be explained by specific alexithymia features.

Some studies have examined to degree to which alexithymia mediates the relationships between number of trauma exposures and mental health problems. For example, it was found that the greater the number of traumatic experiences, the stronger the association with severe alexithymia (Hébert, Boisjoli, Blais, & Oussaïd, 2018). Alexithymia was also found to be a predictor for both internal and external symptoms (Mannarini, Balottin, Toldo, & Gatta, 2016). Given the known direct links between trauma and mental health problems, more research is needed into the etiology of pandemic-related mental health problems and the role alexithymia plays in predicting the mental health problems associated with the COVID-19 pandemic to enable the development of more effective mental health intervention services.

The relationship between alexithymia, PTSD and depression has also been studied to some degree, with alexithymia having been found to be independently and uniquely associated with PTSD in adults who had experienced serious physical injuries (Zahradnik, Stewart, Marshall, Schell, & Jaycox, 2009). Several other studies found that PTSD predicted depression (Green et al., 2006); for example, in a longitudinal study on war veterans, PTSD was found to predict subsequent depression and anxiety; however, suffering from either depression or anxiety was not found to change the likelihood of PTSD (Ginzburg, Ein-Dor, & Solomon, 2010). A more recent longitudinal study on adult terrorist attack survivors found that following a traumatic incident, depression may manifest after the emergence of PTSD (Adams et al., 2018). As a direct association between alexithymia and depression has been confirmed, it is possible that alexithymia may be a component of or a related symptom for depression (Parker, Bagby, & Taylor, 1991).

During the COVID-19 outbreak in China, most residents and many university students were advised to self-quarantine at home to prevent community transmission. With the aim of providing a reference for campus psychological services, this study sought to determine the relationships between exposure to the COVID-19 pandemic, alexithymia and mental health problems by: specifically testing the dose–response relationships between number of exposures and mental health

problems; assessing whether the alexithymia features (DIF, DDF, and EOT) were independently correlated with mental health problems; determining whether the relationships between number of exposures and mental health problems were mediated through alexithymia; and investigating whether there were definitive relationships between alexithymia, PTSD and depression; for which structural equation modeling was employed.

Based on previous studies, it was therefore hypothesized that:

Hypothesis 1. Individuals with probable PTSD or depression report more symptoms of alexithymia and its dimensions.

Hypothesis 2. A dose–response relationship exists between number of exposures and mental health problems.

Hypothesis 3. Each alexithymia dimension is independently associated with PTSD or depression.

Hypothesis 4. Exposure to the COVID-19 pandemic affects PTSD or depression through alexithymia.

Hypothesis 5. PTSD mediates alexithymia and depression.

2. Methods

2.1. Participants

Data were collected from a web-based survey at six universities in Chengdu and Chongqing in southwest China between 20 February and 27 February 2020. The survey used convenience sampling to recruit suitable participants from the four universities in Chengdu and the two universities in Chongqing that volunteered to participate. Under representativeness, convenience, and budgetary considerations, 3610 undergraduate students were invited to participate in the study, with 2501 ranging from 16 to 27 years finally completing the surveys, a response rate of 69.3%. The inclusion criterion was that the participants had to be university undergraduates, and the exclusion criteria was a history of past mental illness diagnoses.

2.2. Procedure

This research was approved by the Ethics Committee of the Sichuan Psychology Association. Before the survey was conducted, the questionnaire content and procedures were discussed with the psychological services at all participating universities and written consent obtained from the proper authorities. Electronic consent was also given by participants by signing the first page of the survey. The student participants were informed about the study aims and procedure and data confidentiality, were told that participation was voluntary, and that consent could be withdrawn at any time. The survey was completed on the Chinese Star Survey website, and a relevant smartphone link pushed to the WeChat student group by the undergraduate instructors. After completing the questionnaires, to maximize the participant motivation, a random but small monetary reward (RMB 1–10) was given.

2.3. Measures

2.3.1. Alexithymia

The alexithymia was assessed using the Toronto Alexithymia-20 Scale (TAS-20) (Bagby, Taylor, & Parker, 1994), the questionnaire for which is a 20-item self-report instrument that measures: (a) difficulties in identifying feelings (DIF); (b) difficulties in describing feelings (DDF); and (c) externally oriented thinking (EOT). All items were rated on a 5-point scale from 1-strongly disagree to 5- strongly agree. The sum of all 20 items was used to generate the TAS-20 score, which had a possible range of 20–100, with higher scores denoting more severe alexithymia symptoms. The three subcategories have 5 items each with potential scores ranging from 7–35 for DIF, 5–25 for DDF, and 8–40 for

EOT. The TAS-20 has been proven to be a reliable and valid instrument in many different languages and cultures (Bagby, Parker, & Taylor, 2020), and has also been found to have reasonably good psychometric properties in Chinese populations (Ling, Zeng, Yuan, & Zhong, 2016). In the present study, the Cronbach's α values were 0.838 for the total scale, 0.905 for the DIF subscale, 0.826 for the DDF subscale, and 0.742 for the EOT subscale.

2.3.2. Depression

Probable depression was assessed using the Patient Health Questionnaire-9 (PHQ-9) (Kroenke, Spitzer, & Williams, 2001), which has been found to be a valid screening measure for detecting depression in Chinese populations (Wang et al., 2014). The items were rated on a 4-point scale ranging from 0-never to 3-nearly every day. The total PHQ-9 score ranges from 0 to 27, with scores ≥10 being indicative of possible depression (Manea, Gilbody, & McMillan, 2012). The Cronbach's α in the present study was 0.870.

2.3.3. Post-traumatic stress disorder/PTSD

The presence of PTSD was assessed using the PTSD Check List−Civilian Version (PCL−C) (Weathers, Ruscio, & Keane, 1999), which has 17 items rated on a 5-point scale ranging from 1-not at all to 5-extremely that assess three symptom clusters: re-experience, avoidance/numbing and hyper-arousal. The total PCL-C score ranges from 17 to 85, with scores of 38 or above being considered indicative of probable PTSD (Dobie et al., 2002; Harrington & Newman, 2007). The scale has been found to have reasonably good psychometric properties in Chinese populations (Jin, Xu, Liu, & Liu, 2014). The Cronbach's α in the present study was 0.915.

2.3.4. Exposure to COVID-19

Based on previous disaster exposure scale studies (Roussos et al., 2005), the exposure was assessed using an 8-item scale for which respondents answered with a "yes" or "a no" to evaluate the following 7 objective and 1 subjective exposure features: people infected in the immediate community; living in the worst-affected areas; knowing a person who died of the infection; infected neighbors; infected friends; infected relatives; infected family members; and exposure to stressful media messages: and with one item related to a subjective fear of contamination. The total exposure was calculated by summing the eight sections, with higher scores indicating a higher number of exposures.

The Cronbach's α in the present study was 0.501. Based on the dose-response effect (Kendler, Kuhn, & Prescott, 2004; Liu & Tein, 2005), these answers were added up based on the amount of exposure they had.

2.3.5. Duration of home-quarantine

The home quarantine durations were determined with the question "How much time on average have you spent in quarantine since the COVID-19 outbreak?", with participants categorized into 5 groups: None, < 1 week, 1–2 weeks, 2–4 weeks, and > 4 weeks.

2.4. Statistical analysis

The mean score differences were compared between the undergraduates not reporting probable depression or PTSD and the undergraduates reporting probable depression or PTSD on the total alexithymia survey and on each of the three subcategories. The differences were assessed for significance using an independent-sample *t*-test and Cohen's d calculations. After adjusting for age and gender, stepwise linear regressions were then conducted to examine the independent associations between the alexithymia subcategories (DDF, DIF, and EOT) and depression or PTSD. All statistical analyses were performed using SPSS 22.0 for Windows (IBM, Chicago, IL, USA), and the mediation analysis was conducted using the PROCESS macro (Hayes, 2013) within SPSS 22.0 to test whether alexithymia mediated the relationship between exposure and mental health problems. Structural equation modeling (SEM) using AMOS 20.0 for Windows (IBM, Chicago, IL, USA) was employed to establish the path relationships between the variables and several SEM model indices examined: the goodness of fit index (GFI), the normed fit index (NFI), the comparative fit index (CFI), the Tucker–Lewis index (TLI), and the root mean squared error of approximation (RMSEA). Acceptable model fit was determined as values > 0.90 for the GFI, NFI, CFI and TLI and < 0.08 for the RMSEA, $P < 0.05$.

3. Results

In total, 2501 undergraduate students completed the survey, with 16 being eliminated because of illogical answers, such as all choices being one or zero for all items. Therefore, the final sample was 2485 undergraduate students, of which 960 were male and 1525 were female, with a mean age of 19.8 years (SD, 1.55 years; range, 16–27 years). During the epidemic, 2229 students (89.7%) reported that they had stayed in home-quarantine for: < 1 week (n = 147), 1–2 weeks (n = 242), 2–4 weeks (n = 1704) and > 4 weeks (n = 136).

3.1. Differences in the observed alexithymia between the undergraduate students with and without probable depression or PTSD

Two point 9% (n = 73) of participants scored at or above the clinical cut-off of 38 on the PCL-C, which indicated probable PTSD, and 9% (n = 223) scored at or above the clinical cut-off of 10 on the PHQ-9, which indicated probable depression. The differences in the alexithymia characteristics between the participants with or without PTSD or depression are shown in Table 1. Participants with probable depression or PTSD reported significantly higher levels of total alexithymia and alexithymia DIF and DDF features, with the DIF score in individuals with mental health issues being twice that of the non-depressive individuals.

3.2. Pearson's correlation coefficient of the study variables

Pearson's correlation coefficient was used to examine the potential associations between the study variables (Table 2). While moderate

Table 1
Comparison of alexithymia between the home-quarantined university students with or without PTSD and depressive symptoms (N = 2485).

Measure	Depression (n = 223) (M ± SD)	Non-depression (n = 2262) (M ± SD)	t	Cohen's d	PTSD (n = 73) (M ± SD)	Non-PTSD (n = 2412) (M ± SD)	t	Cohen's d
Total alexithymia	51.38 ± 9.74	40.58 ± 8.46	17.92***	1.18	55.79 ± 8.64	41.11 ± 8.78	14.27***	1.71
Subscale1: DIF	18.27 ± 6.24	11.34 ± 5.11	18.93***	1.22	21.23 ± 5.46	11.68 ± 5.34	15.04***	1.77
Subscale1: DDF	13.81 ± 3.50	10.26 ± 3.09	16.16***	1.08	15.25 ± 2.80	10.43 ± 3.20	12.70***	1.60
Subscale1: EOT	19.30 ± 3.46	18.99 ± 3.79	1.19	0.09	19.51 ± 2.78	19.0 ± 3.78	1.14	0.15

Abbreviations: PTSD, Posttraumatic stress disorder; DIF, Difficulty identifying feelings; DDF, Difficulty describing feelings; EOT, Externally oriented thinking.
*** $P < 0.001$.

Table 2

Correlations between depressive symptoms, PTSD, exposure and alexithymia subscales in home-quarantined university students (N = 2485).

Variable	1	2	3	4	5	6	7	8
1. PTSD	–	0.662**	0.518**	0.570**	0.474**	− 0.004	0.224**	0.018
2. Depressive symptoms		–	0.476**	0.519**	0.442**	− 0.002	0.184**	0.011
3. Total alexithymia			–	0.860**	0.860**	0.397**	0.139**	0.015
4. Subscale1: DIF				–	0.765**	− 0.069**	0.151**	0.024
5. Subscale1: DDF					–	0.074**	0.122**	0.027
6. Subscale1: EOT						–	0.006	− 0.023
7. Number of exposures							–	0.024
8. Home-quarantine duration								–

Abbreviations: PTSD, Posttraumatic stress disorder; DIF, Difficulty identifying feelings; DDF, Difficulty describing feelings; EOT, Externally oriented thinking.
** P < 0.01.

correlations were found between depression and DDF (r = 0.442) or the PTSD symptoms and DDF (r = 0.474), there were stronger correlations observed between depression and DIF (r = 0.570) and PTSD and DIF (r = 0.519); however, no correlations were found between mental health issues and EOT. There was no association between home-quarantine duration and the psychological problem or alexithymia.

3.3. Stepwise regression for depression and PTSD symptoms for the three alexithymia subscales after controlling for age and gender

To identify which specific alexithymia factors were independent predictors for depression and/or PTSD, stepwise linear regression analyses were conducted using the alexithymia subscale categories (see Table 3). Both the DIF and DDF were found to be independently associated with depressive or PTSD symptoms. DIF was found to explain much of the variance for PTSD ($\Delta R^2 = 0.326$) and depressive symptoms ($\Delta R^2 = 0.276$), and DDF was found to explain a small amount of the variance for PTSD ($\Delta R^2 = 0.003$) and depressive symptoms ($\Delta R^2 = 0.005$).

3.4. Mediation analyses for the direct and indirect effects of exposure on mental health problems through alexithymia

The mediation analysis indicated that alexithymia partially mediated the effects of the number of exposures on PTSD (30.77% of the total effect mediated) and depressive symptoms (34.85% of the total effect mediated) (Table 4), with PTSD symptoms being found to partly mediate the association between alexithymia and depressive symptoms (61.86% of the total effect mediated).

3.5. Structural equation modeling

The model fit indices showed an acceptable fit [GFI = 0.999, TLI = 0.991, NFI = 0.998, CFI = 0.998, and RMSEA = 0.042 (90% CI.016–0.080)] and the model was significant ($\chi^2 = 5.46$, df = 1, P = 0.016) (Fig. 1). It was found that exposure exerted a significant direct effect on PTSD ($\beta = 0.16$) and directly affected alexithymia ($\beta = 0.14$). The following indirect paths were also identified: exposure→ alexithymia → PTSD ($\beta = 0.07$); exposure → alexithymia → depression ($\beta = 0.03$); and alexithymia → PTSD → depression ($\beta = 0.29$).

Table 3

Stepwise regression of PTSD and depression with exposure, DIF, DDF and EOT in home-quarantined university students (N = 2485)[a].

PTSD symptoms

		Step 1: adjusted R² = 0.002	Step 2: R² = 0.328	Step 3: R² = 0.331	Step 4: R² = 0.332
Independent variable	Step 0: Coefficients	Beta[a]	Beta[a]	Beta[a]	Beta[a]
Age	0.025	0.027	0.042	0.041	0.041
Gender	0.035	0.030	0.018	0.021	0.022
DIF	0.519***		0.571***	0.500***	0.508***
DDF	0.442***			0.092***	0.084***
EOT	− 0.002				0.026

Depressive symptoms

		Step 1: adjusted R² = 0.001	Step 2: R² = 0.271	Step 3: R² = 0.276	Step 4: R² = 0.276
Independent variable	Step 0: Coefficients	Beta[a]	Beta[a]	Beta[a]	Beta[a]
Age	0.040	0.014	0.028	0.027	0.027
Gender	0.039	0.030	0.019	0.022	0.023
DIF	0.570***		0.519***	0.435***	0.441***
DDF	0.474***			0.110***	0.104***
EOT	− 0.004				0.022

Abbreviations: PTSD, Posttraumatic stress disorder; DIF, Difficulty identifying feelings; DDF, Difficulty describing feelings; EOT, Externally oriented thinking.
[a] PTSD was the dependent variable.
*** P < 0.001.

Table 4
Mediation analyses to assess the direct and indirect effects between exposure, alexithymia, PTSD and depression.

Path	Effect	*SE*	P	95% CI
Exposure(X) → Alexithymia(M) → PTSD(Y)				
Total effect of X on Y	2.375	0.207	< 0.001	1.968–2.781
Direct effect of X on Y	1.664	0.181	< 0.001	1.290–1.998
Indirect effect of X on Y	0.731	0.119	< 0.001	0.508–0.975
X → M	2.165	0.310	< 0.001	1.558–2.772
M → Y	0.338	0.012	< 0.001	0.315–0.360
Exposure(X) → Alexithymia(M) → Depression(Y)				
Total effect of X on Y	1.292	0.139	< 0.001	1.021–1.564
Direct effect of X on Y	0.843	0.124	< 0.001	0.600–1.086
Indirect effect of X on Y	0.449	0.073	< 0.001	0.313–0.594
X → M	2.165	0.310	< 0.001	1.558–2.772
M → Y	0.207	0.008	< 0.001	0.192–0.223
Alexithymia(X) → PTSD(M) → Depression(Y)				
Total effect of X on Y	0.215	0.008	< 0.001	0.199–0.231
Direct effect of X on Y	0.082	0.008	< 0.001	0.067–0.098
Indirect effect of X on Y	0.133	0.007	< 0.001	0.119–0.147
X → M	0.352	0.012	< 0.001	0.329–0.375
M → Y	0.376	0.011	< 0.001	0.354–0.399

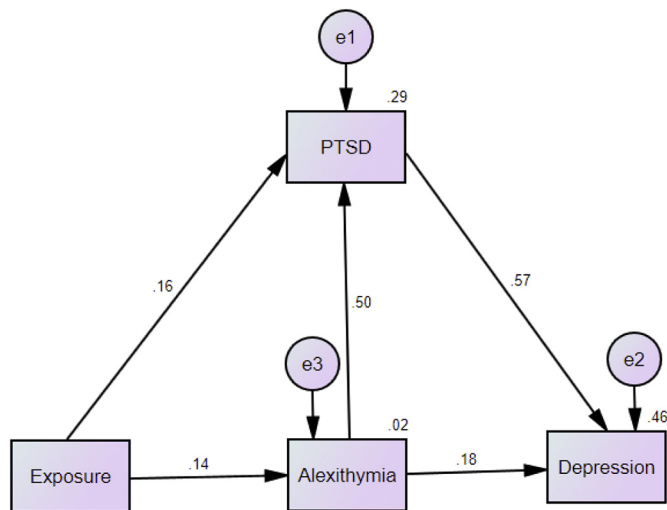Abbreviations: PTSD, Posttraumatic stress disorder; SE, standard error; CI, confidence interval.

Fig. 1. Path diagram showing the structural equation modeling analysis. A structural equation modeling (SEM) analysis was employed to determine the paths between exposure, alexithymia and mental health problems.
Abbreviations: PTSD, posttraumatic stress disorder.

4. Discussion

As the mechanisms for the associations between COVID-19 pandemic exposure and mental health problems in the general population are largely unknown, this study examined whether alexithymia was able to explain this relationship. This cross-sectional study was the first to investigate the role of alexithymia as a mediator between COVID-19 pandemic exposure and mental health problems in a university student population, from which it was found that the students who reported probable depression or PTSD exhibited higher alexithymia and especially DIF and DDF than students who did not report such symptoms. It was also found that PTSD and depressive symptoms were strongly correlated with DIF and DDF. The regression analyses revealed that DIF or DDF were independently associated with PTSD or depressive symptoms in the home-quarantined university students, the SEM and mediation analysis found that alexithymia was a mediator between COVID-19 pandemic exposure and PTSD or depressive symptoms, and PTSD was also found to partly mediate the relationship between alexithymia

and depressive symptoms.

A moderate correlation was found between the DIF and DDF subscale scores and PTSD or depressive symptoms, and DIF and DDF were also found to be independently associated with PTSD or depressive symptoms, which was consistent with several other studies that had examined the associations between alexithymia and psychological distress measures in both clinical and general populations (Ciarrochi, Heaven, & Supavadeeprasit, 2008; Lipsanen, Saarijärvi, & Lauerma, 2004; Marchesi, Fontò, Balista, Cimmino, & Maggini, 2005). One of the reasons for this could have been the commonalities between emotional identification and expression problems, alexithymia and mental health problems (Berking & Wupperman, 2012; Pandey, Saxena, & Dubey, 2011). Another explanation could be that people with alexithymia and especially DIF and DDF have problems identifying and communicating their emotions because they fail to link their affective states to the specific situations, memories or expectations that triggered these affective states (Rieffe et al., 2010). In other words, a person that scores high on the DIF or DDF subscales may find it difficult to differentiate between emotions and verbalization without realizing exactly what has caused these feelings (Leising, Grande, & Faber, 2009). Inevitably, an impaired ability to identify the causes of one's negative emotions might also prevent a person from adequately and adaptively handling that specific situation (Rieffe et al., 2010), which could result in a continuous negative cycle that may eventually develop into depression or other emotional disturbances. The alexithymic difficulties in identifying and describing emotions have been associated with irrational social beliefs (Culhane & Watson, 2003) and specific memory process impairments related to happiness, which could increase (Takahashi, Hirano, & Gyoba, 2015) the risk of negatively interpreting social interactions. Therefore, the results of this study provided strong evidence that alexithymia and the associated emotional recognition and emotional expression difficulties contribute significantly to mental health problems (Berking & Wupperman, 2012) and could be used to identify vulnerable mental health groups.

The finding that alexithymia was a mediator between exposure and mental health supported findings in previous studies that found that alexithymia mediated interpersonal trauma and depression (Hébert et al., 2018) and earthquake trauma and PTSD (Tang, Xu, & Xu, 2020).

The first important path in this study was that the number of exposures led to a more severe alexithymia (Eichhorn, Brähler, Franz, Friedrich, & Glaesmer, 2014). In public health crises such as the COVID-19 pandemic, the self-quarantined students probably attempted to adapt by suppressing, denying, or distancing themselves from their own emotional needs (Spaccarelli, 1994). These coping mechanisms, although beneficial in emotionally unsafe environments, may result in poor emotional awareness when employed over time, possibly giving rise to alexithymia (Canning, Canning, & Boyce, 1992). Therefore, it is likely that alexithymia may develop as part of a coping mechanism (Parker, Taylor, & Bagby, 1998) to avoid exploring the fear and panic associated with COVID-19. Consistent with these interpretations, alexithymia has been found in people trying to cope with the emotions associated with an overwhelming stressor (Devine, Stewart, & Watt, 1999; Karukivi et al., 2010). Therefore, in accordance with previous findings (Craparo et al., 2014; Güleç et al., 2013), it can be concluded that traumatic events can cause emotional disturbances that people seek to cope with by withdrawing from identifying and/or describing their emotions. Therefore, identifying high-exposure students and low-exposure students is important when seeking to develop preventive measures and/or interventions against COVID-19 pandemic-related alexithymia symptoms.

The second path found was that alexithymia increased the risk of depression, which was consistent with a previous study on alexithymia and depressive feelings (Lankes, Schiekofer, Eichhammer, & Busch, 2020). Alexithymia is an emotional identification and expression deficiency that is characterized by a reduced ability to identify and describe feelings (McCaslin et al., 2006). People with alexithymia may find it

difficult to take advantage of social support (Wells, Rehman, & Sutherland, 2016), may develop hostile interpersonal styles (Grynberg, Luminet, Corneille, Grèzes, & Berthoz, 2010), and may fail to recognize their own emotions and those of others or the appropriate responses to those emotions (Kojima, Senda, Nagaya, Tokudome, & Furukawa, 2003). Low social support has often been associated with depression (Stice, Ragan, & Randall, 2004), and it has been proven that people with depressive symptoms typically engage in emotional inhibition strategies to deal with their symptoms and have significant difficulties in subjectively identifying and describing their emotions (hwa Son et al., 2012).

The third path found was that PTSD indirectly accounted for the link between alexithymia and depressive symptoms in the home-quarantined university student sample. It was found that alexithymia had a strong direct effect on PTSD, which was consistent with previous studies in which it was found that alexithymia contributed significantly to numbing and hyperarousal PTSD characteristics (Declercq, Vanheule, & Deheegher, 2010). Not surprisingly, PTSD was also found to strongly predict depression in the self-isolated university students (Ginzburg et al., 2010; Tang et al., 2017). Therefore, the current findings reconfirmed that PTSD and alexithymia both play an important role in the development and/or maintenance of depression in the acute stage following a trauma event.

5. Limitations

There were several study limitations. First, the cross-sectional design limited the ability to make inferences about the directions of causality. Second, although PHQ-9 has been found to have a good ability to identify depression compared to diagnostic interviews (Liu et al., 2016; Wang et al., 2014), and the PCL-C has been found to have a good ability to identify PTSD (Yang et al., 2007) in general populations in China, the measuring instruments used in this study had their own limitations. The exclusive reliance on self-report measures might have limited the conclusions that could be drawn as the setting did not allow for diagnostic assessments, which would have indicated whether probable depression led to actual depressive disorders. Third, as past research has identified other relevant psychopathologies, such as anxiety, somatic symptoms, and suicidality (Cao et al., 2020; Gunnell et al., 2020), these require further exploration in the future. Fourth, in this same vein, social support is widely known to play a significant role in the relationship between trauma exposure and the subsequent development of PTSD; however, as this was not examined in this study, this omission is also considered a limitation.

6. Conclusion

Within the context of these limitations, the results of this study suggested that alexithymia and especially DDF and DIF, which have been somewhat overlooked in previous studies, was highly associated with the development of PTSD or depressive symptoms during the COVID-19 pandemic. Therefore, in terms of psychological services for university students, future studies could engage youths with COVID-related PTSD or depression in exercises to identify their own emotions and the emotions of others. Future longitudinal studies are needed to examine whether a lessening of DIF and DDF results in decreased psychological problems.

This study extended past research and suggests that following a deadly pandemic, depression may occur shortly after the onset of PTSD symptoms. As alexithymia was found to be significantly associated with the participants' post COVID-19 pandemic mental health issues, alexithymia needs to be considered part of the etiology of trauma-related mental health problems in vulnerable groups.

Ethical standards

The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008. This project was approved by the Research Ethics Committee of Sichuan Psychology Association.

CRediT authorship contribution statement

Wanjie Tang: Investigation, Data curation, Writing - original draft, Resources.**Tao Hu:**Investigation, Visualization.**Le Yang:**Software, Formal analysis.**Jiuping Xu:**Conceptualization, Methodology, Writing - review & editing.

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