

A profile analysis of post-traumatic stress disorder and depressive symptoms among Chinese Shidu parents

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ABSTRACT

Background: Due to the one-child policy implemented in China, most families have only one child. When parents experience the death of their only child, these parents receive the label 'Shidu parents'. Shidu is a major public health issue in China. However, the patterns of post-traumatic stress disorder (PTSD) and depressive symptoms that are present in this population remain unclear.

Objective: This study aims to identify profiles of PTSD and depressive symptoms among Shidu parents and to explore the predictors of profile membership.

Methods: A total of 363 participants ($M_{\text{age}} = 61.5$ years, $SD = 7.5$) were asked to complete questionnaires assessing PTSD, depressive symptoms, perceived social support, and demographic information. Latent profile analyses and multivariate logistic regressions were used.

Results: Three distinct profiles were identified: low (39.4%), moderate (32.8%), and high symptoms (27.8%). Parents who were younger and perceived lower levels of support from family and significant others were more likely to experience higher levels of PTSD and depressive symptoms.

Conclusions: These results indicate that the severity of PTSD and depressive symptoms tightly cohere, providing evidence for the co-occurrence of PTSD and depressive symptoms after bereavement. The findings provide valuable information for the development of tailored professional interventions for bereaved parents.

Un análisis de perfil del trastorno de estrés postraumático y de los síntomas de depresión entre los padres shidu chinos

Antecedentes: Debido a la política de un hijo implementada en China, la mayoría de las familias tienen sólo un hijo. Cuando los padres experimentan la muerte de su único hijo, estos padres reciben la etiqueta de 'padres shidu'. Shidu es un gran problema de salud pública en China. Sin embargo, los patrones del trastorno de estrés postraumático (TEPT) y de los síntomas de depresión que se presentan en esta población no están claros.

Objetivo: Este estudio busca identificar los perfiles del TEPT y de los síntomas depresivos entre los padres shidu y explorar los predictores de la pertenencia al perfil.

Método: Se le solicitó a un total de 363 participantes ($M_{\text{edad}} = 61.5$ años, $DE = 7.5$) que completaran cuestionarios para evaluar TEPT, síntomas depresivos, apoyo social, e información demográfica. Se usaron análisis de perfil latente y regresiones logísticas multivariadas.

Resultados: Tres perfiles distintivos fueron identificados: síntomas bajos (39.4%), moderados (32.8%), y altos (27.8%). Los padres que eran más jóvenes y que reportaron niveles más bajos de apoyo desde la familia y otros tenían más probabilidades de experimentar altos niveles de TEPT y síntomas depresivos.

Conclusiones: Estos resultados indican que la severidad del TEPT y los síntomas depresivos coinciden estrechamente, proporcionando evidencia para la co-ocurrencia del TEPT y los síntomas depresivos luego de la pérdida. Los hallazgos proveen información valiosa para el desarrollo de intervenciones profesionales a la medida para los padres en duelo.

中国失独父母创伤后应激障碍和抑郁症状的潜在剖面分析

背景: 子女的死亡是丧亲事件里最有毁灭性的重大创伤事件。与其他国家相比, 中国独生子女政策提高了失独父母比例。在中国, 失独已成为重要的公共卫生问题。尽管已有的研究探讨了失独父母的心理健康状况, 但目前仍缺乏失独父母创伤后应激障碍和抑郁症状的潜在类别及相关因素研究。

目的: 本文旨在探讨失独父母创伤后应激障碍和抑郁症状的潜在类别及其相关因素。

方法: 以365名失独父母($M = 61.5$ 岁, $SD = 7.5$)为研究对象, 采集了其创伤后应激障碍, 抑郁症状, 领悟社会支持和人口学信息, 并进行潜在剖面分析和逻辑回归分析。

结果: 本研究发现了失独父母创伤后应激障碍和抑郁症状的三个潜在类别: 低症状组(39.4%), 中度症状组(32.8%)和高症状组(27.8%)。年龄较小, 来自家庭和他人社会支持水平较低的失独父母更容易表现出较高水平的创伤后应激障碍和抑郁症状。

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关键词

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HIGHLIGHTS

- Three patterns of PTSD and depressive symptoms profiles were found among Chinese Shidu parents: low (39.4%), moderate (32.8%), and high (27.8%).
- Within each profile the severity of PTSD and depressive symptoms tightly cohered.
- Younger age and perceived lower levels of social support were predictors of distinct profiles.
- The current study provides valuable information for the development of tailored professional interventions for bereaved parents.

结论: 结果表明, 失独后的创伤后应激障碍和抑郁症状紧密相关。研究结果为制定针对失独父母的专业干预措施提供了科学依据。

1. Introduction

In the early 1970s, due to the one-child policy implemented in China, most families have only one child (Hesketh, Lu, & Xing, 2005). When parents experience the death of their only child, these parents receive the label 'Shidu parents'. Shidu parents are parents who have lost their only child and the mothers over 49 years of age who have passed their reproductive windows (Chen, 2013). Compared to other countries, China's one-child policy has greatly increased the country's proportion of Shidu parents. It is estimated from population census statistics that there are currently at least one million families in China who have lost their only child, and this number is increasing by approximately 76 thousand families each year (China National Committee on Ageing, 2013). Thus, Shidu is a major public health issue in China.

Research has found that people confronted with the death of a loved one due to a violent or unnatural cause, such as homicide, suicide, or accident, are at elevated risk for developing post-traumatic stress disorder (PTSD) as well as depressive symptoms (Christiansen, 2017; Djelantik, Smid, Kleber, & Boelen, 2017; Kristensen, Weisæth, & Heir, 2012). The death of a child is a life-changing traumatic event that causes severe psychiatric symptoms in parents (Aho, Malmisuo, & Kaunonen, 2017). Previous findings have shown that Shidu parents are at high risk for developing PTSD (Chan et al., 2012; Wang & Xu, 2016; Xu, Wang, & Sun, 2017; Yin et al., 2018). The prevalence rate of PTSD among Shidu parents has been estimated to be 32.6% (Yin et al., 2018). Another research study examined PTSD prevalence in Shidu parents who have lost their only children in an earthquake; the study found that probable PTSD prevalence was as high as 83.5% (Wang & Xu, 2016). Furthermore, depressive symptoms are also prevalent and serious among Shidu parents. A cross-sectional study found that the rate of depressive symptoms in Shidu parents was as high as 44.0% (Zhou et al., 2018). According to a survey by the China National Committee on Ageing, the prevalence rate of depressive symptoms among Shidu parents was estimated to be 50% (China National Committee on Ageing, 2013). Overall, PTSD and depressive symptoms are the most common symptoms among Shidu parents.

Moreover, not every Shidu parent has PTSD or depressive symptoms; in fact, quite a few people have

mild or no symptoms (Wang, Xu, Ren, Wang, & Wang, 2019; Zhou et al., 2018). These findings indicate that there are individual differences in parents' responses (e.g. PTSD and depressive symptoms) to the loss of an only child. A previous study also suggested that people respond to loss of a loved one in different ways (Bonanno, 2004). Thus, fully understanding traumatic response (e.g. PTSD and depressive symptoms) and individual differences in bereavement is valuable. Person-centred analyses account for heterogeneity among individuals, and such analyses identify subgroups of individuals who share common characteristics (Hruska, Irish, Pacella, Sledjeski, & Delahanty, 2014). Latent profile analysis (LPA), a person-centred approach, is a suitable method to identify heterogeneity in PTSD and depressive symptoms within populations. Several previous studies have used LPA to identify various patterns of PTSD and depressive symptoms in individuals after traumatic events. The groups based on patterns identified include a high PTSD and low depressive symptoms group and a low PTSD and high depressive symptoms group (e.g. Contractor, Roley-Roberts, Lagdon, & Armour, 2017), a coexisting high PTSD and high depressive symptoms group and a coexisting low PTSD and low depressive symptoms group (Armour, Contractor, Shea, Elhai, & Pietrzak, 2015; Au, Dickstein, Comer, Salters-Pedneault, & Litz, 2013; Zhen, Zhou, & Wu, 2019), and a predominately PTSD group and a predominately depressive symptoms group (e.g. Cao et al., 2015). These studies were conducted in people who had experienced war, sexual assault, or natural disaster; however, there is still a lack of research on PTSD and depressive symptoms in bereaved parents, especially on Chinese Shidu parents.

To our knowledge, only one study has identified latent profiles based on psychological outcomes (e.g. PTSD, depressive symptoms, prolonged grief disorder, post-traumatic growth, and physical health) among Shidu parents, and it found three profile groups: resilient (characterized by low levels of all indicator outcomes), coping (characterized by moderate levels of physical impairment, PTSD, depressive symptoms, and prolonged grief disorder, as well as the highest levels of post-traumatic growth), and dysfunctional (characterized by high levels of physical impairment, PTSD, depressive symptoms, and prolonged grief disorder, as well as lower levels of post-traumatic growth; Zhou et al., 2018). Although Zhou et al. (2018) tested more psychological indicators and found three latent profiles, the characteristics of latent profiles based only on PTSD and depressive symptoms are still not well understood. In addition, Zhou et al.

(2018) used total scores for the LPA instead of individual item scores. The use of total scores provides a relatively rough analysis that cannot accurately capture the relationship between the two indicators of PTSD and depressive symptoms and cannot identify heterogeneity in these symptoms. In fact, the identification of heterogeneous subgroups on the basis of PTSD and depressive symptoms after bereavement could help in the development of tailored professional interventions for each group.

In addition to identifying individual differences in Shidu parents, another important consideration is to elucidate factors possibly related to individual differences in PTSD and depressive symptoms. The factors that may influence the pattern of psychiatric problems manifested by recently bereaved parents can be divided into two types: demographic and loss-related variables, which include sex, age, cause of death, time since death (Cao et al., 2013; Cao, Yang, & Wang, 2018; Wang & Xu, 2016; Xu & Song, 2011; Yin et al., 2018), and social support.

With regard to sex, some studies have found that females are more likely to develop higher levels of PTSD and depressive symptoms (Cao et al., 2013; Xu & Song, 2011), whereas others have not found significant differences between males and females (Cao et al., 2018; Wang & Xu, 2016). The findings regarding age have also been mixed. Some studies have shown that older individuals are more likely to develop higher levels of PTSD and depressive symptoms (Wang & Xu, 2016; Xu et al., 2017), whereas others have found the opposite associations (Cao et al., 2013; Yin et al., 2018). In addition, it has been shown that time can help alleviate symptoms of PTSD and depressive symptoms in the bereaved (Bratt, Stenstrom, & Rennemark, 2016; Mccarthy et al., 2010). Regarding the cause of death, some studies have found that death from accidents led to more PTSD and depressive symptoms after bereavement than death from disease (Cao et al., 2018; Harper, O'Connor, & O'Carroll, 2014), whereas others have not found a significant difference based on the cause of death (Djelantik et al., 2017; Wei, Jiang, & Basten, 2016).

Social support may be useful to consider when investigating patterns of psychiatric problems. Social support is particularly significant in improving the psychological suffering of persons who have experienced traumatic events. Previous findings have indicated that social support is helpful to bereaved persons in buffering the negative influence of stressful life events, and individuals who have more social support exhibit better mental health than those with less social support (Dai et al., 2016; Rzeszutek, Oniszczenko, & Firląg-Burkacka, 2017). In addition, studies have found that a lack of social support is a risk factor for poor mental health outcomes in bereaved parents, as it leads to more PTSD and depressive symptoms (Cao et al., 2018; Van Der Houwen et al., 2010).

To summarize, these findings have provided valuable information for understanding the trauma response after

bereavement. However, there are several limitations to these previous studies. First, the patterns of PTSD and depressive symptoms among Shidu parents have been insufficiently studied. Second, the findings regarding the roles of demographic and loss-related variables have been mixed. Third, previous studies have suggested that the effect of perceived social support on adaptation to loss is inherently complex (Stroebe, Zech, Stroebe, & Abakoumkin, 2005). However, limited studies have identified the role of different sources of support in bereavement (Cao et al., 2018). Therefore, the aim of this study was to use LPA to identify the various patterns of PTSD and depressive symptoms among Shidu parents and to examine the predictive role of demographic variables, loss-related variables, and social support on profile membership.

2. Method

2.1. Participants and procedure

A cross-sectional study was conducted from November 2016 to July 2017. Participants were recruited from 10 cities in 5 provinces (Baoding and Hengshui in Hebei province; Dezhou in Shandong province; Dingxi in Gansu province; Yanji in Jilin province; and Changzhou, Huaian, Nanjing, Yancheng and Zhenjiang in Jiangsu province). Participants were recruited through the community workers and local health and family planning departments. Participants were informed to voluntarily choose one of their spouses to participate in the study. Participants who satisfied the following inclusion criteria were invited to the community office: (1) the participants had only one child; (2) the child had died, and the participants currently had no living child; (3) female participants were older than 49, which meant that they had passed their reproductive age, and (4) the Shidu parents had lost their only child at least 1 year prior.

The aim of the survey was explained by the investigators. The investigators were trained psychologists and community workers. Anonymity and confidentiality in the reporting of results was emphasized to the participants, and it was clearly indicated that they had the right to withdraw from the study at any time. Written informed consent was obtained from the participants. The data were collected through a paper questionnaire designed for self-reporting. Answers on the questionnaire were obtained through face-to-face interviews if the subjects had difficulties in self-reporting. Finally, after completing the survey, each participant was provided a gift of daily necessities (e.g. thermos bottle, hot pack). The study protocol was approved by the ethics review committee of the Institute of Psychology, Chinese Academy of Sciences. All the research processes met ethical standards. Professional psychological services were provided to the participants if psychological discomfort occurred during

or after the investigation. A total of 395 people participated in this survey. Of these, 22 (5.6%) participants with high rates of missing values for the PTSD Checklist of the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) (PCL-5) and the Centre for Epidemiological Studies Depression Scale (CES-D-10) were excluded, and 10 (2.5%) females who were not older than 49 years of age were also excluded. The final sample consisted of 363 (91.9%) individuals. Among 363 participants, there were 16 couples completing the tests at the same time. As these data account for only a small percentage of the sample, we did not consider their nested structure.

2.2. Measures

2.2.1. Demographic characteristics and loss-related information

A questionnaire was devised to obtain demographic information, including sex (0 = female, 1 = male), age, and loss-related variables, including cause of death (0 = unnatural cause [e.g. accident, homicide, suicide, natural disaster, or other], 1 = natural cause [e.g. illness]), and time since death.

2.2.2. PTSD symptoms

PTSD symptoms were measured by the PTSD Checklist for DSM-5 (PCL-5; Weathers et al., 2013). The PCL-5 is a 20-item self-report inventory measuring the severity of PTSD symptoms over the past month. The 20 items map onto the DSM-5 diagnosis for PTSD (American Psychiatric Association [APA], 2013). The PCL-5 has four subscales that correspond to the four DSM-5 symptom clusters: intrusion, avoidance, negative alterations in cognition and mood, and alterations in arousal and reactivity. The respondents rated how much a problem described in an item statement bothered them over the past month on a 5-point scale from 0 = *not at all* to 4 = *extremely*. In the present study, PTSD symptoms were measured in relation to the perceptions and effects of the Shidu event. Examples of questions included 'How much have you been bothered by feeling very upset when something reminds you of the child's death?' and 'Have you had some trouble remembering important parts of the child's death?'. A cut-off score of 33 or higher indicated the presence of significant PTSD symptoms (Weathers et al., 2013). The Chinese version of the PCL-5 was adapted by translation and back translation and has been previously used in samples of traumatized Chinese populations (Wang et al., 2017). In the present study, the Cronbach's alpha value for this measure was 0.96.

2.2.3. Depressive symptoms

Depressive symptoms were measured by the Centre for Epidemiological Studies Depression Scale (CES-D-10;

Andresen, Malmgren, Carter, & Patrick, 1994). The CES-D-10 is a short form that consists of 10 items from the original 20-item Likert-scale questionnaire assessing depressive symptoms over the past week. The CES-D-10 includes four items on depressed affect, four items on somatic symptoms, and two items on positive affect (with these two items being reverse scored). The options for each item range from 0 to 3 [0 = *Rarely or none of the time* (less than 1 day); 1 = *Some or a little of the time* (1–2 days); 2 = *Occasionally or a moderate amount of time* (3–4 days); and 3 = *Most or all of the time* (5–7 days)]. A cut-off score of 10 or higher indicated the presence of significant depressive symptoms (Andresen et al., 1994). The Chinese version of the CES-D-10 has been validated and widely used in Chinese populations (Yu, Lin, & Hsu, 2013). In the present study, the Cronbach's alpha value for this measure was 0.88.

2.2.4. Perceived social support

Perceived social support was measured by the Perceived Social Support Scale (PSSS; Zimet, Dahlem, Zimet, & Farley, 1988). The PSSS is a 12-item self-report scale that assessing perceived support arising from three groups, namely family, friends, and significant others. The participants answered the questions using a 7-point scale from 1 = *strongly disagree* to 7 = *strongly agree*. Total scores can range from 12 to 84, with higher scores indicating greater perceived social support. The Chinese version of the PSSS has been validated and shown to have good internal reliability (Che et al., 2014; Zhang, Wang, Shi, Wang, & Zhang, 2012). In the present study, the Cronbach's alpha values for the three subscales of family support, friends support, and significant others support were 0.86, 0.90 and 0.89, respectively.

2.3. Statistical analyses

First, Little's (1988) test was used to assess the pattern of missing data. The results revealed that data were missing completely at random ($\chi^2_{1552} = 2197.29, p = 0.12$). Robust maximum likelihood estimation was used to adjust for missing data and estimate the model.

Second, to identify homogeneous groups on the basis of PTSD and depressive symptoms, we conducted LPA based on their endorsed item-level responses on the PCL-5 and CES-D-10. For these analyses, Mplus version 7.0 was used (Muthén & Muthén, 1998–2011). Given the difference in scale range between the PCL-5 and CES-D, the scores for all 30 items were converted to z-scores for LPA. To determine the optimal number of latent profiles to fit the data, 1- to 5-class solutions of LPA models were evaluated and compared based on fit indices, parsimony, and interpretability. We assessed comparative model fit using the following indices: (1) Akaike's

information criterion (AIC), Bayesian information criterion (BIC), and sample-size-adjusted Bayesian information criterion (SS-BIC), with lower values indicating better model fit; (2) entropy, with values between 0 and 1 and higher values indicating higher classification accuracy; and (3) significant Lo-Mendell-Rubin test (LMR), indicating that the k -profiles model was a significantly better fit to the data than the $k-1$ -profiles model. In addition, we also considered the interpretability of the profiles and whether each profile consisted of at least 5% of the sample (Nylund, Asparouhov, & Muthén, 2007).

Third, chi-square tests and one-way analyses of variance (ANOVAs) were used to examine the distribution differences of each variable in each profile. For these analyses, SPSS version 21.0 was used. The variables with different distributions were included in multinomial logistic regression analyses. Multinomial logistic regression analyses were used to test whether demographic variables, loss-related variables, and social support variables differentially predicted profile membership.

3. Results

3.1. Descriptive characteristics of the participants

A total of 363 Shidu parents participated in our survey, including 153 (42.1%) males, 178 (49.0%) females, and 32 (8.9%) with missing sex information. The age of males ranged from 44 to 84 years ($M = 62.2$ years; $SD = 7.8$), and the age of females ranged from 50 to 88 years ($M = 61.4$ years; $SD = 7.0$). With regard to educational level, 104 (34.2%) completed high school or above, and 239 (65.8%) completed only junior high school or below. Regarding marital status, 263 (72.5%) were married (first/remarriage), and 100 (27.5%) were single/divorced/separated/widowed. With regard to their economic situation, the average family monthly income was 3000 RMB (an amount falling in the middle to lower level in China) or below for 242 participants (66.7%), the average family monthly income was more than 3000 RMB for 33 participants (9.1%), and this information was missing for 88 participants (24.2%). For cause of death, 130 (35.8%) had lost their only child due to unnatural cause (accident, homicide, suicide, or other), 184 (50.7%) participants had lost their only child due to a natural cause (illness),

and 49 (13.5%) participants had missing information for this variable. The losses had occurred an average of 10.3 years ($SD = 7.4$) prior to the data collection.

3.2. Latent profile analysis

To identify the most appropriate number of profiles, 1- to 5-profile models were tested. Based on established guidelines, the 3-profile solution was determined to be the final solution. The fit indices for the latent profile solutions are presented in Table 1. As the number of latent profiles estimated increased, the AIC, BIC, and SS-BIC fit indices continuously decreased. However, the decrements were quite small between the 3- and 5-profile solutions, and the SS-BIC value of the 4-profile solution decreased slightly relative to the 3-profile model. The 3-profile models showed higher classification accuracy than the other models. The entropy values were quite similar for all the models tested. With respect to the p -LMR, the values associated with this test reached non-significance with the estimation of the 4- and 5-profile models. Nylund et al. concluded that p -LMR is the most sensitive index to the classification of latent profiles (Nylund et al., 2007). Therefore, the p -LMR supported the 3-profile model. Finally, we found that compared with the 3- and 4-profile models, the 5-profile models offered poor interpretability and less meaningfulness. Furthermore, compared with the 3-profile model, the 4-profile model simply subdivided one of the classes in the 3-profile model into two similar small profiles. Overall, based on fit statistics and substantive interpretability of the profiles, the 3-class model was chosen as the final solution.

As shown in Figure 1, the PCL-5 and CES-D standardized subscores for the 3-profile model of symptom profiles were identified. Profile 1 (39.4% of the sample) was labelled the *low symptom* group because this profile had the lowest levels of PTSD and depressive symptoms. Profile 2 (32.8% of the sample) was labelled the *moderate symptom* group because this profile had medium levels of PTSD and depressive symptoms. Profile 3 (27.8% of the sample) was labelled the *high symptom* group because this profile had the highest levels of PTSD and depressive symptoms. Furthermore, the mean score of the PCL-5 item assessing traumatic amnesia was lower ($M = 0.07$) than the other PCL-5 and CES-D items ($M = 0.32 \sim 1.13$) for Profile 3. However, the mean score of amnesia was higher ($M = 0.45$) than the other PCL-5 and CES-D items ($M = -0.50 \sim 0.28$) for Profile 2. In Profile 1, the

Table 1. Fit Indices for best fit model LPA.

Number of profiles	AIC	BIC	SS-BIC	Entropy	p -LMR	Proportions min
1	30577.28	30810.94	30620.59	-	-	-
2	25692.19	26046.58	25757.88	0.97	< 0.001	0.49
3	24116.26	24591.38	24204.32	0.97	< 0.01	0.28
4	23671.95	24267.79	23782.39	0.95	0.16	0.22
5	23378.00	24094.57	23510.82	0.96	0.23	0.11

AIC = Akaike Information Criterion. BIC = Bayesian Information Criterion. SS-BIC = sample size adjusted Bayesian Information Criterion. p -LMR = p -value of Lo-Mendell-Rubin test. Boldface indicates the selected model.

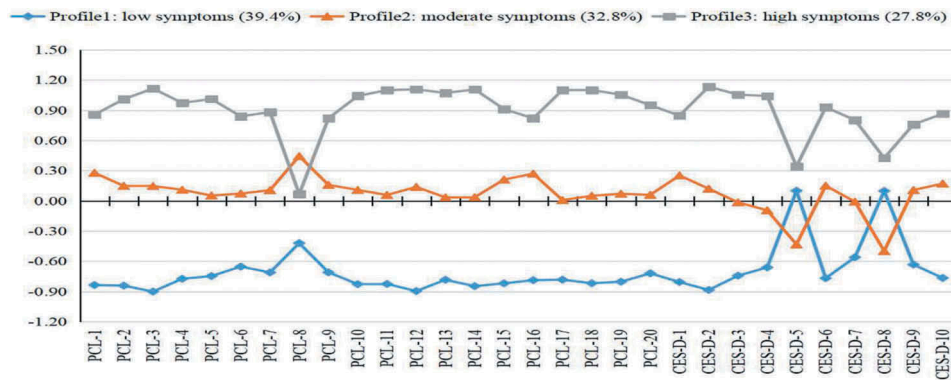


Figure 1. Figure of the three latent profile using the PCL-5 and CES-D-10 item scores.

Note. Horizontal ordinate from 1-20 are the corresponding items of PTSD and 21-30 are the corresponding item of depression symptoms. PCL-1: Recurrent thoughts. PCL-2: Nightmares. PCL-3: Flashbacks. PCL-4: Psychological cue reactivity. PCL-5: Physiological cue reactivity. PCL-6: Avoidance of thoughts. PCL-7: Avoidance of reminders. PCL-8: Amnesia. PCL-9: Negative beliefs. PCL-10: Distorted blame. PCL-11: Negative emotional state. PCL-12: Diminished interest. PCL-13: Detachment. PCL-14: Restricted affect. PCL-15: Irritability or anger. PCL-16: Reckless of self-destructive behavior. PCL-17: Hypervigilance. PCL-18: Exaggerated startle. PCL-19: Difficulty concentrating. PCL-20: Sleeping difficulties. CES-D-1: Bothered by things. CES-D-2: Difficulty keeping mind. CES-D-3: Depressed mood. CES-D-4: Everything is an effort. CES-D-5: Hopeful about future. CES-D-6: Fearful. CES-D-7: Poor sleep. CES-D-8: Happy. CES-D-9: Lonely. CES-D-10: Could not get going.

mean score of amnesia was higher ($M = -0.42$) than other PCL-5 and CES-D items ($M = -0.90 \sim -0.56$) except for two items of CES-D: ‘Hopeful about future’ ($M = 0.10$) and ‘Happy’ ($M = 0.10$), after reverse scoring.

3.3. Predictors of class membership

The χ^2 tests and one-way ANOVA examining the differences among the profiles associated with the 3-profile model on the variables included in the LPA are shown in Table 2. We included the variables that reached significance in the logistic regression analysis. The profiles differed with regard to age, $F(2, 346) = 10.35$, $p < 0.001$, $\eta^2 = 0.06$, and time since death, $F(2, 346) = 5.06$, $p < 0.01$, $\eta^2 = 0.03$. However, no significant differences among the profiles were found in terms of sex, $\chi^2(2, 331) = 4.11$, $p > 0.05$, or cause of death, $\chi^2(2, 318) = 5.26$, $p > 0.05$. The ANOVA also showed that the profiles significantly differed in terms of family support, $F(2, 362) = 70.65$, $p < 0.001$, $\eta^2 = 0.29$, friends support,

$F(2, 362) = 30.36$, $p < 0.001$, $\eta^2 = 0.15$, and significant others support, $F(2, 362) = 64.53$, $p < 0.001$, $\eta^2 = 0.27$.

Multinomial logistic regression analysis was used to determine which predictors were still associated with the profile groups when controlling for the shared variance between the predictor variables. Participant age, time since death, and scores on the three PSSS subscales were included as predictor variables. We compared each pair of groups and calculated the odds ratios (OR) to estimate the strengths of these associations (see Table 3). Compared to those in the low symptoms group, 1) individuals in the high symptom group were more likely to be younger, $OR = 0.95$, 95% confidence interval [CI] = [0.90, 0.99], $p < 0.05$, to report a lower level of family support, $OR = 0.78$, 95% CI = [0.70, 0.86], $p < 0.001$, and to report a lower level of significant others support, $OR = 0.90$, 95% CI = [0.83, 0.98], $p < 0.05$; and 2) individuals in the moderate symptom group were more likely to be younger, $OR = 0.94$, 95% CI = [0.91, 0.98], $p < 0.001$. Compared to those

Table 2. Variables characteristics, scores on social support, diagnostic information for each latent group per the three-profile solution.

	Low symptoms ($n = 143$)	Moderate symptoms ($n = 119$)	High symptoms ($n = 101$)	Significance tests
Sex				
Male	72 (50.35)	39 (32.77)	42 (41.58)	$\chi^2(2, 331) = 4.11$
Female	66 (46.15)	61 (51.26)	51 (50.50)	
Age	63.81 (7.24)	60.47 (6.93)	59.60 (8.61)	$F(2, 346) = 10.35^{***}$, $\eta^2 = 0.06$
Cause				
Natural cause	82 (57.34)	53 (44.54)	49 (48.51)	$\chi^2(2, 318) = 5.26$
Unnatural cause	44 (30.77)	41 (34.45)	45 (44.55)	
Time since death	11.41 (8.54)	10.76 (7.37)	8.40 (5.36)	$F(2, 346) = 5.06^{**}$, $\eta^2 = 0.03$
Family support	17.63 (4.94)	16.23 (5.52)	10.06 (5.92)	$F(2, 362) = 70.65^{***}$, $\eta^2 = 0.29$
Friends support	16.09 (4.96)	14.87 (5.49)	10.64 (7.16)	$F(2, 362) = 30.36^{***}$, $\eta^2 = 0.15$
Significant others support	16.79 (5.01)	16.69 (5.56)	9.78 (5.93)	$F(2, 362) = 64.53^{***}$, $\eta^2 = 0.27$

Sex was dummy coded such that 1 = male and 0 = female. Cause of death was dummy coded such that 1 = Natural cause, 0 = Unnatural cause.

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

Table 3. Multinomial logistic regression predicting profile membership.

		B	SE	OR	95%CI	p-value
High vs. Low [#]	Age	-0.06	0.02	0.95	[0.90, 0.99]	< 0.05
	Time since loss	-0.05	0.03	0.96	[0.91, 1.01]	0.08
	Family support	-0.25	0.05	0.78	[0.70, 0.86]	< 0.001
	Friends support	0.09	0.05	1.09	[1.00, 1.19]	0.05
	Significant others support	-0.10	0.04	0.90	[0.83, 0.98]	< 0.05
High vs. Moderate [#]	Age	0.01	0.02	1.01	[0.96, 1.05]	0.95
	Time since loss	-0.05	0.03	0.95	[0.91, 1.01]	0.06
	Family support	-0.17	0.05	0.84	[0.76, 0.93]	< 0.001
	Friends support	0.12	0.05	1.13	[1.03, 1.24]	< 0.01
	Significant others support	-0.17	0.04	0.84	[0.77, 0.92]	< 0.001
Moderate vs. Low [#]	Age	-0.06	0.02	0.94	[0.91, 0.98]	< 0.001
	Time since loss	0.03	0.02	1.00	[0.97, 1.04]	0.85
	Family support	-0.08	0.04	0.93	[0.85, 1.01]	0.06
	Friends support	-0.03	0.04	0.97	[0.89, 1.05]	0.41
	Significant others support	0.07	0.04	1.07	[0.99, 1.15]	0.07

B = Beta. SE = Standard Error. OR = Odds Ratio. CI = Confidence Interval. # indicates the reference profile.

in the moderate symptom group, individuals in the high symptom group were more likely to report a lower level of family support, $OR = 0.84$, 95% CI = [0.76, 0.93], $p < 0.001$, higher level of friends support, $OR = 1.13$, 95% CI = [1.03, 1.24], $p < 0.01$, and lower level of significant others support, $OR = 0.84$, 95% CI = [0.77, 0.92], $p < 0.001$.

In summary, parents who were younger were more likely to be included in the moderate or high symptom group. Parents who reported lower levels of family and significant others support were more likely to be included in the high symptom profile group. In contrast, parents who reported a higher level of friends support were more likely to be included in the high symptom group, and level of friends support did not distinguish the low symptom group from the moderate and high symptom groups. Sex, cause of death, and time since death had no predictive effects in this study.

4. Discussion

The current study used LPA to examine patterns of PTSD and depressive symptoms among Shidu parents. Three distinct profile groups of individuals with low symptoms (39.4%), moderate symptoms (32.8%), and high symptoms (27.8%) emerged from the data, which indicated that individual heterogeneity existed in the post-traumatic reactions. Additionally, the present study found that several covariates were related to the latent profiles. These findings advance our understanding of Shidu parents' traumatic response patterns after loss.

The current study revealed three patterns of PTSD and depressive symptoms. Within each profile, the severity of PTSD and depressive symptoms tightly cohered. Specifically, one set of parents (27.8%) exhibited high levels of both PTSD and depressive symptoms. Another set of parents (32.8%) reported moderate levels of both PTSD and depressive symptoms. The findings of our study provide support for the co-occurrence of PTSD and depressive symptoms post bereavement (Djelantik et al., 2017; Harper et al.,

2014). This finding, however, is not consistent with some previous findings regarding subgroups of individuals with predominant PTSD or predominant depressive symptoms (Contractor et al., 2017; Heeke, Stammel, Heinrich, & Knaevelsrud, 2017; Nickerson et al., 2014). This may be partly because the trauma of losing an only child is especially serious. On the one hand, in Chinese culture, a child has an important value to parents, which is that a child is the major source of hope and the meaning of life for their parents. (Zimmer & Kwong, 2003). Parent-child bonds are highly strained (Feng, 2018). Moreover, Chinese culture regards the death of a child as a sign of bad luck, which brings feelings of stigma to parents; thus, Shidu parents encounter both psychological trauma and cultural pressure (Zheng & Lawson, 2015). Therefore, Shidu parents might experience an unforgettable grief process and have higher vulnerability to PTSD. On the other hand, a child plays an important economic and social support role for parents (Wei et al., 2016). Losing the only child means that Shidu parents have lost their care provider during the ageing process, which increases the financial burden of these parents (Wang et al., 2019; Xiao & Yang, 2014). This increased economic pressure further leads to depressive symptoms. Overall, psychological trauma, cultural pressure and financial burden could exacerbate PTSD and depressive symptoms. Thus, these aspects are important in explaining why the current research did not find a profile marked by predominant PTSD or predominant depressive symptoms.

Our findings differed from those of previous LPA studies in terms of the profiles' proportions of PTSD and depressive symptoms. Specifically, the high symptom group proportion (27.8%) was higher than that reported in previous studies (from 5.4% to 9.0%; Cao et al., 2015; Zhen et al., 2019). The moderate symptom group proportion (32.8%) was close to that identified in Armour et al. (2015); however, it was higher than some other previous studies (Zhen,

Quan, & Zhou, 2018; Zhen et al., 2019). The low symptom group proportion (39.4%) was smaller than those identified in previous studies (Cao et al., 2015; Zhen et al., 2019). It is possible that this difference resulted from the different types of traumatic events experienced by participants. Previous research examined samples consisting of veterans (Armour et al., 2015), flood disaster victims (Zhen et al., 2018), and earthquake survivors (Zhen et al., 2019), whereas the participants in the present study were bereaved parents who had lost their only child, which might have led to more traumatic responses than other types of traumatic events (Liang, Zhou, & Liu, 2019; Liu et al., 2017).

We found that the average score of the PCL-5 item assessing traumatic amnesia was lower relative to other PCL-5 items for the high symptom group. In the current study, amnesia was assessed as Shidu parents' inability to remember important aspects of the child's death, which is typically due to dissociative amnesia. Amnesia episodes are common in traumatic experiences, such as in car accidents (APA, 2013). However, only a low proportion of participants (20%) have been exposed to a trauma such as a car accident while losing their child in this study, which may not have easily made those parents have trouble remembering. Moreover, the difference between the loss of an only child and other traumatic events (e.g. earthquakes and car accidents) is that the parents would continually remind themselves of their loss. When they see the empty bedroom that used to belong to their child or notice other children who are of a similar age to the child they have lost, they may remember all the details of the child's death (He, Tang, Zhu, & Wang, 2014). Therefore, the environment that they encounter may bring about a return of memory for Shidu parents.

In addition, a considerable number of Shidu parents (39.4%) reported lower levels of PTSD and depressive symptoms. This outcome has important public health implications, as it suggests that adaptation is a possible response following loss. These findings accord with prior evidence that some people exposed to trauma and experiencing bereavement still have the ability to deal with stress and loss (Alam, Barrera, D'Agostino, Nicholas, & Schneiderman, 2012; Djelantik et al., 2017; Zhou et al., 2018). However, we should not be too optimistic about Shidu parents, even in the low symptom group. Parents in this group are not fully adaptive after the loss of their only child. As our findings revealed, parents in the low symptom group reported lower scores on the items 'Hopeful about future' and 'Happy'. This implies that parents still worry about their future lives and feel less happy, even in the low symptom group, which suggests that Shidu parents still need attention.

In this study, we further explored the roles played by demographic variables, loss-related variables, and social support variables. We found that younger parents were more likely to be in the profile groups with high and moderate levels of PTSD and depressive symptoms. This finding is consistent with some previous studies (Cao et al., 2013; Wei et al., 2016; Yin et al., 2018), but inconsistent with other results (Xu & Wang, 2016; Xu et al., 2017). The possible explanation for this is that with increasing age, individuals accumulate more experience facing negative events and have more psychological energy to deal with catastrophic events (Amir & Ramati, 2002). Sex and cause of death had no predictive effects in this study, which was inconsistent with the results of some prior studies (Cao et al., 2018; Zhen et al., 2018). The main reason for these results may lie in the intricacies of Chinese culture. In Chinese culture, children are vital for generational continuity, for which both men and women are responsible; thus, irrespective of the cause of death, those who have lost a child suffer tremendously. Furthermore, we found that time since death did not predict profile assignment, which is inconsistent with the results of previous studies indicating that time can help alleviate grief symptoms in the bereaved (Bratt et al., 2016) but consistent with the results of studies of Chinese parents who lost their only child (Cao et al., 2018; Wei et al., 2016). This finding in the current study may be due to the severity of the trauma caused by the loss of an only child. As a child has an important value to parents in Chinese culture, losing a child is a tremendous threat to parents, and psychological distress is unlikely to diminish as time goes by, especially in a Chinese context.

Different types of social support had different predictive effects on inclusion in a particular profile group. In line with previous findings with other traumatic populations (Dai et al., 2016; Rzeszutek et al., 2017) and following bereavement (Cao et al., 2018; Xu et al., 2017), we found that parents who perceived lower levels of support from family and significant others were more likely to be included in the profile group with higher levels of PTSD and depressive symptoms. According to the theory of social support, the more social support a person has, the better the individual can cope with various challenges from the outside world (Cao et al., 2018; Van Der Houwen et al., 2010). In addition, we found results contrary to the expectation that friends support did not distinguish individuals in the low symptom group from those in the moderate or high symptom group, although the level of friends support was higher in the high symptom group than in the moderate symptom group. Thus, it could be concluded that the effect of friends support on the effects of buffering from bereavement in this study was weak or unstable. The main reason for this finding is also related to Chinese culture. In the Chinese cultural context, the loss of an only child means termination of family lines

and loss of a caregiver, and communicating about the death of an only child could be stigmatizing; thus, Shidu parents not only experience social isolation but also show a reluctance to be associated with others, especially with families that have children. However, those parents are often willing to associate with other Shidu parents as *Tong Ming Ren*, which means ‘those who share the same destiny’ (Zheng & Lawson, 2015). Therefore, their social circle will be restored over a period of time, and the effect of friends support will reflect instability.

4.1. Limitations

When interpreting our findings, the limitations of the present study should be considered. First, self-report instruments were used and the participants may have been somewhat subjective and thus subject to recall bias. Future studies should collect data from multiple informants to better replicate our findings. Second, the individuals in this study are limited to Chinese Shidu parents, and the sample size is small, due to the difficulties in accessing this group. Therefore, the findings of this study must be interpreted with caution, and its conclusions should be carefully generalized in deference to potential stability problems in the data. Third, it would be valuable to include prolonged grief disorder (PGD) when investigating the mental health of Shidu parents given that PGD is one of the main psychological syndromes closely associated with the death of a loved one (Djelantik et al., 2017). For instance, the prevalence rate of PGD among Chinese Shidu parents has been estimated at 16.2% (Zhou et al., 2018). However, a more comprehensive assessment including PGD and potential additional losses was not implemented in the current study. This psychological syndrome and information of additional losses could be examined in the future. Finally, this was a cross-sectional study, so the timing of the measurement could not establish formal causal relationships. Future research should use longitudinal designs to observe the characteristics of symptoms and to determine the direction of causality.

4.2. Implications

The present study has important theoretical and practical implications. First, the current study confirms that post-traumatic responses are heterogeneous among Shidu parents, providing evidence that individuals could be distinguished into different subgroups according to PTSD and depressive symptoms after bereavement. This suggests that psychological assistance and trauma interventions are supposed to vary by person. Thus, interventions tailored to the individuals’ specific needs may be more effective than universal treatments that indiscriminately target these groups. We also found that the severity of PTSD and depressive symptoms

tightly cohered. These findings provide evidence for the co-occurrence of PTSD and depressive symptoms after bereavement, which indicates that intervention should be considered for PTSD and depressive symptom simultaneously.

Second, we found that parents were still worried about their future lives and felt less happiness even when conforming to the low symptom profile. This finding reminds us that parents’ anxiety and happiness need to be evaluated. Elderly parents are a vulnerable group and are associated with a low overall economic status, even before they lose their only child (Xiao & Yang, 2014). Moreover, the pension system in China is far from perfect. Shidu parents may worry about their future lives, with the concern that no one would care for them in their old age. Additionally, Shidu parents may have less happiness due to the value of a child and their special cultural background. Therefore, it is urgent to enact effective strategies to reduce anxiety levels and increase happiness in Shidu parents. For instance, more financial and psychological support should be offered to Shidu parents by the government and other social organizations, such as improving the pension system, financing poor families, and establishing psychological counselling channels for Shidu parents.

Finally, the current study provides a useful direction for identifying high-risk groups. For instance, parents who are younger and have poorer perceived family and significant others support have an elevated risk for symptoms of PTSD and depression. This implies that younger individuals are more vulnerable and merit attention. Additionally, family support and significant others support are important protective factors against psychopathology after loss. Thus, it is helpful to establish or rebuild a social network for Shidu parents. For instance, with regard to family support, it would be beneficial to promote the family relationship in Shidu parents whereby mutual understanding can be enhanced to provide support for each other. With regard to support from significant others, social organizations or community workers should be mobilized to provide support for Shidu parents.

5. Conclusion

Three distinct profiles of individuals with low symptoms (39.4%), moderate symptoms (32.8%), and high symptoms (27.8%) were found among Chinese Shidu parents. Additionally, parents who were younger and reported lower levels of support from family and significant others were differentiated across the latent profiles. These findings advance our understanding of Shidu parents’ traumatic response patterns after losing an only child.

Disclosure statement

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