




## Regular Article

# Patterns of childhood maltreatment influence sleep quality: The role of emotion regulation

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### Abstract

Childhood maltreatment exerts long-term consequences on sleep health, and different subtypes could constitute maltreatment patterns. However, how naturally occurring patterns of childhood maltreatment affect subsequent sleep quality and the underlying mechanisms remain relatively unclear, particularly in youths undergoing a transitional period and in the Chinese cultural context. In this study, we identified childhood maltreatment patterns and explored how these patterns predicted sleep problems through differential emotion regulation strategies. We tracked 1929 Chinese youths ( $M_{age} = 18.49$ ; 63.1% females) for one year. Three latent profiles were identified: low maltreatment exposure, high physical and emotional maltreatment, and high sexual abuse. Compared with “low maltreatment exposure,” youths in “high physical and emotional maltreatment” used fewer cognitive reappraisal strategies, and those in “high sexual abuse” used more expressive suppression, and then leading to more sleep problems. This study reveals new insights into the patterns of childhood maltreatment in Chinese youths and implies that individuals exposed to sexual abuse or a combination of physical and emotional maltreatment experience sleep problems through the impairment of differential emotion regulation processes. It also highlights the necessity of setting differential targets on emotion regulation strategies for distinct groups of maltreatment and considering the co-occurrence of physical and emotional maltreatment.

**Keywords:** Childhood maltreatment; sleep problems; emotion regulation; cognitive reappraisal; expressive suppression

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### Introduction

Sleep is essential to individual healthy development across physical, cognitive, and psychosocial domains (Medic et al., 2017). Youths, defined as those persons between the ages of 15 and 24 years, undergo salient transitions and are confronted with important but competing developmental tasks (United Nations, 2023). They reported more sleep problems than children and early adolescents (Gradisar et al., 2011). Studies have indicated that sleep problems could be shaped by both distal childhood experiences (Kajeepeeta et al., 2015) and proximal regulatory processes (Nielsen, 2017). However, how distal factors influence sleep problems through proximal regulation strategies remains unclear, much less so from a person-centered perspective. Maltreatment subtypes often co-occur within individuals (Contractor et al., 2018), and the present study aimed to determine the co-occurring patterns of childhood maltreatment and then explored how differential maltreatment profiles predicted subsequent sleep problems through strategies of emotion regulation.

### Childhood maltreatment and sleep problems

Sleep problems are defined as a sleep pattern that is insufficient, inconsistent, nonrestorative, disrupted, or poorly timed (Gradisar et al., 2011). Youths in China often reported less than six-hour sleep at night (Li et al., 2019; X. Liu et al., 2022), and 25.7% of them had a

degree of sleep disturbances, according to a meta-analysis (Li et al., 2018). The opponent-process theory on sleep (Dahl & Lewin, 2002; Dahl, 1996) proposes that sleep is a physiological state with a significant diminishment of awareness and arousal to the external environment; thus, it can be facilitated by perceptions of safety and places where the needs of vigilance are minimal (Tsai et al., 2018). Adverse experiences, however, may deprive individuals of the emotional and social security required for restorative sleep (Hamilton et al., 2018). Children exposed to maltreatment are more likely to develop sleep disturbances, an important aspect of posttraumatic stress symptoms, including being hyperarousal and having nightmares of re-experiencing the maltreated experiences (Charuvastra & Cloitre, 2009). Maltreatment exposure could induce sleep problems not only in childhood but also in adulthood (Laskemoen et al., 2021).

Childhood maltreatment refers to the phenomenon in which a parent or caregiver harms or endangers a child in their care that occurs in children under 18 years of age (Sedlak et al., 2010). It is a multidimensional construct that encompasses both abuse and neglect (Rivera et al., 2018). Abuse is referred to direct harm (e.g., slapping, insulting) and often includes sexual, physical, and emotional abuse (Oh et al., 2018; Sedlak et al., 2010); neglect is defined as being unsupported or unprotected and includes physical and emotional neglect (Oh et al., 2018; Sedlak et al., 2010).

### Latent profiles of childhood maltreatment

Researchers have increasingly recognized that experiences of maltreatment often co-occur (Rivera et al., 2018). One exposure to

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maltreatment significantly increases the risk for further exposure, such that children exposed to emotional neglect are more vulnerable to experiencing physical neglect and emotional abuse (John-Henderson et al., 2018). Therefore, exposure to childhood maltreatment may reflect an interrelated pattern. Under this conceptualization, maltreatment exposure should be explored by examining multiple subtypes simultaneously and considering its co-occurrence (Oh et al., 2018).

Using a person-centered approach such as latent profile analysis (LPA) and latent class analysis, researchers can group individuals into distinct groups based on combined maltreatment endorsements (Rivera et al., 2018). Additionally, compared with latent class analysis based on the occurrence of maltreatment, LPA based on severity could provide a more nuanced understanding of maltreatment patterns (Zhang & Zheng, 2018). Individuals in the same profile share similar patterns of maltreatment in terms of both maltreatment subtypes and severity (Contractor et al., 2018). Thus, LPA provides a comprehensive and refined strategy to distinguish the characteristics of childhood maltreatment (Contractor et al., 2018). Considering that sexual abuse, physical abuse, physical neglect, emotional abuse, and emotional neglect are the most common subtypes of childhood maltreatment (Oh et al., 2018; Rivera et al., 2018), we included these five subtypes as indicators to identify the patterns of childhood maltreatment.

There has been a concerted effort by researchers to use LPA to identify distinct patterns of childhood maltreatment. However, only a few of them have studied the associations between maltreatment patterns and later sleep problems. Hoag et al. (2015) found that the “most extreme abuse” class (frequent combined emotional, physical, and sexual abuse; also named “poly-traumatization”) exhibited the strongest association with poor sleep quality in low-income young women after experiencing a hurricane. This finding, however, might be limited in the particular sample who experienced both childhood interpersonal trauma and recent natural disaster, providing less common information for practical implications in general youths. Moreover, the underlying mechanisms through which childhood maltreatment patterns affect sleep problems are largely unclear, particularly in non-Western countries, such as China.

In the Chinese cultural background that emphasizes the sense of collectivity and social harmony, individuals exposed to maltreatment might be prone to feel shame and guilty (Futa et al., 2001). Specifically, Chinese self-identity is defined as a system of relationships, in which shame is more likely to be derived from interpersonal events. Besides, the triggers for guilt appear to span a broader range in Chinese culture than Western culture (Bedford & Hwang, 2003). Thus, Chinese might be more shame- and guilt-prone compared to Westerners (Zhuang & Bresnahan, 2017). Further, shame and guilt could exert a detrimental effect on emotion dysregulation, and they were positively associated with expressive suppression (Liw et al., 2022). Considering all the above, focusing on the underlying mechanisms of emotion regulation is of great significance in Chinese culture.

### *Mechanism between childhood maltreatment and sleep problems*

Maltreatment exposure during the sensitive developmental period of childhood could interfere with individuals' learning ability of emotion regulation (Warmingham et al., 2022). Thus, it may be difficult for youths exposed to maltreatment to use different

strategies to adaptively down- and up-regulate emotional experiences (Snow et al., 2022), which in turn induce sleep problems in childhood and even adulthood (Laskemoen et al., 2021). Thus, emotion regulation strategies may function as a mediating mechanism underlying childhood maltreatment and sleep problems.

According to the cognitive model of trauma (Ehlers & Clark, 2000), adverse experiences can influence individuals' cognitive processing and produce excessively negative appraisals of maltreatment and its sequelae, thereby leading to fewer benign or positive interpretations or perspectives of the stressful situation (i.e., cognitive reappraisal; Gross & John, 2003). The lack of cognitive appraisal might lead to sleep problems especially recurrent emotional dreaming about the maltreatment (Nielsen, 2017). In addition, Gaensbauer and Jordan's (2009) defensive coping theory proposes that maltreated individuals may develop “maladaptive” emotion regulation strategies to cope with their abusive experiences and negative affect. Although such strategies can relieve distress and work in an abusive setting for a short term, chronic usage may result in the circles of emotional cascade (Baiden et al., 2015). Expressive suppression is a common example of the “maladaptive” strategies after experiencing maltreatment, which refers to a form of response modulation inhibiting ongoing emotional expression (Snow et al., 2022). Since sleep is a physiological state with diminished awareness of the external environment (Dahl & Lewin, 2002), expressive suppression may contribute to increased sleep problems (Ellis et al., 2019).

Considering the above frameworks, the focus of this study was on two strategies of emotion regulation: cognitive reappraisal and expressive suppression. In the Chinese cultural background where maintenance of interpersonal harmony is highly advocated, individuals are less likely to show emotional expression that may draw unwanted attention to themselves or against group cohesion (Soto et al., 2011). Meanwhile, researchers found that compared with American youths, Chinese-born youths exhibited greater beliefs that emotions are changeable and use more cognitive reappraisal (Qu & Telzer, 2017). Consequently, the examination of the mediating roles of cognitive reappraisal and expressive suppression might be of great implications for Chinese youths. In addition, emotion regulation strategies were found to be correlated (Lougheed & Hollenstein, 2012), thereby examining reappraisal and suppression together could provide a more accurate understanding of their effects on psychopathology.

Moreover, previous literature has supported differential pathways of cognitive reappraisal and expressive suppression between childhood maltreatment and psychopathological outcomes. For instance, Zhou and Zhen (2022) found that expressive suppression (but not cognitive reappraisal) mediated the link between emotional abuse and depression, whereas it did not mediate the link between physical abuse and depression. This finding implies that different abusive exposure has distinct influential mechanisms on psychopathology because they may impair different regulatory processes (Zhou & Zhen, 2022). Researchers using a person-centered approach also have revealed that profiles of childhood maltreatment link to emotion regulation differentially, suggesting that “chronic and multiple trauma” and “neglect only” similarly decreased affective processing but only “chronic and multiple trauma” increased emotion regulation difficulties (Warmingham et al., 2022). Taken together, there may appear potentially different mechanisms of emotion regulation strategies underlying childhood maltreatment patterns and sleep problems.

## The present study

Despite some explorations of childhood maltreatment profiles in specific populations, it is still largely unknown how childhood maltreatment co-occurs in Chinese youths; also unclear are the underlying mechanisms through which childhood maltreatment affects sleep problems. To fill these gaps, this study used LPA to identify how sexual, physical, and emotional maltreatment co-occur in Chinese youths; whether youths with distinct profiles showed different severity of sleep problems; and how cognitive reappraisal and expressive suppression mediate the associations between maltreatment patterns and sleep problems. Since youths undergoing a transitional period may depend on emotion regulation skills and strategies (Warmingham et al., 2022) and report severe sleep problems (Li et al., 2018), the identification of emotion regulation mechanisms could be helpful in differential targets on emotion regulation strategies for distinct maltreatment groups.

We hypothesized that at least three groups would be identified: a group with minimum maltreatment, a group with primarily sexual abuse, and a group with both elevated abuse and neglect (Zhang & Zheng, 2018). The group characterized by high endorsement of multi-subtype maltreatment would report the highest levels of sleep problems (Hoag et al., 2015). Furthermore, we expected that childhood maltreatment patterns would predict sleep problems via cognitive reappraisal and expressive suppression differently (Zhou & Zhen, 2022).

## Method

### Participants

The current study engaged a sample of youths who participated in a longitudinal Youths' Well-Being Project in mainland China from 2019 to 2020. At baseline (T1), the sample included 2447 participants ranging in age from 16 to 22 ( $M_{age} = 18.51$ ;  $SD = 0.80$ ), and 58.8% were females. The second wave of data collection (T2) was conducted approximately 12 months after T1. At T2, 2551 youths ( $M_{age} = 19.31$ ,  $SD = 0.89$ ; 63.7% were females) participated. To ensure that our results were based on valid responses, we embedded quality check items (e.g., Please choose "agree") in the survey to screen out inattentive respondents. A total of 1929 youths participated in both waves and passed the quality check items, resulting in an effective retention rate of 78.8%. The Missing Completely at Random test (Little & Rubin, 2002) was conducted, and the results indicated that the data were not missing completely randomly,  $\chi^2 = 382.56$ ,  $df = 187$ ,  $p < .001$ . However, the effect sizes were quite small ( $\eta^2 < .005$ ), indicating a minimal impact on the results.

The final sample included 1929 participants ( $M_{age} = 18.49$ ,  $SD = 0.80$ ; 63.1% were females). Almost half of them (55.0%) resided in rural areas, approximately 13.8% resided in the suburban area, and 31.2% resided in the city. In addition, the majority of the participants (85.2%) came from intact families, and others came from divorced families (5.6%), reconstituted families (5.0%), or others (e.g., living with other relatives; 4.2%). Approximately 32.2% of their fathers and 29.9% of their mothers reported more than a high school diploma. In terms of the annual household income, a total of 14.0% of the participants reported living in households with an annual income at or above the average for Chinese families (approximately \$13,700 annually; National Bureau of Statistics of the People's Republic of China, 2019).

### Procedure

The research team gained approval from the research ethics committee of Beijing Normal University. Next, the team leader contacted the principal of the school and obtained the students' informed consent to our study. During the baseline survey, participants finished a series of questionnaire questions through the online Qualtrics Survey Software (Qualtrics Labs, Inc., 2012, for approximately 20 minutes). One year later, participants completed the follow-up survey. They were assured that their responses would be kept completely anonymous. The two waves of data were matched based on participants' Student IDs that were completed at both waves.

### Measures

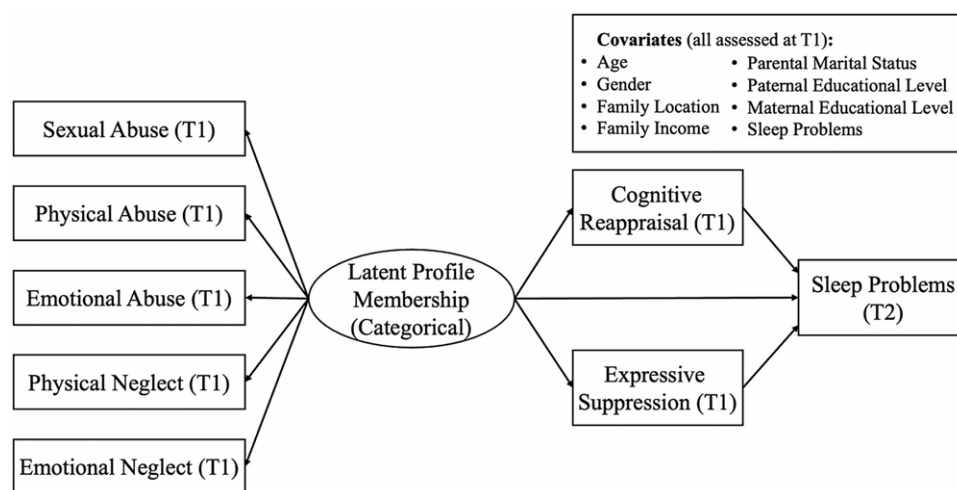
#### Childhood maltreatment

The 28-item Childhood Trauma Questionnaire-Short Form (CTQ-SF; Bernstein et al., 2003) is a retrospective assessment that specifies an individual's perceived abuse and neglect before the age of 16. The CTQ-SF contains five subscales: sexual abuse (e.g., *Someone molested me*), physical abuse (e.g., *People in my family hit me so hard that it left me with bruises or marks*), emotional abuse (e.g., *I thought that my parents wished I had never been born*), physical neglect (e.g., *I didn't have enough to eat*), and emotional neglect (e.g., *I felt loved*; reversed item). Participants reported the CTQ-SF at T1, with a 5-point scale ranging from 1 (*never true*) to 5 (*very often true*). A total severity score (ranging from 25 to 125) and scores for each subscale (ranging from 5 to 25) can be calculated. Severity classifications can be derived from each subtype by cutoff values (Bernstein & Fink, 1998): "none or minimal" refers to sexual abuse 5, physical abuse 5–7, emotional abuse 5–8, physical neglect 5–7, emotional neglect 5–9; "low to moderate" refers to sexual abuse 6–7, physical abuse 8–9, emotional abuse 9–12, physical neglect 8–9, emotional neglect 10–14; "moderate to severe" refers to sexual abuse 8–12, physical abuse 10–12, emotional abuse 13–15, physical neglect 10–12, emotional neglect 15–17; and "severe to extreme" refers to sexual abuse  $\geq 13$ , physical abuse  $\geq 13$ , emotional abuse  $\geq 16$ , physical neglect  $\geq 13$ , emotional neglect  $\geq 18$ . In addition, cutoff scores of "low to moderate" were used to examine the prevalence of childhood maltreatment (Li et al., 2014): sexual abuse  $\geq 6$ , physical abuse  $\geq 8$ , emotional abuse  $\geq 9$ , physical neglect  $\geq 8$ , and emotional neglect  $\geq 10$ .

The Chinese version of the CTQ-SF has been shown to have great psychometric properties (He et al., 2019). In the current study, the internal consistencies for the five subscales were  $\alpha = .67$ ,  $.71$ ,  $.72$ ,  $.47$ , and  $.75$ . The internal consistency was relatively low for the physical neglect subscale ( $\alpha = .47$ ), which was also found in previous studies for several reversed-scoring items (e.g., Zhang & Zheng, 2018).

#### Emotion regulation strategies

The Emotion Regulation Questionnaire (Gross & John, 2003) was utilized to assess emotion regulation strategies in two aspects: cognitive reappraisal was rated by six items (e.g., *When I want to feel happier, I think about something different*), and expressive suppression was rated by four items (e.g., *I keep my feelings to myself*). Participants completed the Emotion Regulation Questionnaire at T1, with a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Psychometric properties of the Chinese version were established by Li and Wu (2020). In the



**Figure 1.** Hypothesized model for examining childhood maltreatment profiles, emotion regulation strategies, and sleep problems.

current study, the internal consistencies for the two subscales were good,  $\alpha = .83$  and  $.71$ .

### Sleep problems

Pittsburgh Sleep Quality Index (PSQI; Buysse et al., 1989) was used to assess youth's sleep problems. Participants reported the PSQI at both T1 and T2. The 14-item PSQI is composed of 7 different components of an individual's sleep quality, including subjective sleep quality, sleep latency, habitual sleep efficiency, night-time disturbances, sleep duration, use of sleep medications, and daytime dysfunction. Each item was scored ranging from 0 (*none*) to 3 (*third a week*). The mean of the 14 items generates a global score, with a higher score indicating a higher level of sleep problems. The Chinese version of the PSQI has been widely used in previous studies and has shown good reliability and validity (Guo et al., 2016). In the current study, the internal consistencies for PSQI were adequate at both T1 and T2,  $\alpha = .81$  and  $.84$ , respectively.

### Covariates

Participants were asked to report their age and gender (0 = male, 1 = female). Additionally, they reported their family location (0 = rural area, 1 = suburban area, 2 = city), parents' marital status (0 = currently married, 1 = others (e.g., divorced, reconstituted)), paternal and maternal educational level (0 = junior high and below, 1 = high school, 2 = bachelor's degree, 3 = master's degree or above), and family monthly income (from 1 = less than 2,000 yuan [approximately 300 USD] to 11 = more than 20,000 yuan [approximately 3,000 USD]). Participants' sleep problems at T1 were also controlled when predicting sleep problems at T2 across the models.

### Data analyses

Means, standard deviations, and intercorrelations among variables were calculated using SPSS version 26.0. Then, LPA on the five subscales of the CTQ was conducted using maximum likelihood estimation with robust standard errors in Mplus version 8.3. Figure 1 presents the hypothesized model.

The sum scores of each subtype on the CTQ were selected as the indicators of LPA. Primary analyses were performed in four steps. (a) The following model fit indices were used to determine the optimal number of latent profiles: Akaike information criterion (AIC; Akaike, 1987), Bayesian information criterion (BIC;

Schwarz, 1978), entropy (Lubke & Muthén, 2007), Lo-Mendell-Rubin adjusted likelihood ratio test (LMR-LRT), and bootstrapped likelihood ratio test (BLRT; Lo et al., 2001). Smaller AIC and BIC values indicate a better model fit. Entropy is a metric for classification accuracy ranging from 0 to 1, with higher values indicating greater precision. Both LMR-LRT and BLRT examine whether a  $k$  profile model fits significantly better than a  $k-1$  profile model. (b) The optimal number of profiles was labeled based on their characteristics. To confirm the distinction among identified groups, mean differences of the childhood maltreatment subtypes across groups were examined using multivariate analysis of variance (MANOVA) and Bonferroni post hoc comparisons. (c) We examined the differences in sociodemographic characteristics across profiles. We treated gender (0 = male, 1 = female), family location (0 = rural area, 1 = suburban area, 2 = city), and parents' marital status (0 = currently married, 1 = others (e.g., divorced, reconstituted)) as categorical variables, Chi-square test of independence was calculated comparing the differences in these sociodemographic characteristics across profiles. Other variables (age, parental educational level, family income) were treated as continuous variables and were analyzed using MANOVA to compare differences across maltreatment profiles. (d) To test the mediating roles of emotion regulation strategies (i.e., cognitive reappraisal and expressive suppression) in the link between childhood maltreatment profiles and subsequent sleep problems, the Bolck-Croon-Hagenaars (BCH) method was used. The BCH method is a preferred approach to predict continuous outcomes from profile memberships because it considers classification error and controls for covariates when estimating the means of outcomes (Asparouhov & Muthén, 2014; Bakk & Vermunt, 2016). The direct effect of childhood maltreatment profiles at T1 was first tested on youths' sleep problems at T2, with T1's sleep problems and sociodemographic characteristics as potential covariates. For the mediation test, as suggested by McLarnon and O'Neill (2018), the "Model Constraint" command was used in Mplus to create the indirect effect terms. Specifically, we multiplied the mean difference of a certain emotion regulation strategy between two maltreatment subgroups with the regressive coefficient from the certain emotion regulation strategy to sleep problems at T2, obtaining a new parameter. If this parameter was significantly different from zero, then this indirect effect would be regarded as significant. Significance tests were based on  $p$  values less than .05.



**Table 1.** Means, standard deviations, and Pearson's correlations for study variables

Variable	1	2	3	4	5	6	7	8	9
1. Sexual abuse	—								
2. Physical abuse	.18***	—							
3. Emotional abuse	.22***	.47***	—						
4. Physical neglect	.18***	.20***	.33***	—					
5. Emotional neglect	.14***	.30***	.44***	.46***	—				
6. Cognitive reappraisal	.01	-.07**	-.14***	-.12***	-.18***	—			
7. Expressive suppression	.09***	.08***	.11***	.14***	.16***	.15***	—		
8. Sleep problems	.14***	.23***	.40***	.25***	.21***	-.21***	.14***	—	
9. Sleep problems (T2)	.09***	.16***	.29***	.19***	.20***	-.17***	.11***	.50***	—
<i>M</i>	1.07	1.10	1.31	1.91	2.00	5.02	4.09	1.65	1.57
<i>SD</i>	0.21	0.29	0.47	0.58	0.78	0.91	1.09	0.46	0.46

Note. \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ . Variables 1–8 were collected in T1.

**Table 2.** Model fit indices for latent profile analyses

Profile	AIC	BIC	aBIC	$p$ LMR-LRT	$p$ BLRT	Entropy	Group sizes					
1	27,386.32	27,441.97	27,410.20	—	—	—	1929					
2	25,440.83	25,529.87	25,479.04	.151	<.001	0.98	1823	106				
<b>3</b>	<b>24,010.29</b>	<b>24,132.71</b>	<b>24,062.81</b>	<b>.007</b>	<b>&lt;.001</b>	<b>0.99</b>	<b>1766</b>	<b>91</b>	<b>72</b>			
4	23,101.24	23,257.05	23,168.10	.285	<.001	0.99	1707	136	66	20		
5	22,530.95	22,720.15	22,612.13	.745	<.001	0.97	1634	133	97	65	20	
6	22,023.40	22,245.99	22,118.91	.251	<.001	0.98	1599	149	74	61	33	13

Note. Values in bold indicate the best fitting model. AIC = Akaike information criterion; BIC = Bayesian information criterion; aBIC = sample size-adjusted Bayesian information criterion;  $p$ LMR-LRT =  $p$  values for Lo-Mendell-Rubin adjusted likelihood ratio test for  $k$  vs.  $k-1$  profiles;  $p$ BLRT =  $p$  values for bootstrapped likelihood ratio test.

## Results

### Preliminary analyses

Means, standard deviations, and correlations for the study variables are shown in Table 1. Significant associations were found among almost all the main study variables ( $ps < .004$ ), except the correlation between childhood sexual abuse and cognitive reappraisal ( $r = -.01$ ,  $p = .626$ ).

The prevalence of having experienced childhood sexual, physical, and emotional abuse were 17.8%, 6.9%, and 15.3%, respectively; that of having experienced childhood physical and emotional neglect were 66.3% and 46.7%, respectively. A total of 78.3% of the participants endorsed at least one subtype of maltreatment on the CTQ, among which 29.5% of them reported at least one subtype of abuse and 74.5% reported at least one subtype of neglect.

### Latent profiles of childhood maltreatment

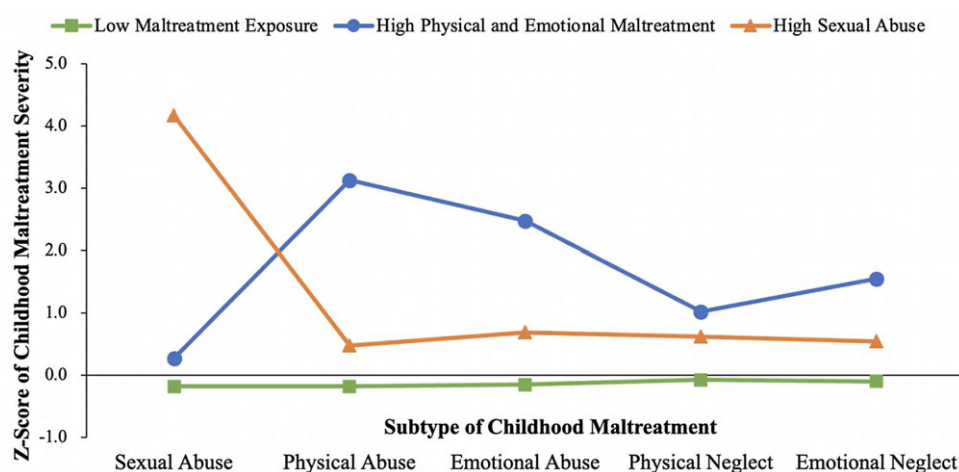
As shown in Table 2, LPA began with a one-profile solution, and then the numbers increased from one to six to determine the optimal profiles. The three-profile model was determined to be the best model to fit the data. The three-profile solution showed lower AIC, BIC, and aBIC values than both the one- and two-profile solutions and had significant LMR-LRT and BLRT  $p$  values than the two-profile solution, which suggests that the three-profile model was better than the two-profile model. In addition, the three-profile solution had a high entropy value of 0.99, indicating high precision of the classification.

Table 3 presents the childhood maltreatment severity in three profiles. Specifically, profile 1 comprised 91.6% of the sample ( $n = 1766$ ) and was labeled “low maltreatment exposure” due to the low scores on each dimension of the CTQ. Profile 2 consisted of 4.7% of the participants ( $n = 91$ ) and was labeled “high physical and emotional maltreatment.” These participants reported severe physical and emotional abuse and neglect whereas minimal sexual abuse. Profile 3 included 3.7% of the sample ( $n = 72$ ) and was labeled “high sexual abuse” since the participants reported relatively severe sexual abuse whereas low physical and emotional maltreatment. These three profiles were different in the five dimensions of the CTQ based on post hoc tests, indicating a valid profile solution of the classification. To better visualize the profiles, Figure 2 shows the three latent profiles using standardized  $z$  scores. Moreover, significant differences in sleep problems in both T1 and T2 emerged across groups. Individuals in the “high physical and emotional maltreatment” group had the most severe sleep problems, followed by the “high sexual abuse” group, and the “low maltreatment exposure” group reported the lowest sleep problem at T1.

The results from Chi-square test of independence and MANOVAs suggested differences in sociodemographic characteristics across profiles. The results of the Chi-square test of independence showed that there was a significantly different gender ratio across profiles ( $\chi^2(2) = 25.78$ ,  $p < .001$ ). The proportion of girls in the “low maltreatment exposure” group (64.8%) was higher than in the “high physical and emotional maltreatment” group (45.1%) or “high sexual abuse” group (44.4%). The difference of parents’ marital status across

**Table 3.** Childhood maltreatment, emotion regulation, and sleep problems across profiles

Variable	Low Maltreatment Exposure (91.6%)	High Physical and Emotional Maltreatment (4.7%)	High Sexual Abuse (3.7%)	Pos hoc
	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	
Childhood maltreatment (T1)				
Sexual abuse	1.03 (0.10)	1.13 (0.18)	1.97 (0.37)	3 > 2 > 1
Physical abuse	1.05 (0.14)	2.00 (0.64)	1.23 (0.36)	2 > 3 > 1
Emotional abuse	1.24 (0.34)	2.49 (0.80)	1.64 (0.57)	2 > 3 > 1
Physical neglect	1.77 (0.55)	2.40 (0.64)	2.17 (0.62)	2 > 3 > 1
Emotional neglect	1.92 (0.70)	3.20 (1.03)	2.42 (0.79)	2 > 3 > 1
Emotion regulation (T1)				
Cognitive reappraisal	5.04 (0.91)	4.58 (0.96)	4.95 (0.84)	1, 3 > 2
Expressive suppression	4.06 (1.07)	4.26 (1.28)	4.45 (1.11)	3 > 1
Sleep problems				
Sleep problems (T1)	1.62 (0.44)	2.12 (0.54)	1.88 (0.48)	2 > 3 > 1
Sleep problems (T2)	1.55 (0.44)	1.90 (0.54)	1.76 (0.49)	2 > 3 > 1

**Figure 2.** Three latent profiles of childhood maltreatment.

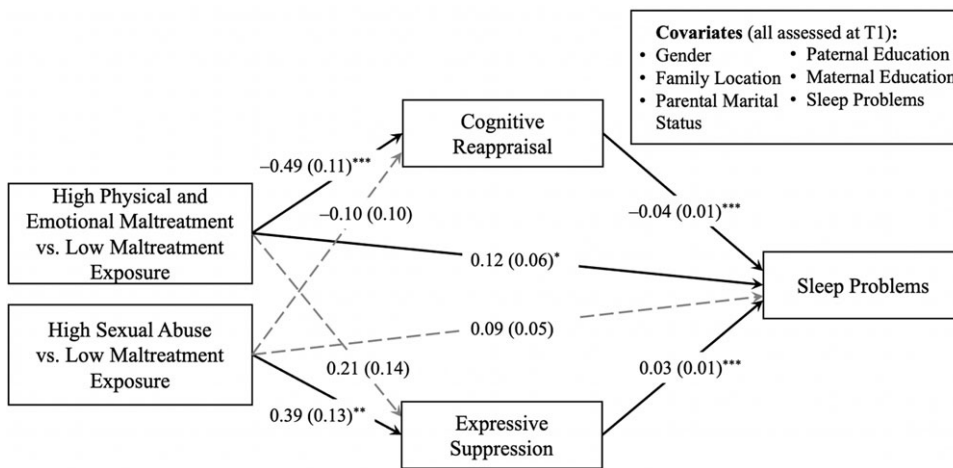
profiles was also significant ( $\chi^2(2) = 14.67, p < .001$ ) and the proportion of parents in the state of marriage in “high physical and emotional maltreatment” group (71.4%) was lower than in the “low treatment exposure” group (86.0%) or “high sexual abuse” group (83.3%). Regarding family location, no significant difference was found across profiles ( $\chi^2(4) = 4.25, p = .374$ ). Other variables (age, parental educational level, family income) were analyzed using MANOVAs. Specifically, individuals with higher-educated fathers were more likely to be classified into “high physical and emotional maltreatment” or “high sexual abuse”; similarly, those with higher-educated mothers were more likely to be classified into “high physical and emotional maltreatment” than “low maltreatment exposure.”

#### Mediation of emotion regulation between childhood maltreatment profiles and sleep problems

To determine the final covariates, one-way ANOVAs (for categorical covariates) and correlation analysis (for continuous covariates) were used to test the relations between the covariates and the key variables in the mediation model (i.e., emotion

regulation strategies and sleep problems at T2). One-way ANOVA tests showed that girls (vs. boys) reported lower levels of cognitive reappraisal ( $F(1,1928) = 12.30, p < .001$ ) and expressive suppression ( $F(1,1928) = 56.04, p < .001$ ) but more severe sleep problems at T2 ( $F(1,1928) = 6.91, p = .009$ ). Youths living in urban areas had more severe expressive suppression than youths in rural areas and counties ( $F(2,1928) = 6.64, p = .001$ ). Youths whose parents were in marriage had fewer sleep problems at T2 ( $F(1,1928) = 8.64, p = .003$ ). Additionally, Pearson correlation analysis showed that parental education was positively correlated with expressive suppression ( $r_s = .05 \sim .06, p_s < .046$ ). T1’s sleep problems were positively correlated with T2’s sleep problems ( $r = .50, p < .001$ ). Other covariates were not correlated with any of the adjustment indicators ( $|r|s < .04, p_s > .063$ ). Therefore, gender, family location, parental marital status, paternal and maternal educational levels, and sleep problems at T1 were entered as covariates in the BCH model.

Before conducting the mediation model, the direct effect of childhood maltreatment profiles was tested on subsequent sleep problems. The results indicated that individuals in both the “high



**Figure 3.** Mediating model linking childhood maltreatment profiles and subsequent sleep problems.

Note. The numbers indicated unstandardized regression coefficients (standard errors).

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

physical and emotional maltreatment” ( $b = 0.14$ ,  $SE = 0.06$ ,  $p = .014$ ) and “high sexual abuse” ( $b = 0.10$ ,  $SE = 0.05$ ,  $p = .063$ ) groups had higher sleep problems at T2 than those in the “low maltreatment exposure” group.

Figure 3 shows the mediation results. Compared with the “low maltreatment exposure” group, individuals in the “high physical and emotional maltreatment” group reported lower levels of cognitive reappraisal ( $b = -0.49$ ,  $SE = 0.11$ ,  $p < .001$ ); in turn, lower levels of cognitive reappraisal predicted subsequent increases in sleep problems ( $b = -0.04$ ,  $SE = 0.01$ ,  $p < .001$ ). In addition, individuals in the “high sexual abuse” group reported higher levels of expressive suppression ( $b = 0.39$ ,  $SE = 0.13$ ,  $p = .003$ ) than those in the “low maltreatment exposure” group, and higher expressive suppression predicted later increases in sleep problems ( $b = 0.03$ ,  $SE = 0.01$ ,  $p < .001$ ). Mediating analyses indicated that cognitive reappraisal mediated the relation between “high physical and emotional maltreatment” (vs. “low maltreatment exposure”) and sleep problems (*indirect effect* = 0.019,  $SE = 0.006$ ,  $p = 0.003$ , 95% CI = [0.006, 0.031]), accounting for 15.45% of the total effect. Moreover, expressive suppression mediated the relation between “high sexual abuse” (vs. “low maltreatment exposure”) and sleep problems (*indirect effect* = 0.012,  $SE = 0.005$ ,  $p = 0.022$ , 95% CI = [0.002, 0.022]), accounting for 13.48% of the total effect.

## Discussion

Childhood maltreatment can cause long-term impacts on sleep quality (Laskemoen et al., 2021). Limited research has examined profiles in China and focused on the longitudinal associations between childhood maltreatment patterns, emotion regulation strategies, and sleep problems. This study conducted LPA to identify patterns of childhood maltreatment and then investigated how the patterns influenced subsequent sleep problems through cognitive reappraisal and expressive suppression among Chinese youths. In this study, three distinct groups of childhood maltreatment were identified: “low maltreatment exposure,” “high physical and emotional maltreatment,” and “high sexual abuse.” Youths in “high physical and emotional maltreatment” reported the most severe sleep problems. Compared with “low maltreatment exposure,” youths in “high physical and emotional maltreatment” reported more sleep problems through decreasing cognitive reappraisal, while those in the “high sexual abuse” had more sleep problems through increasing expressive suppression. The above findings are consistent with our hypotheses.

## Patterns of childhood maltreatment

The LPA technique yielded three distinct profiles of childhood maltreatment in Chinese youths. The predominant pattern was “low maltreatment exposure” (91.6%), with nearly no childhood abuse in each subtype. This proportion is similar to previous studies that the minimally treated group ranged from 80 to 90% (Boyda et al., 2022; Curran et al., 2021; J. Liu et al., 2022; McAnee et al., 2019). In the “low maltreatment exposure” group, the total score of physical neglect was a bit higher than the cutoff values. Besides, the variability of physical and emotional neglect were large, indicating some youths with high scores in neglect. Nevertheless, those youths reported low scores of sexual, physical, and emotional abuse. Considering that LPA was estimated based on the combination of different subtypes of maltreatment, they were classified into the “low maltreatment exposure” group.

The second group “high physical and emotional maltreatment” (4.7%) had the highest scores of physical and emotional abuse and neglect but a low degree of sexual abuse. In other words, physical and emotional maltreatment, as well as neglect and abuse in the physical and emotional domains, were prone to co-occur within individuals (Papalia et al., 2022; Zhang & Zheng, 2018). Individuals exposed to multiple maltreatment were considered poly-traumatization and often reported the most severe psychopathological consequences (Curran et al., 2021). The third group “high sexual abuse” (3.7%) was characterized by the highest level of sexual abuse and moderate levels of physical and emotional maltreatment, also revealed in other studies (Mekawi et al., 2021). The latter two profiles “high physical and emotional maltreatment” and “high sexual abuse” account for a tiny percentage of the total sample, which is common in the literature conducted in non-clinical sample (Boyda et al., 2022; McAnee et al., 2019; Zhang & Zheng, 2018). Above all, these three patterns capture the differential characteristics and distinct combinations of sexual, physical, and emotional maltreatment – the co-occurring patterns between maltreatment in physical and emotional domains and the relatively isolated-occurring pattern in sexual abuse. This finding describes how maltreatment co-occurred within individuals in China, which is informative and insightful for interventions.

When considering the sociodemographic variables, the “low maltreatment exposure” group had more girls than maltreatment groups. Because harsh discipline and corporal punishment are commonly practiced for male children in China (Cui & Lan, 2020), Chinese males may have a higher risk of experiencing childhood

maltreatment. Additionally, youths in the “high physical and emotional maltreatment” were more likely to live in urban areas and divorced or reconstituted families than those in the “low maltreatment exposure.” These results suggest that children growing up in unstable environments may experience more maltreatment, in line with the argument that marital status is an important determinant of childhood maltreatment (Liang et al., 2020). Moreover, Chinese parents with higher education may have great expectations for children given the fiercest academic competition, in which they may use more harsh discipline for better supervision (Cui & Lan, 2020). Thus, children with higher-educated parents may perceive more physical and emotional discipline. Given the inconsistent findings of the associations between parental education level and maltreatment between prior studies conducted in non-Chinese (Goings et al., 2022; J. Liu et al., 2022) and the present study, more research is needed to be conducted in China.

### *Childhood maltreatment patterns and sleep problems*

Consistent with the opponent-process theory on sleep (Dahl & Lewin, 2002; Dahl, 1996), childhood maltreatment is considered a critical factor in sleep health. Youths in the “low maltreatment exposure” profile reported the fewest sleep problems at both T1 and T2, which is the most adaptive group. This group is functioned as the reference group in later analyses. By contrast, youths in the “high physical and emotional maltreatment” profile had the most sleep problems at both waves. Youths with poly-traumatization reported the most severe sleep problems, which partly supports the “dose-response” effect (the heightened harm from the cumulative traumatic events; Chapman et al., 2011). Multiple childhood abuse and neglect can increase the odds of sleep problems (Hoag et al., 2015; Kajeepeta et al., 2015). Meanwhile, sleep problems in the sexually abused group were higher than the reference group but lower than the poly-traumatization group. For youths with childhood sexual abuse, bedtime may be a trigger for rethinking their maltreatment experiences (Gaensbauer & Jordan, 2009). Thus, they may have more sleep problems, such as difficulties falling asleep, frequent awakenings, and sleep nightmares (Baiden et al., 2015) than those with little-maltreated youths. The findings extend the concurrent associations between maltreatment patterns and sleep quality into a longitudinal perspective and for youths.

### **Mediation of emotion regulation strategies: cognitive reappraisal vs. expressive suppression**

One of the most significant findings of this study is to confirm the presence of distinct mediating mechanisms of emotion regulation strategies from childhood maltreatment to sleep problems. Specifically, compared with the “low maltreatment exposure,” youths in the “high physical and emotional maltreatment” group engaged in more sleep problems through decreasing cognitive reappraisal (rather than expressive suppression), whereas those in the “high sexual abuse” group engaged in more sleep problems through increasing expressive suppression (rather than cognitive reappraisal). This finding extends Ehlers and Clark’s (2000) cognitive model of trauma and Gaensbauer and Jordan’s (2009) defensive coping theory – to differentiate emotion regulation outcomes from different maltreatment co-occurrence patterns.

On one hand, compared with individuals with little maltreatment, individuals exposed to multiple childhood maltreatment may tend to perceive their environment as threatening and unpredictable (Ehlers & Clark, 2000). They may perceive little

opportunity to change the situation and become less likely to reappraise it (Yu et al., 2021). Even worse, poly-traumatization in childhood can exert long-term effects on neurobiological changes in stress response systems and brain functions related to emotion regulation and cognitive control (Agorastos et al., 2018). Consequently, youths exposed to maltreatment may be less likely to re-evaluate and re-frame certain events positively, especially for those who enter emerging adulthood and experience great changes in their social and occupational roles (Li et al., 2018; Warmingham et al., 2022). The deficiency and inflexibility in cognitive reappraisal, however, may further deprive individuals of recovering from negative emotions, which ultimately leads to sleep problems, such as nightmares and insomnia (Nielsen, 2017).

On the other hand, compared with youths exposed to minimal maltreatment, those in the “high sexual abuse” group were more likely to use expressive suppression to regulate emotions. This finding partly echoes Snow et al. (2022)’s finding that expressive suppression was the most frequently used emotion regulation strategy in individuals exposed to childhood sexual abuse. Jiang et al. (2021) explained that maltreated children, in particular sexually abused ones, often experience overwhelming emotional arousal; however, because of the private form of sexual abuse, it is difficult for them to express their negative emotions. Thus, an inhibition strategy might be applied. In addition, our finding can be interpreted within Chinese socialization norms of sexuality (adhering to sexual chastity before marriage) and shame (feeling shameful in a society that stresses “face”) (Futa et al., 2001). Chinese families particularly value family honor and harmony, in which children exposed to sexual abuse may become hesitant to disclose their experiences for protecting their family name; thus, the feelings of fear, guilt, and distress from “shameful” events are often suppressed (Futa et al., 2001; Sawrikar & Katz, 2017), thereby developing a habitual use of expressive suppression. However, individuals using expressive suppression tend to deal with stressful situations by masking their feelings, viewing their emotions as unacceptable, and ruminating about negative events (Zhou & Zhen, 2022). The suppressed emotions continue to accumulate in an unresolved state (Gross & John, 2003), finally resulting in poor sleep (Ellis et al., 2019).

### *Implications*

There are several important implications for clinical practice. First and foremost, there is evidence that youths with sleep disorders and a history of childhood maltreatment require different treatments than those without a history of maltreatment (Kajeepeta et al., 2015); thus, targeted interventions should be established for maltreated children and youths to reduce potential sleep problems. For example, for youths with sexual abuse experience, creating a safe and trustful environment to reconstruct a sense of safety and help them disclose their emotions would be particularly important (Nielsen, 2017). For those in the combination of physical and emotional abuse and neglect, it is necessary to help them learn more adaptive emotion regulation strategies, such as finding attention anchors for redirecting attention at times of distress (Joss & Teicher, 2021). In addition, physical and emotional maltreatment often co-occurred, in which children exposed to one type of maltreatment may be more likely to be exposed to other types of childhood maltreatment. Thus, practitioners should pay attention to the co-occurring patterns within individuals (Contractor et al., 2018). Third, cultural background is an influential factor not only in the perceptions



of maltreatment but also in the development of effective interventions. For instance, Chinese people exposed to maltreatment are less likely to seek professional help due to the need to preserve family harmony or prevent family shame (Futa et al., 2001). Clinicians should consider the cultural perceptions of maltreatment when working with clients exposed to childhood maltreatment and culturally sensitive interventions are needed (Shen, 2009).

### Limitations and future directions

Notwithstanding the aforementioned findings and implications, some limitations in the current study should be noted. First, two groups of LPA – “high sexual abuse” [3.7%] and “high physical and emotional trauma” [4.7%] – made up small percentages of the sample. Although differentiation among these classes was supported by the post hoc tests and consistent with other person-centered studies that have identified small but meaningfully different profiles (e.g., “sexual abuse” [3%] and “poly-trauma” [1%] in Mekawi et al., 2021), an examination with a larger sample size or more diverse sample is warranted. Second, since only a total of 14.0% of the participants reported living in households with an annual income above the average for Chinese families, our findings may be more suitable for low-socioeconomic status youths. Future studies with a national sample of Chinese youths are encouraged to examine the profiles of childhood maltreatment and its long-term impacts. Third, the study relies on two-time points for the mediation model. A mitigation of this weakness lies in the temporal nature of the variables to be examined, which means that abuse happened during childhood. Nevertheless, future research using a fully developmental model that requires predictor, mediator, and outcome measured at different time points can be used to verify our findings. Fourth, the present study only focused on overall sleep problems and examined its associations with different patterns of childhood maltreatment and different strategies of emotion regulation. Nevertheless, different challenges of sleep may be also associated with different maltreatment exposure (Hamilton et al., 2018), which requires further investigation.

### Conclusions

Childhood maltreatment has long-term adverse consequences for individuals, one of which is sleep problems. There has been a dearth of work on the effects of naturally occurring patterns of childhood maltreatment on sleep problems and the potential mediating mechanisms. The current study fills this research gap by exploring how profiles of childhood maltreatment predict subsequent sleep problems through different strategies of emotion regulation. Three distinct groups of childhood maltreatment emerged in Chinese youths: low maltreatment exposure, high physical and emotional maltreatment, and high sexual abuse. Compared with “low maltreatment exposure,” youths in the “high physical and emotional maltreatment” group tended to use less cognitive reappraisal, while those in the “high sexual abuse” group tended to use more expressive suppression, ultimately leading to more sleep problems. This study reveals new insights into the patterns of childhood maltreatment in youths and implies that individuals exposed to sexual abuse or a combination of physical and emotional maltreatment may experience sleep problems through different emotion regulation processes. Thus, it highlights the necessity of setting differential targets on emotion regulation

strategies for distinct maltreatment groups and considering the co-occurrence of physical and emotional maltreatment.

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