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Characteristics and factors associated with psychotic-like experiences in remission: a cross-sectional study of 4208 college students in China

Xin-Hu Yang,[1,2] Rui Wang,[1,2] Yue Li,[1,2] Hong-Ling Zhou,[1,2] Liang Zhou ,[1,2] Meng Sun [1,2]

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[1]Department of Social Psychiatry, Affiliated Brain Hospital, Guangzhou Medical University, Guangzhou, Guangdong, China
[2]Key Laboratory of Neurogenetics and Channelopathies of Guangdong Province and the Ministry of Education of China, Guangzhou Medical University, Guangzhou, Guangdong, China

Correspondence to
Dr Liang Zhou;
liangzhou_csu@vip.163.com
and
Dr Meng Sun;
sunmengjw0701@163.com

ABSTRACT

Objectives Previous research has extensively explored the factors associated with psychotic-like experiences (PLEs). However, the characteristics and associated factors of remitted PLEs, which refer to the absence of current PLEs following previous PLEs, remain unclear. Therefore, this study aims to describe the characteristics of adolescents who reported remitted PLEs.

Design Cross-sectional study.

Setting The survey was conducted from October to December 2020 in three colleges located in Guangzhou, China.

Participants A total of 4208 college freshmen aged from 15 to 24 participated in our survey.

Primary and secondary outcome measures The 15-item positive subscale of the Community Assessment of the Psychic Experience was used to assess both lifetime and current PLEs. Multivariate logistic regression models were used to examine the associations between remitted PLEs and a range of demographic factors, lifestyle, psychosocial factors, lifetime affective symptoms and sleep problems.

Results Three groups of PLEs were observed: non-PLEs (47.27% of the sample), remitted PLEs (40.42%) and current PLEs (12.31%). Several factors have been identified as shared correlates of remission and absence of PLEs, including fewer recent adverse life events, greater resilience, fewer symptoms of depression and anxiety, and early waking. Furthermore, higher levels of social support (OR 1.48, 95% CI 1.01 to 2.17; OR 1.53, 95% CI 1.18 to 1.97) was a specific factor associated with the remission of PLEs. Compared with individuals without PLEs, those with remitted PLEs were more likely to be female (OR 1.50, 95% CI 1.28 to 1.75), less likely to be younger (OR 0.88, 95% CI 0.81 to 0.95) and prone to have more chronic physical illness (OR 1.67, 95% CI 1.29 to 2.16), habitual alcohol intake (OR 1.85, 95% CI 1.19 to 2.88), more childhood trauma (OR for low vs high=0.72, 95% CI 0.57 to 0.91) and the sleep problems of waking up easily (OR 1.36, 95% CI 1.12 to 1.65).

Conclusion These findings suggest that remitted PLEs play a vital, unique role among three groups and provide preliminary targets for the intervention for adolescents at risk of mental health problems. Further investigation may shed light on the causality of the relationship between remitted PLEs and associated factors.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ This study includes a multicentre design, a validated measure of psychotic-like experiences (PLEs), a relatively large sample and multidimensional potentially associated factors.
⇒ A limitation of this study was that it is subject to the limitations of cross-sectional study design, such as recall bias.
⇒ Another limitation was that simplified items were adopted in our measures of lifestyle factors and sleep problems.

INTRODUCTION

Psychotic-like experiences (PLEs) refer to symptoms that are similar to positive symptoms of psychosis.[1 2] However, these experiences are less intense and frequent than full-threshold positive symptoms and typically do not cause significant functional impairment.[3] As one of the worldwide public health concerns, PLEs are relatively common in adolescents, with a median prevalence of 7.5%[4] and the peak incidence in late adolescence.[5] Previous studies have revealed that PLEs are a crucial predictor of several mental disorders, including both psychotic disorders[6 7] and non-psychotic disorders.[8 9] A recent systematic review and meta-analysis[8] found that adolescents with PLEs were 3.96 times more likely to develop psychotic disorders and 2.82 times more likely to develop non-psychotic disorders compared with their peers. Fonseca-Pedrero *et al* have also found that PLE is an important marker in the development of mental illness, suggesting that PLEs may be related to the potential pathogenesis of these disorders.[10 11] Another research further confirmed that PLEs and mental disorders shared some genetic and environmental risk factors.[12] Accordingly, PLEs, shared by several mental disorders

during their development, could be considered as an early state of psychosis, indicative of high risk for subsequent psychopathology.[13 14] Thus, exploring factors associated with PLEs should be beneficial to the prevention of mental health problems.

According to the psychosis proneness-persistence-impairment model proposed by van Os *et al*, the onset and development of PLEs result from the interaction of genetic factors with environmental exposures.[15] However, a recent study has indicated that environmental factors may play a greater role in the aetiology of PLEs than genetic factors.[16] Therefore, it is crucial to identify modifiable environmental factors in this high-risk population, in order to enhance protective factors and weaken risk factors of PLEs, which may help to avoid the onset of PLEs or to prevent the individuals with PLEs from a worse outcome.

Although PLEs are relatively common among adolescents, most of them are transient. According to a systematic review in the general population, only 20% of those who report PLEs will experience persistent PLEs, while PLEs remit over time for approximately 80% of these individuals.[6] Recent literature has identified different trajectories of PLEs, such as persistent PLEs and remitted PLEs.[6 17 18] Compared with those who have never experienced PLEs (more likely to benefit from genetic factors), individuals with remitted PLEs tend to be influenced by environmental factors, such as resilience, cannabis, stress and urbanicity.[6 19] For instance, a recent systematic review of 15 studies from 10 countries has found that resilience can help to mitigate or reduce PLEs to some extent.[19] A deeper exploration of remitted PLEs may provide more information for secondary prevention. For the time being, most previous studies have focused on the factors associated with the persistence of PLEs, which are multidimensional and intricate, including heritability/genetics, ethnic minority status, urbanicity, substance use, psychopathology and trauma.[8 20 21] However, there is still little knowledge of the group who have experienced the remission of PLEs.[22]

Therefore, this study aims to describe the characteristics of individuals who reported remitted PLEs by comparing them with those with non-PLEs and current PLEs in a large sample of college students across five domains: demographics, lifestyle, psychosocial factors, lifetime affective symptoms and sleep problems.

METHODS

Procedure and participants

In this cross-sectional study, all freshmen (n=5637) from three colleges in Guangzhou were invited to participate in an online survey between October and December 2020. With the supervision of the teachers from the Student Management Office, the quick response code of the questionnaire was delivered through WeChat, which is a widely used social media and messaging app in China. All participants, or their legal guardians (if students younger than 18), were provided electronic informed consent before the study. They were promised that only researchers in this programme could get access to their data, and their answers would have no impact on their campus life or academic scores. Participants then completed the self-reported survey (see online supplemental file 1) using their smartphones.

Measures

Psychotic-like experiences

PLEs were assessed simultaneously over two periods (both lifetime and past month) using the 15-item positive subscale of the Community Assessment of the Psychic Experience (CAPE-P15). The CAPE-P15 is a self-report scale derived from the 42-item Community Assessment of Psychic Experiences.[23] The scale contains two subscales: the frequency subscale and the associated distress subscale. We used the frequency subscale to assess lifetime PLEs (CAPE-P15_L), as well as PLEs in the past month (CAPE-P15_M) in our study. Response to each item ranges from 1 (none) to 4 (always), with a higher score indicating more PLEs. The total score was divided by the number of valid answers to provide the weighted score,[17] which was used to screen the positive cases in this study. The psychometric properties of the Chinese version of the CAPE-P15 for measuring both current and lifetime PLEs were certified in our previous study.[24] We have identified the optimal cut-off value of the self-report CAPE-P15 for detecting genuine PLEs using interview-verified PLEs as the golden criteria in our prior study of college students.[25] On the basis of this previous research,[25] we adopted a cut-off value of 1.30 and 1.57 to identify genuine PLEs during the lifetime and in the past month (ie, lifetime PLEs and current PLEs), respectively. The Cronbach's α coefficient was 0.87 in this sample.

Demographic characteristics

Demographic characteristics were collected in a self-report questionnaire, including age, sex, ethnicity, birthplaces, parental married status, left-behind child status (referring to those left behind in their hometown by one or both of their migrant worker parents),[17] prior mental health diagnosis, family history of psychiatric illness and condition of chronic physical illness (having at least one of the following: arthritis, angina, asthma, diabetes, visual impairment or hearing problems).[26]

Lifestyle factors

Following the methodology of a previous study,[27] lifestyle factors (including the habit of alcohol intake, smoking and physical exercise in the past 12 months) were assessed through dichotomous items, as follows: 'Have you smoked cigarettes?'; 'Have you drunk so much alcohol that you have been really drunk?'; 'Do you play sports on a regular basis?'.

Psychosocial factors

The Childhood Trauma Questionnaire (CTQ) was used to assess self-reported experiences of childhood traumas

before the age of 16.[28] The CTQ consists of 28 items and all items are rated using a 5-point scale, ranging from 1 (never) to 5 (always), with a higher score indicating a higher level of adverse childhood experiences. Based on previous research,[29 30] the CTQ was recoded into three categories by the 27th and 73rd percentile (scores falling at 27th percentile or below indicate a low level of adverse childhood experiences, scores between 27th and 73rd percentile indicate a medium level of adverse childhood experiences while scores falling at 73rd percentile and above indicate a high level of adverse childhood experiences). The CTQ has been found to have good reliability and validity in the Chinese population. [31] The Cronbach's α coefficient was 0.75 in this sample.

The Adolescent Self-Rating Life Events Checklist (ASLEC) was used to assess adverse life events in the past 12 months.[32] Items of ASLEC are rated on a 5-point scale from 0 (events did not occur) to 4 (the effect of events that occurred was extremely severe), with a higher score indicating more adverse life events. According to previous studies,[29 30] ASLEC was recoded into three categories by the 27th and 73rd percentile (scores falling at the 27th percentile or below indicate a low level of recent adverse life events in the past 12 months, scores between 27th and 73rd percentile indicate a medium level of recent adverse life events while scores falling at 73rd percentile and above indicate a high level of recent adverse life events. The validity and reliability of the ASLEC have been corroborated in Chinese adolescents.[33] The Cronbach's α coefficient was 0.92 in this sample.

The 27-item Resilience Scale for Chinese Adolescents (RSCA) was used to evaluate individual resilience.[34] The scale is composed of 27 items, with each item scored from 1 (not at all) to 5 (strongly agree). The higher combined RSCA score reflects a higher level of resilience. Referring to prior publications,[29 30] RSCA was recoded into three categories by the 27th and 73rd percentile (scores falling at 27th percentile or below indicate a low level of resilience, scores between 27th and 73rd percentile indicate a medium level of resilience while scores falling at 73rd percentile and above indicate a high level of resilience. The reliability and validity of RSCA have been confirmed in Chinese adolescents.[35] The Cronbach's α coefficient was 0.80 in this sample.

The Multidimensional Scale of Perceived Social Support was used to assess individual perceived social support from family, friends and others.[36] The scale consists of 12 items rated on a 7-point scale, ranging from 1 (strongly disagree) to 7 (strongly agree), with higher scores indicating stronger perceived support. Following the prior studies,[29 30] the sample was divided into three groups (ie, low, medium and high social support) by the 27th and 73rd percentile of the total score in this study. The reliability and validity of RSCA have been confirmed in Chinese population. [37] The Cronbach's α coefficient was 0.96 in this sample.

Lifetime affective symptoms

The Patient Health Questionnaire-9 (PHQ-9) and the Generalised Anxiety Disorder-7 (GAD-7) were used to assess depressive and anxiety symptoms separately. To measure lifetime symptoms, we modified accordingly the scanning time from 'the past 2 weeks' to 'the 2 weeks with the worst mood in your lifetime' and 'the 2 weeks with the most anxious mood in your lifetime' in the guideline. Response to each item ranges from 1-not at all, 2-several days, 3-more than half the days, to 4-nearly every day. Based on the total score, the severity of symptoms was categorised as 'no symptom' (0–4), 'mild' (5–9), 'moderate' (10–14) and 'severe' (≥15) range. In our study, a cut-off score of 5 was adopted to screen the positive cases both for PHQ-9 and GAD-7. The Chinese version of PHQ-9 and GAD-7 both have satisfactory psychometric properties.[38 39] The Cronbach's α coefficients for PHQ-9 and GAD-7 were 0.94 and 0.96, respectively, in this sample.

Sleep problems

Derived from the Pittsburgh Sleep Quality Index,[40] three questions were used to assess sleep problems, including difficulty falling asleep, waking up easily at night and early wakening in the past month.[41 42] Following the methodology of previous studies,[43 44] responses to each query were captured using a binary scale, with a score of 0 indicating 'no' and 1 indicating 'yes'.

Statistical analyses

We analysed the data using SPSS V.25.0. To control the quality of the survey responses, the exclusion criterion was set as 'the response time for the survey <5 min'. Additionally, participants aged over 25 years old were also excluded as we only focused on adolescents, which were defined as 10–24 years.[45] Participants with a previous mental health diagnosis were excluded to avoid potential confounding effects on results by other clinical conditions. There were no missing values to address. A two-sided $p<0.05$ was considered statistically significant.

First, we classified participants into two groups based on the cut-off value we previously found[25]: the non-PLEs group (CAPE-P15_L<1.30) and the lifetime group (CAPE-P15_L≥1.30). Then we classified the lifetime group into another two groups: the current PLEs group (CAPE-P15_L≥1.30 and CAPE-P15_M≥1.57) and the remitted group (CAPE-P15_L≥1.30 and CAPE-P15_M<1.57) (see figure 1). In this study, current PLEs included both persistent (past and current PLEs) and new-onset PLEs (current, but not past). The remitted group is a PLEs group who have met the criteria for 'lifetime PLEs' but not 'current PLEs'. Second, the variance inflation factor (VIF) was used to evaluate potential multicollinearity among all variables.[46] All the variables (see table 1) including demographic, lifestyle, psychosocial factors, lifetime affective symptoms and sleep problems were compared through χ^2 analysis or analysis of variance accordingly. Third, an intercept model was established initially to evaluate the school-level heterogeneity. As the test of intercept variance was not statistically

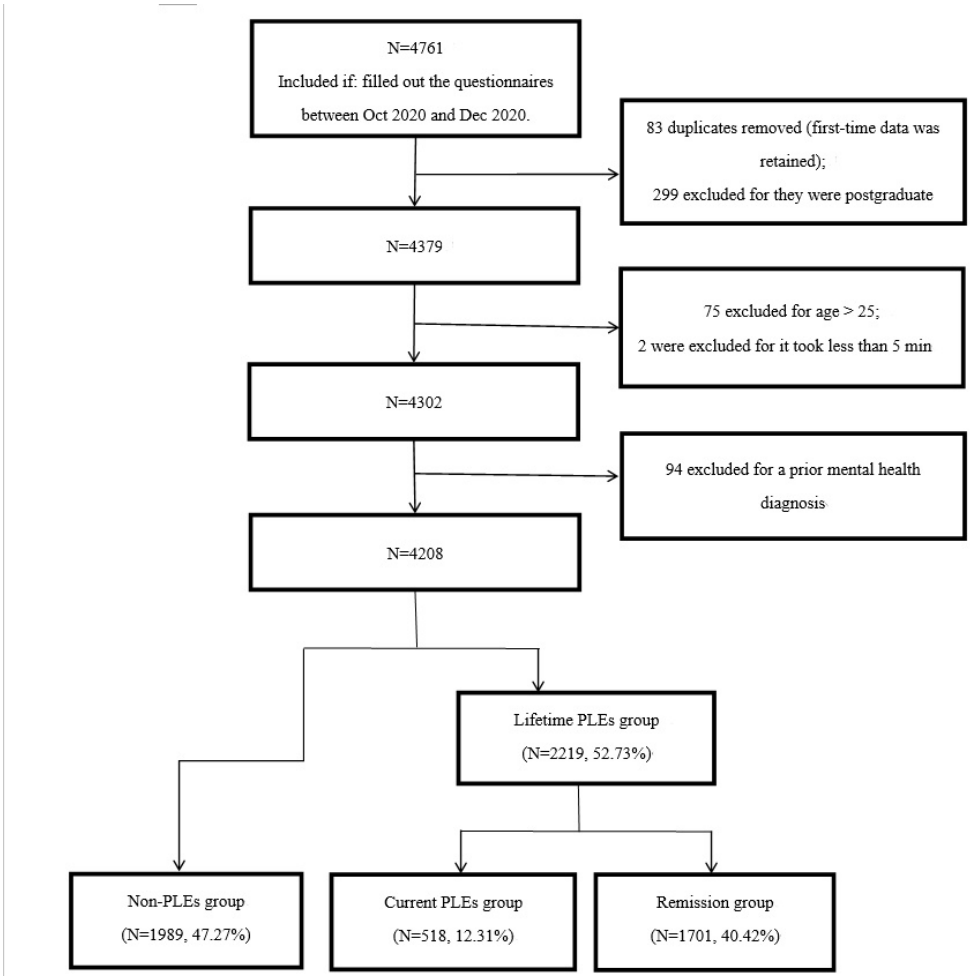

Figure 1 Flow chart of participants. Participants were classified into the non-PLEs group (CAPE-P15_L<1.30) and the lifetime group (CAPE-P15_L≥1.30). The lifetime groups were further classified into the current PLEs group (CAPE-P15_M≥1.57) and the remitted group (CAPE-P15_M<1.57). CAPE, Community Assessment of the Psychic Experience; PLE, psychotic-like experience.

significant (p>0.05), we conducted two multivariate logistic regressions to further investigate the association of PLEs and multidimensional factors (including demographic, lifestyle, psychosocial factors, lifetime affective symptoms and sleep problems). All the factors were examined as independent variables of PLEs. In the first logistic regression, the reference category for the dependent variables was the 'non-PLEs group'. In the second logistic regression, the reference category for the dependent variables was the 'current PLEs group'. We presented results as ORs with 95% CIs.

Patient and public involvement

Patients and the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

RESULTS

Description of the sample

A total of 4761 questionnaires were collected, with 83 duplicates being removed, 299 cases excluded as they were postgraduate students, two cases excluded due to their completion time for the survey being less than 5 min, 75 cases were excluded because they did not meet the age criteria and 94 cases excluded for a prior mental health diagnosis, leaving 4208 valid data. The study achieved a response rate of 74.65% (4208/5637). For full details, refer to figure 1. All 4208 participants were aged between 15 and 24 years, with a mean age of 18.59 (SD=0.95). Of all participants, over half were females (55.16%), most were of Han ethnicity (96.53%) and nearly half were born in rural areas (47.01%). A summary of the sample characteristics is presented in table 1 and the comparison between 94 cases excluded and 4208 participants can be found in online supplemental table 1.

Comparisons among the non-PLEs group, current PLEs group and remitted group

In this sample, over half of the adolescents (52.73%, n=2219) were classified as the lifetime PLEs group. Among those with lifetime PLEs, most adolescents (76.66%, n=1701) were classified as the remitted group while only a small portion (23.34%, n=518) were classified as the current PLEs group. Among all three groups of students (the non-PLEs group, the current PLEs group and the remitted group), there were significant differences in all

Table 1 The comparisons among the non-PLEs group, the current PLEs group and the remitted PLEs group

	Overall (N=4208)	Non-PLEs (N=1989)	Remitted PLEs (N=1701)	Current PLEs (N=518)	F/χ^2	P value	Post hoc pairwise comparisons
Demographic characteristics							
Age, mean (SD)	18.59 (0.95)	18.64 (0.96)	18.50 (0.89)	18.68 (1.03)	12.26	<0.001	A≠B; B≠C
Sex					63.67	<0.001	A≠B; A≠C
Male, N (%)	1887 (44.84)	1020 (51.28)	658 (38.68)	209 (40.35)			
Female, N (%)	2321 (55.16)	969 (48.72)	1043 (61.32)	309 (59.65)			
Ethnicity					1.131	0.568	n.s.
Han*, N (%)	4059 (96.53)	1914 (96.23)	1647 (96.83)	498 (96.14)			
Birthplaces					13.86	0.008	A≠B; A≠C
Urban, N (%)	1209 (28.73)	596 (29.96)	496 (29.16)	117 (22.59)			
Town, N (%)	1021 (24.26)	459 (23.08)	431 (25.34)	131 (25.28)			
Rural, N (%)	1978 (47.01)	934 (46.96)	774 (45.50)	270 (52.12)			
Parental marital status					12.1	0.002	A≠B; A≠C
Married, N (%)	3799 (90.28)	1828 (91.91)	1516 (89.12)	455 (87.84)			
Not currently married†, N (%)	409 (9.72)	161 (8.09)	185 (10.88)	63 (12.16)			
Left-behind child status‡ (yes), N (%)	1384 (32.89)	560 (28.15)	620 (36.45)	204 (39.38)	39.86	<0.001	A≠B; A≠C
Family history of mental disorders (yes), N (%)	154 (3.66)	49 (2.46)	72 (4.23)	33 (6.37)	20.45	<0.001	A≠B; A≠C
Chronic physical illness§ (yes), N (%)	429 (10.19)	121 (6.08)	229 (13.46)	79 (15.25)	71.03	<0.001	A≠B; A≠C
Lifestyle factors							
Smoking, N (%)	106 (2.52)	40 (2.01)	39 (2.29)	27 (5.21)	17.75	<0.001	A≠C; B≠C
Alcohol intake, N (%)	169 (4.02)	46 (2.31)	77 (4.53)	46 (8.88)	47.92	<0.001	A≠B; B≠C; A≠C
Lack of exercise, N (%)	2457 (58.39)	1122 (55.91)	994 (58.44)	351 (67.76)	23.77	<0.001	A≠C; B≠C
Psychosocial factors							
Childhood traumas¶, mean (SD)	43.74 (9.14)	41.63 (7.84)	44.41 (8.88)	49.60 (11.47)	177.43	<0.001	A≠B; B≠C; A≠C
Recent adverse life events**, Mean (SD)	39.82 (12.35)	34.97 (9.26)	42.27 (11.51)	50.35 (15.93)	456.52	<0.001	A≠B; B≠C; A≠C
Resilience††, Mean (SD)	95.45 (13.93)	100.13 (13.93)	92.94 (12.23)	85.73 (11.92)	304.6	<0.001	A≠B; B≠C; A≠C
Social support‡‡, Mean (SD)	64.84 (13.47)	67.33 (13.78)	64.15 (12.04)	57.59 (13.84)	117.53	<0.001	A≠B; B≠C; A≠C
Affective symptoms							
Depressive symptoms§§,N (%)	2060 (48.95)	534 (26.85)	1071 (62.96)	455 (87.84)	835.97	<0.001	A≠B; B≠C; A≠C

Continued

Table 1 Continued

	Overall (N=4208)	Non-PLEs (N=1989)	Remitted PLEs (N=1701)	Current PLEs (N=518)	F/χ^2	P value	Post hoc pairwise comparisons
Anxiety symptoms¶¶, N (%)	1815 (43.13)	435 (21.87)	945 (55.55)	435 (83.98)	825.93	<0.001	A≠B; B≠C; A≠C
Self-reported sleep problems							
Difficulty falling asleep, N (%)	1728 (41.06)	590 (29.66)	811 (47.68)	327 (63.13)	241.76	<0.001	A≠B; B≠C; A≠C
Waking up easily at night, N (%)	1056 (25.10)	305 (15.33)	514 (30.22)	237 (45.75)	242.15	<0.001	A≠B; B≠C; A≠C
Early wakening, N (%)	1559 (37.05)	556 (27.95)	698 (41.03)	305 (58.88)	187.99	<0.001	A≠B; B≠C; A≠C

For post hoc comparisons, A=non-PLEs group, B=remitted PLEs, C=current PLEs; A≠B indicates that a significant difference between group A and group B (p<0.05).
*Han is the major ethnic group in China.
†Not currently married included separated, divorced and widowed.
‡Referring to those left behind in their hometown by one or both of their migrant worker parents.
§Referring to those have at least one of arthritis, angina, asthma, diabetes, visual impairment or hearing problems.
¶The Childhood Trauma Questionnaire was used to assess self-reported experiences of childhood traumas before the age of 16.
**The Adolescent Self-Rating Life Events Checklist was used to assess adverse life events in the past 12 months.
††The 27-item Resilience Scale for Chinese Adolescents was used to evaluate the resilience.
‡‡The Multidimensional Scale of Perceived Social Support was used to assess individual perceived social support.
§§Screen positive for depressive symptoms as measured by the Patient Health Questionnaire-9 score ≥5.
¶¶Screen positive for anxiety symptoms as measured by the Generalised Anxiety Disorder 7-item scale score ≥5.
PLE, psychotic-like experience.

the included factors except ethnicity (table 1). The current PLEs group had the highest proportions of adolescents living in single-parent families (p=0.002), 'left-behind' children (p<0.001), those with a family history of mental disorders (p<0.001), those having chronic physical illness (p<0.001) and those with the habit of smoking (p<0.001) and alcohol intake (p<0.001) while the non-PLEs group had the lowest proportion of adolescents with the above factors.

As for psychosocial factors, the current PLEs group had the highest levels of childhood traumas (p<0.001) and recent adverse life events (p<0.001), lowest levels of resilience (p<0.001) and social support (p<0.001) while the non-PLEs group had the lowest levels of childhood traumas (p<0.001) and recent adverse life events (p<0.001), highest levels of resilience (p<0.001) and social support (p<0.001).

As for affective symptoms, the current PLEs group had the highest proportion of adolescents who experienced depressive symptoms and anxiety symptoms (both p<0.001) while the non-PLEs group had the lowest proportion of adolescents conversely.

As for self-reported sleep problems, the current PLEs group had the highest proportion of adolescents who reported difficulty falling asleep, waking up easily at night and early wakening (all p<0.001) while the non-PLEs group had the lowest proportion of adolescents conversely.

Post hoc pairwise comparisons of all factors including psychosocial factors, affective symptoms and self-reported sleep problems (see table 1) were significantly different (p<0.05).

Factors associated with the remission of PLEs

No evidence for the potential multicollinearity of all variables was found, with VIF values of 1.66 and below. As shown in table 2, compared with adolescents without PLEs, the remitted group were less likely to be younger (OR 0.88, 95% CI 0.81 to 0.95) and females (OR 1.50, 95% CI 1.28 to 1.75) and were more likely to have chronic physical illness (OR 1.67, 95% CI 1.29 to 2.16), have the habit of drinking (OR 1.85, 95% CI 1.19 to 2.88), have less resilience (OR for high vs low 0.66, 95% CI 0.51 to 0.86), have the sleep problems of waking up easily (OR 1.36, 95% CI 1.12 to 1.65) at night and early wakening (OR 1.33, 95% CI 1.13 to 1.57); the remitted group were more likely to experience more childhood traumas (OR for low vs high 0.72, 95% CI 0.57 to 0.91) and more recent adverse life events (OR for low vs high 0.30, 95% CI 0.23 to 0.38; OR for medium vs high 0.73, 95% CI 0.60 to 0.89), more depressive symptoms (OR 1.98, 95% CI 1.67 to 2.36) and anxiety symptoms (OR 1.97, 95% CI 1.66 to 2.34).

As compared with the current PLEs group, the remitted group was more likely to receive social support (OR for high vs low 1.48, 95% CI 1.01 to 2.17; OR for medium vs

Table 2 Factors associated with the remission of PLEs (N=4208)

Variables*		Remitted PLEs vs non-PLEs† OR (95% CI)	Remitted PLEs vs current PLEs‡ OR (95% CI)
Demographic characteristics			
Age	–	**0.88 (0.81 to 0.95)****	0.90 (0.80 to 1.00)
Sex	Male	1	1
	Female	**1.50 (1.28 to 1.75)*****	1.00 (0.80 to 1.25)
Ethnicity	Others	1	1
	Han	1.29 (0.86 to 1.94)	1.47 (0.83 to 2.59)
Birthplaces	Rural	1	1
	Town	1.12 (0.93 to 1.35)	1.15 (0.88 to 1.49)
	Urban	1.06 (0.89 to 1.27)	1.29 (0.98 to 1.68)
Parental marital status	Not currently married	1	1
	Married	0.95 (0.73 to 1.24)	0.95 (0.68 to 1.34)
'Left-behind' child status	No	1	1
	Yes	1.16 (0.98 to 1.37)	1.10 (0.87 to 1.38)
Family history of mental disorders	No	1	1
	Yes	0.86 (0.56 to 1.31)	1.01 (0.63 to 1.60)
Chronic physical illness	No	1	1
	Yes	**1.67 (1.29 to 2.16)*****	1.12 (0.82 to 1.51)
Lifestyle factors			
Smoking	No	1	1
	Yes	0.79 (0.46 to 1.35)	0.66 (0.37 to 1.18)
Alcohol intake	No	1	1
	Yes	**1.85 (1.19 to 2.88)****	0.67 (0.43 to 1.05)
Physical exercise	No	1	1
	Yes	1.13 (0.96 to 1.32)	1.14 (0.91 to 1.44)
Psychosocial factors			
Childhood trauma§	High	1	1
	Medium	0.89 (0.73 to 1.08)	1.20 (0.94 to 1.53)
	Low	**0.72 (0.57 to 0.91)****	1.34 (0.92 to 1.95)
Recent adverse life events¶	High	1	1
	Medium	**0.73 (0.60 to 0.89)****	**1.95 (1.54 to 2.47)*****
	Low	**0.30 (0.23 to 0.38)*****	**1.56 (1.03 to 2.35)***
Resilience**	Low	1	1
	Medium	0.87 (0.71 to 1.07)	**1.38 (1.07 to 1.78)***
	High	**0.66 (0.51 to 0.86)****	1.54 (0.98 to 2.43)
Social support††	Low	1	1
	Medium	1.07 (0.87 to 1.31)	**1.53 (1.18 to 1.97)****
	High	1.08 (0.85 to 1.39)	**1.48 (1.01 to 2.17)***
Affective symptoms			
PHQ-9 score ≥5	No	1	1
	Yes	**1.98 (1.67 to 2.36)*****	**0.50 (0.36 to 0.69)*****
GAD-7 score ≥5	No	1	1
	Yes	**1.97 (1.66 to 2.34)*****	**0.44 (0.33 to 0.59)*****

Continued

Table 2 Continued

Variables*		Remitted PLEs vs non-PLEs† OR (95% CI)	Remitted PLEs vs current PLEs‡ OR (95% CI)
Self-reported sleep problem			
Difficulty falling asleep	No	1	1
	Yes	1.17 (0.99 to 1.38)	0.97 (0.76 to 1.23)
Waking up easily at night	No	1	1
	Yes	**1.36 (1.12 to 1.65)****	0.85 (0.67 to 1.09)
Early wakening	No	1	1
	Yes	**1.33 (1.13 to 1.57)****	**0.64 (0.51 to 0.80)*****

*p<0.05, **p<0.01, ***p<0.001.
Bold values are p<0.05.
*All independent variables were simultaneously entered into multivariate logistic regression models.
†The reference category for the dependent variables was the "non-PLEs group".
‡The reference category for the dependent variables was the "Current PLEs group".
§The Childhood Trauma Questionnaire (CTQ) was used to assess self-reported experiences of childhood traumas before the age of 16.
¶The Adolescent Self-Rating Life Events Checklist (ASLEC) was used to assess adverse life events in the past 12 months.
**The 27-item Resilience Scale for Chinese Adolescents (RSCA) was used to evaluate the resilience.
††The Multidimensional Scale of Perceived Social Support (MSPSS) was used to assess individual perceived social support.
PLEs, psychotic-like experiences.

low 1.53, 95% CI 1.18 to 1.97), has more resilience (OR for medium vs low 1.38, 95% CI 1.07 to 1.78) and the sleep problems of early wakening (OR 0.64, 95% CI 0.51 to 0.80), experiences less recent adverse life events (OR for low vs high 1.56, 95% CI 1.03 to 2.35; OR for medium vs high 1.95, 95% CI 1.54 to 2.47), depressive symptoms (OR 0.50, 95% CI 0.36 to 0.69) and anxiety symptoms (OR 0.44, 95% CI 0.33 to 0.59).

DISCUSSION

To the best of our knowledge, this is the first study to investigate the factors associated with the remission of PLEs from multiple domains, including sociodemographic variables, lifestyle, psychosocial factors, lifetime affective symptoms and sleep problems, in a sample of college students. Adolescence is considered a crucial developmental stage for studying psychopathological phenomena.[10 11] During this special stage of brain maturation,[3] complex factors are associated with the occurrence and development of PLEs.[47] The remitted group seemed to be in an intermediate state between non-PLEs and current PLEs. Several shared factors associated with the remission of PLEs and the absence of lifetime PLEs were identified, such as experiencing fewer adverse life events, exhibiting greater resilience, and reporting more symptoms of depression/anxiety and early waking. Additionally, one specific protective factor has been found to promote the remission of PLEs (ie, more social support). Finally, compared with non-PLEs, we also found several risk factors associated with the remitted group (ie, female, older age, more chronic physical illness, more alcohol intake, more childhood trauma and more symptoms of waking up easily at night).

The remitted group was in an intermediate state between non-PLEs and current PLEs

Significant differences were found between the remitted group and the other two groups across all five domains, including demographics, lifestyle, psychosocial factors, affective symptoms and self-reported sleep problems. The remitted group always scored between the non-PLEs and current PLEs groups, indicating the remitted group might be in an intermediate state. Our findings are consistent with the previous research.[17 18] However, we further explore the intermediated state in multiple domains.

Shared associated factors associated with the remitted PLEs and non-PLEs

The two logistic regressions revealed a stable association between PLEs and recent adverse life events, individual resilience, depressive and anxiety symptoms, as well as early waking. This association existed regardless of current PLEs or remitted PLEs. Our results suggest that fewer recent adverse life events, higher levels of resilience, the absence of depressive and anxiety symptoms and early waking symptoms in adolescents cannot only reduce the occurrence of PLEs but also help to mitigate PLEs that already exist. These are important factors associated with intermediate states of PLEs (ie, remitted PLEs), and their levels of severity seem to exert important influences on the two PLEs groups (ie, remitted and current PLEs).

Adverse life events have been found to be associated with PLEs.[48 49] Passive thoughts caused by adverse life events may interact with relevant stress regulation systems, collectively leading to the current PLEs.[50] It is noteworthy that, in the final models of a wide range of factors, adverse life events in the last year are strongly associated with both the onset and remission of PLEs.

This finding is consistent with that of a previous study,[27] suggesting that a profound impact of recent adverse events deserves. Hence, it is urgently needed to reduce impacts from the recent adverse events in the subsequent intervention strategies.

Resilience also played an important role in the onset and remission of PLEs, which is in line with previous studies.[17 51] As an individual ability that allows recovery from or adaptation to stress,[52] resilience has been found to be associated with more social support from family and friends,[53] good physical[54] and mental health conditions.[55] Taken together, the enhancement of resilience for adolescents requires not only personal improvement but also long-term interventions from family and social levels.

Affective symptoms appear to be closely associated with both the onset and remission of PLEs. Our findings are consistent with that of a recent systematic review,[8] indicating that PLEs may act as a co-occurring psychopathological indicator of multidimensional affective symptoms. A possible explanation is that PLEs in adolescents are associated with altered amygdala-visual cortex connectivity which is also positively associated with depressive and anxiety symptoms.[56] This also provides new perspectives for prevention and intervention, as improving depression and anxiety in adolescents (it is an important public prevention effort) may help prevent and alleviate PLEs to some extent and vice versa.

Early awakening is another associated factor for different groups of PLEs. Previous evidence has revealed a link between PLEs and severe sleep disturbances, such as self-reported insomnia and sleep paralysis.[57] Our study further demonstrated the association between the specific insominia symptom of early awakening and PLEs, suggesting specific insominia symptom should be targeted when seeking to reduce and prevent PLEs.

Specific associated factors for the remission of PLEs

Specific associated factors for the promotion of the remission of PLEs

In the comparison of the remitted group and the current PLEs group, higher social support was a specifically associated factor. Both groups shared a genetic basis of susceptibility, but PLEs may be alleviated among the remitted group with the protective influence of social support. Previous research has found the protective role of social support in the presence of PLEs.[58 59] Our findings provide additional evidence that social support may facilitate the reversal of developmental trajectories of PLEs and aid individuals with PLEs in achieving remission, rather than solely preventing the onset of PLEs. Moreover, our results indicate that psychosocial interventions encompassing social support from family, school and society may be imperative for promoting the remission of PLEs.

Specific associated factors for remission of PLEs in comparison to the non-PLEs group

We also identified several associated factors when comparing remitted PLEs to non-PLEs rather than comparing remitted PLEs to current PLEs, including females, younger age, chronic physical illness, intake of alcohol and more childhood traumas and sleep problems of waking up easily at night. The reason for this difference in associations may be that these factors are more relevant to the genetic basis or early experiences, which coincided with the theory of the psychosis proneness-persistence-impairment model.[6 60] Meanwhile, the significance of comparing the two groups is to identify factors associated with PLEs that may prevent the development of PLEs in adolescents, even if it is transient.

Our findings demonstrated adolescents with chronic physical illness are more likely to be those who reported remitted PLEs, which is supported by a previous study.[30] The association between PLEs and chronic physical illness might be explained by genetic factors. It may be relevant that chronic physical illness has well-established relationships with genetic heritage,[61 62] which also be conjointly associated with PLEs.[63] For instance, there is preliminary evidence of shared genetic factors between diabetes and mental illness.[64] Additionally, chronic physical illness is also a long-lasting trauma that can affect the quality of life and cause psychological distress, increasing the risk for the onset of mental health issues.[65] Adolescents with the habit of alcohol intake were more likely to be in the remitted PLEs group, which is in accordance with past research.[6] The result can be understood from different perspectives. On the one hand, the same genetic mechanisms may be shared by PLEs and alcohol intake, as alcohol intake was correlated with a genetic risk[66] and some alcohol-related genes shared genetic mechanisms with psychiatric disorders.[67] Furthermore, some genotypes could predict future alcohol use.[68] On the other hand, alcohol intake may serve as a maladaptive coping style for PLEs.[69 70]

Our results found that females were more likely to be in the remitted PLEs group, while males were in the non-PLEs one, which is supported by previous studies.[71 72] Females were associated with an elevated risk of PLEs, potentially attributable to the interplay of both genetic and environmental factors.[73] However, a few studies have found that male is a risk factor for PLEs[15 74] while some studies have concluded that no significant sex differences were found in the prevalence of PLEs.[75 76] Further studies are needed to clarify this association and its mechanisms.

The risk of transient PLEs increases with a higher exposure of childhood traumas. The association between childhood trauma and PLEs is well established as many large population-based studies have found their associations.[77 78] This association can be explained by environmental factors. External adverse events in early years lead to negative emotions and even psychological traumas in individuals, which may further result in adverse outcomes in mental health.[79 80] Waking up easily at night is also an associated factor. However, no relevant study has examined the relationship between easy waking and the remission of PLEs. Our study showed that adolescents with easy waking were more likely to be in the remitted group than in the non-PLEs group, highlighting the importance of insomnia

symptom subtypes. Waking up easily has distinct effects on the onset of depression,[81 82] which is associated with the developmental trajectories of PLEs.[18] However, the underlying mechanisms are unknown and require further research. As for age, remitted PLEs decreased with age in our sample. Due to the narrow age range of our current sample, the result should be interpreted with caution.

Strength and limitation

The strengths of this study include a multicentre design, a validated measure of PLEs, a relatively large sample and inclusion of multidimensional potentially associated factors. It should be noted that this study has some limitations. First, the study achieved a high response rate of 74.65%, indicating a representative sample. However, it is important to consider potential non-response bias that could impact the generalisability of the findings. Second, this study is subject to the limitations of cross-sectional analysis, such as recall bias. Third, the reliability and validity of most measures, including the CAPE-P15, have been well established in the Chinese population. However, all of them relied on self-reports rather than structured interviews, which may lead to reporting bias due to individuals' mental state and recollection inaccuracy. Fourth, our study used simplified measures for lifestyle factors and sleep problems and failed to collect some valuable information, such as academic performance. Future research should collect more comprehensive and detailed data. Fifth, our study was conducted among college students, which may limit the generalisation of the conclusion in other populations to some extent, such as their relatively high levels of education and good family environment. Moreover, the potential mechanisms underlying the association between these associated factors and PLEs remain unclear. For instance, interaction effects may exist between various factors when they act on PLEs, and these factors may also exert both direct and indirect effects on PLEs. Consequently, further investigation is warranted to explore these potential mechanisms.

CONCLUSION

The remitted group seems to be in an intermediate state between those who reported no PLEs and current PLEs. Fewer recent adverse life events, greater resilience, fewer symptoms of depression and anxiety, and early waking, higher levels of social support were identified to be associated with the remission of PLEs. Our findings may offer guidance to mental healthcare providers on how to support individuals already with PLEs, as well as provide potential targets for the development of future intervention strategies.

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ORCID iDs

Liang Zhou http://orcid.org/0000-0002-3677-867X
Meng Sun http://orcid.org/0000-0003-2024-2923

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