



## Correspondence

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# Non-suicidal self-harm is linked to suicidal thoughts in Chinese adolescents with mood disorders: a cross-sectional report

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Non-suicidal self-injury (NSSI) refers to any intentional, self-inflicted behavior that causes direct damage to body tissues (Kerr et al., 2010), and has emerged as a challenging public health issue worldwide, especially among adolescents. The most common presentations of NSSI include skin-cutting, severe scratching, and burning (Whitlock et al., 2006). In a community-based study conducted in England, 6% of 5506 adolescents reported self-harm in 2014, and 1320 adolescents (74% aged 15–17 years) presented to hospitals due to non-fatal self-harm (Geulayov et al., 2018). In Australia, 8% of adolescents aged less than 20 years reported a history of self-harm (Hiscock et al., 2018). In addition, the prevalence of NSSI has significantly increased in recent years. It was reported by McManus et al. (2019) that the prevalence of self-reported lifetime NSSI increased from 2.4% in 2000 to 6.4% in 2014, with the largest increase in females aged 16–24 years (from 6.5% to 19.7%). Researchers have also proposed an “iceberg” model of self-harm, indicating that the phenomenon of NSSI is often concealed and that most individuals with NSSI do not seek help

from others (McMahon et al., 2014; Geulayov et al., 2018).

The outcomes of NSSI may not be as notable as suicide; however, NSSI is still an issue of critical importance due to its association with a variety of adverse consequences, including suicidal thoughts and suicide attempts. Children and adolescents who committed NSSI were approximately nine times more likely to subsequently die unnaturally, with increased risks of suicide and fatal acute alcohol or drug poisoning (Morgan et al., 2017). Other studies have also shown a strong positive correlation between future suicide attempts and NSSI, which was measured by form and frequency (Guan et al., 2012; Hamza et al., 2012; Mars et al., 2019). It is estimated that approximately 800 000 people die by suicide every year (World Health Organization, 2019), and suicide has become one of the leading causes of death in adolescents. With regard to long-term outcomes, Borschmann et al. (2017) suggested that mental health problems, daily tobacco smoking, and illicit drug use and dependence were all more common among adolescents with NSSI. NSSI can occur either concurrently with mental disorders, such as depression (Moran et al., 2012), or without a comorbid diagnosis of mental disorders (Nock et al., 2006; Glenn and Klonsky, 2013).

NSSI has recently become a major mental health problem in many countries, including China. A previous study reported that 33.6% of 3161 Chinese adolescents

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were involved in certain forms of NSSI (Tang et al., 2013). Adolescent NSSI is an indicator of future adverse individual health and social outcomes throughout adulthood (Borschmann et al., 2017). However, NSSI in adolescents has received inadequate attention from health services and national health organizations. More than 50% of respondents who reported lifetime NSSI did not seek mental health services or psychological support (McManus et al., 2019).

Many studies have been conducted to identify the risk factors related to suicidal behavior, such as personality and individual differences, cognitive factors, social aspects, and negative life events (Hamza et al., 2012; O'Connor and Nock, 2014). However, factors that influence the behavior of NSSI are still unclear. McManus et al. (2019) indicated that the intention of dealing with negative emotions (including anger, tension, anxiety, and depressive mood) was associated with NSSI. Huang and Zhang (2016) found that emotional adjustments, drug dependence, neuroticism, and the parents' relationship may be associated with NSSI in college students, and NSSI clustering at class level might also be involved. Fox et al. (2015) proposed that a prior history of NSSI, Cluster B personality, and hopelessness were the strongest risk factors found in current studies regarding NSSI. Depressive symptoms were also found to be a significant predictor of future NSSI. Other factors, such as self-injurious behavior in peers, may also have an impact on NSSI in adolescents (Prinstein et al., 2010). Several studies have demonstrated that a significant proportion of individuals engaging in NSSI reported feeling better after harming themselves (Franklin et al., 2010; Weinberg and Klonsky, 2012; Bresin and Gordon, 2013). However, few studies have examined other potential risk factors of NSSI in adolescence, especially in non-western countries. A longitudinal study of 5154 Chinese adolescents found that previous exposure to suicide-death or suicidal behaviors of relatives were correlated with increased risk of NSSI (Liu et al., 2019).

Despite the increasing number of studies on NSSI, few studies have investigated the prevalence of NSSI in patients with mood disorders. Therefore, the aim of the current study was to address the issue of NSSI in Chinese adolescents with mood disorders. Herein, a cross-sectional survey of adolescents with mood disorders and their parents was performed to

identify the relationship between NSSI and family, academic, emotional, and suicidal factors.

The study was carried out from July 1 to Sept. 31, 2019. Participants were recruited from the psychiatric clinic or wards of the First Affiliated Hospital, Zhejiang University School of Medicine, Hangzhou, China. Adolescents with a previous or current diagnosis of major depressive disorder or bipolar disorder according to the Diagnostic and Statistical Manual of Mental Disorders Fifth Edition (DSM-5), and their parents, were eligible to participate in this study. Demographic profiles, including age, gender, educational level, marital status of parents, siblings, and religious belief, were recorded.

A total of 70 adolescents and 59 parents completed the questionnaire in this study. Of these participants, 55 adolescents and their parents were matched. Demographic data of the adolescents, but not their parents, are shown in Table 1. The average age of the adolescents was (16.1±2.4) years, and the proportion of females was 71.4%. Most (86.7%) were at a middle school (junior or senior) educational level. Only a minority of adolescents (14.3%) had a religious belief. With regard to their family background, 17.1% of the adolescents' parents were divorced, and nearly half of the adolescents (48.6%) had siblings.

Two versions of a questionnaire evaluating self-injury behavior (NSSI in the last month, and/or NSSI more than five times in the last year) and associated factors in the adolescents and their parents were administered (see supplementary information: self-injury questionnaire (adolescent version) and self-injury questionnaire (parent version)). Potential factors linked to self-injury behaviors, including predisposition, family financial status, parents' relationship, relationship with others, history of bullying, and suicidal ideations or plans, were investigated in this study.

Data analysis was performed using SPSS 20.0 (IBM Corp., Armonk, New York, USA). Normally distributed measurement data are presented as mean± standard deviation (SD) or as median (interquartile range). Enumeration data are presented as frequency or percentage (%). Spearman's rank correlation analysis was performed to calculate the correlation between different factors.  $P < 0.05$  was considered statistically significant.

Of the adolescents included, 44 (62.9%) reported NSSI. Of the adolescents with NSSI, 35 (79.5%) were

**Table 1 Demographics of all adolescent participants**

Variables	All adolescents (n=70)	Adolescents with NSSI (n=44)
Sex		
Male	20 (28.6%)	9 (20.5%)
Female	50 (71.4%)	35 (79.5%)
Age (year)	16.1±2.4	17.0±2.7
12	1 (1.4%)	0 (0%)
13–15	30 (42.9%)	22 (50.0%)
16–18	31 (44.3%)	17 (38.6%)
19–20	5 (7.1%)	4 (9.1%)
21–25	3 (4.3%)	1 (2.3%)
Education		
Primary school	2 (2.9%)	1 (2.3%)
Junior middle school	27 (38.6%)	16 (36.6%)
Senior middle school	33 (47.1%)	18 (40.9%)
College/university	8 (11.4%)	7 (20.2%)
Marital status of parents		
Divorced	12 (17.1%)	8 (18.2%)
Married	58 (82.9%)	36 (81.8%)
Family members/siblings		
No siblings	36 (51.4%)	24 (54.5%)
Have siblings	34 (48.6%)	20 (45.5%)
Religious belief		
No	60 (85.7%)	40 (90.9%)
Yes	10 (14.3%)	4 (9.1%)

Data are expressed as number (percentage) of adolescents or mean±standard deviation. NSSI: non-suicidal self-injury.

female and 39 (88.6%) were aged 13 to 18 years. In the adolescents included, 38 (54.3%) reported NSSI in the month prior to the survey, and 26 (37.1%) reported NSSI more than five times in the last year before this survey (the frequency and duration criterion of the diagnosis of NSSI Disorder in DSM-5). Of note, 20 (28.6%) of the participants had committed self-harm both in the last month and more than five times in the last year. However, only 11 (18.6%) and 4 (6.8%) parents reported the above two situations in their children, respectively.

According to the 70 adolescents, 48 (68.6%) reported hopelessness; 44 (62.9%) reported a wish to die; 49 (70.0%) reported suicidal thoughts; 44 (62.9%) reported a wish to end life by accident. However, the proportions of the above mood disorders reported by their parents were extremely low, accounting for 37.3%, 23.7%, 6.8%, and 11.9%, respectively (Table 2).

Among the listed family factors, 34 (48.6%) adolescents and 21 (30.0%) parents reported poor

**Table 2 Psychological consequences associated with NSSI in adolescents**

Consequence	Percentage in total sample (%)	
	Self-report (n=70)	Parent report (n=59)
Hopelessness	68.6	37.3
Wish for death	62.9	23.7
Having the ability and courage to commit suicide	24.3	17.0
Suicidal ideations	70.0 (21.4% with detailed plans)	6.8 (1.7% with detailed plans)
Suicidal plans		
Cutting wrists	10.0	
Jumping building	5.7	1.7
Charcoal-burning	2.9	
Hanging	2.9	
Drugs	2.9	
Electrocution	1.4	
Detailed suicidal plans with enough determination to implement	17.1	1.7
Wish to end life by accidents	62.9	11.9
Handle things in a hurry due to anticipation of death	18.6	1.7

NSSI: non-suicidal self-injury.

family relationships. Among the academic factors, “failing the exams recently,” “too much academic pressure from expectations of parents or teachers,” and “limited time for leisure or entertainment due to large amounts of schoolwork,” appeared to be the major reasons. Among the emotional factors, problems such as “having nobody to talk with when feeling sad” and “psychological pain cannot be understood” were common and similarly reported by the adolescents and their parents (Table 3).

To better clarify the relationships between different factors, rank correlation analysis was performed. As shown in Tables 4 and 5, a positive correlation was identified between “self-harm in the last month” and “over five incidents of NSSI in the past year,” as reported by both adolescents and parents (correlation coefficient  $\rho=0.349$ ,  $P<0.05$ ;  $\rho=0.390$ ,  $P<0.05$ ). As reported by the adolescents, other factors positively correlated with “self-harm in the last month” included “hopelessness,” “wish for death,” “suicidal ideations,” “detailed suicide plans,” “wish to end life by accident,” “handle things in a hurry due to anticipation of death,” and “feeling embarrassed or ashamed due to family

**Table 3 Different factors associated with NSSI in adolescents**

Variables	Percentage in the total sample (%)	
	Self-report (n=70)	Parent-report (n=59)
<b>Family</b>		
Feeling that life was not worth living due to poor family relationship	48.6	20.3
Family financial burden	7.1	5.1
Death of close relatives recently	4.3	1.7
Falling seriously ill recently (yourself or relatives)	4.3	1.7
<b>Academic</b>		
Failing exams recently	30.0	23.7
Pressure due to high school or university entrance test	17.1	15.3
Too much academic pressure from expectations of parents or teachers	45.7	54.2
Limited time for leisure or entertainment due to large amount of schoolwork	38.6	42.4
Strained relationship with schoolfellow or friends	11.4	15.3
Suffered from bullying	12.9	37.3
Feeling embarrassed or ashamed due to family financial burden	8.6	10.1
<b>Emotion</b>		
Have nobody to talk to when feeling sad	70.0	57.6
Psychological pain cannot be understood	75.7	66.1
<b>Others</b>		
Accidental fright or incident	7.1	5.1

NSSI: non-suicidal self-injury.

financial burden" ( $\rho=0.429, 0.363, 0.463, 0.265, 0.482, 0.483, \text{ and } 0.281$ , respectively, all  $P<0.05$ ). Of note, factors such as "hopelessness," "wish for death," "suicidal ideations," "wish to end life by accident," and "handle things in a hurry due to anticipation of death" ( $\rho=0.329, 0.407, 0.374, 0.407, \text{ and } 0.241$ , respectively, all  $P<0.05$ ) were also positively correlated with "over five times of NSSI in the past year." In addition, "too much academic pressure due to expectations of parents or teachers" and "feeling that life was not worth living due to poor family relationships" were factors positively associated with "over five incidents of NSSI in the past year" ( $\rho=0.244 \text{ and } 0.318$ , respectively, both  $P<0.05$ ; Table 4). However, as reported by the parents, "hopelessness" was the only factor positively associated with "self-harm in the last month" ( $\rho=0.261, P<0.05$ ; Table 5).

In this study, which investigated the prevalence of NSSI and associated factors in Chinese adolescents with mood disorders, a considerable proportion of adolescents (62.9%) reported NSSI, which was linked to adverse psychological outcomes such as hopelessness and suicidal thoughts. Compared with adolescents, their parents appeared to underestimate the adverse

psychological influences related to NSSI. Overwhelming academic pressure and limited time for leisure or entertainment were dominant factors that contributed to NSSI, as reported by both the adolescents and their parents. Correlation analysis also indicated positive relationships between hopelessness, suicide and NSSI.

The percentage of female adolescents who engaged in NSSI was several times greater than that of male adolescents in our study, consistent with previous findings (Watanabe et al., 2012; Geulayov et al., 2018). We also found a strong association between NSSI and suicidal thoughts. Several factors of NSSI were identified according to the responses from both the adolescent and parent groups, including "hopelessness," "lack of understanding of psychological pain," and "limited time for leisure and entertainment due to large amount of schoolwork." In addition, factors such as "poor family relationship," "school bullying," "embarrassment or shame due to family financial burden" were only reported by a minority of participants.

Most adolescents engaging in NSSI were aged 13 to 18 years, and this is consistent with many other studies on NSSI (Tang et al., 2013; Geulayov et al.,

**Table 4 Rank correlations between different factors according to responses from adolescents**

Factor	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17
A1	1.000																
A2	0.349*	1.000															
A3	0.429*	0.329*	1.000														
A4	0.363*	0.407*	0.690*	1.000													
A5	-0.015	0.116	0.096	0.229	1.000												
A6	0.463*	0.374*	0.430*	0.400*	0.225	1.000											
A7	0.265*	0.121	0.226	0.271*	0.273*	0.298*	1.000										
A8	0.482*	0.407*	0.626*	0.755*	0.160	0.465*	0.350*	1.000									
A9	0.438*	0.241*	0.165	0.291*	0.072	0.232	0.465*	0.367*	1.000								
A10	0.088	-0.142	0.228	0.013	-0.165	0.184	0.215	0.077	0.072	1.000							
A11	0.216	0.160	0.550*	0.392*	0.010	0.284*	0.169	0.461*	0.099	0.502	1.000						
A12	0.020	0.120	0.284*	0.305*	0.030	0.006	0.029	0.184	-0.227	0.134	0.312*	1.000					
A13	0.209	0.244*	0.251*	0.290*	0.149	0.225	0.115	0.290*	0.152	0.038	0.252	0.333*	1.000				
A14	0.203	0.318*	0.289*	0.392*	0.183	0.262*	0.316*	0.274*	0.271*	0.200	0.284*	0.111	0.141	1.000			
A15	0.095	-0.119	-0.108	-0.058	0.081	0.158	0.052	0.119	-0.074	0.251*	0.118	0.134	0.162	0.054	1.000		
A16	0.281*	-0.024	0.097	0.024	0.184	0.089	0.132	0.130	0.116	0.200	0.173	0.072	0.334*	0.213	0.340*	1.000	
A17	0.081	-0.114	-0.024	-0.089	0.277*	-0.043	0.166	-0.021	0.055	0.100	-0.048	0.004	0.051	-0.245*	0.165	0.170	1.000

A1: self-harm in the last month; A2: over five times of NSSI in the past year; A3: hopelessness; A4: wish for death; A5: self-certainty of ability and courage to commit suicide; A6: suicidal ideations; A7: detailed suicide plans; A8: wish to end life by accidents; A9: handle things in a hurry due to anticipation of death; A10: have nobody to talk to when feeling sad; A11: psychological pain cannot be understood; A12: limited time for leisure or entertainment due to large amount of schoolwork; A13: too much academic pressure due to expectations of parents or teachers; A14: feeling that life was not worth living due to poor family relationship; A15: suffer from bullying; A16: feeling embarrassed or ashamed due to family financial burden; A17: temporarily absent from school. Answer “Yes” was defined as 1, while “No” was defined as 2 (see supplementary information: self-injury questionnaire (adolescent version) and self-injury questionnaire (parent version)). \* Statistical significance is set at  $P<0.05$ .

**Table 5 Rank correlations between different factors according to responses from parents**

Factor	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17
A1	1.000																
A2	0.390*	1.000															
A3	0.261*	0.210	1.000														
A4	0.244	0.008	0.641*	1.000													
A5	0.132	0.238	0.492*	0.385*	1.000												
A6	0.217	0.195	0.350*	0.325*	0.238	1.000											
A7	-0.063	-0.035	0.170	0.235	0.291*	-0.035	1.000										
A8	0.094	-0.099	0.367*	0.411*	0.114	0.318*	-0.048	1.000									
A9	-0.063	-0.035	0.170	0.235	-0.059	-0.035	-0.017	0.358*	1.000								
A10	-0.118	-0.178	0.213	0.572	0.600	0.177	0.247	0.113	0.396	1.000							
A11	-0.117	0.051	0.330*	0.147	0.228	0.051	0.094	0.152	0.094	0.763	1.000						
A12	0.030	0.042	0.119	0.086	0.161	0.042	-0.113	0.110	0.153	-0.167	-0.111	1.000					
A13	0.003	0.112	0.005	-0.047	0.052	-0.023	-0.143	0.127	0.121	-0.030	-0.011	0.306*	1.000				
A14	0.082	0.199	0.220	0.213	0.108	0.366*	-0.066	0.205	0.260*	0.092	0.184	-0.007	0.295*	1.000			
A15	0.081	-0.069	0.203	0.311*	0.119	0.210	-0.101	0.151	0.170	0.023	0.034	0.403*	0.286	0.406	1.000		
A16	0.127	0.132	0.320*	0.208	0.147	-0.091	-0.044	0.397*	0.390*	0.175	0.122	0.165	0.084	0.109	0.088	1.000	
A17	0.082	0.031	0.046	0.015	-0.116	0.031	-0.066	0.075	0.260*	0.092	0.006	-0.007	0.126	-0.046	0.133	-0.031	1.000

The definitions of different factors (A1–A17) are consistent with those in Table 4. \* Statistical significance is set at  $P<0.05$ .

2018; Hiscock et al., 2018). Adolescents in this age group seem to be more likely to engage in NSSI. As mentioned previously, the pattern of NSSI tends to fit the iceberg model (Tang et al., 2013; Geulayov et al., 2018), indicating that a significant proportion of individuals engaging in NSSI are not presenting to hospitals. The actual number of adolescents with mood disorders who engage in NSSI is probably extremely high. Therefore, more attention to NSSI in adolescents is needed.

NSSI was associated with adverse psychological outcomes such as hopelessness, which is consistent with another study (Watanabe et al., 2012). One possible explanation for this is that engaging in NSSI may be an approach to reduce the feeling of hopelessness and make oneself feel better (Franklin et al., 2010; Weinberg and Klonsky, 2012; Bresin and Gordon, 2013). In this study, we also found a close relationship between NSSI and suicidal thoughts. Previous studies have suggested that NSSI can be considered a robust predictor of future suicide attempts (Guan et al., 2012; Borschmann et al., 2017; Morgan et al., 2017; Mars et al., 2019). Therefore, young adolescents with mood disorders reporting NSSI are at high risk of suicide, which warrants special attention.

With regard to social and family factors linked to NSSI, the results from previous studies have varied. In several previous studies, higher parental invalidation and dysfunctional peer relationships were observed in adolescents who engaged in NSSI (Tan et al., 2014; Gandhi et al., 2019; Victor et al., 2019). The relationship between siblings may also influence this issue, as shown by Tschan et al. (2019). Lauw et al. (2018) found that the marital status of parents and childhood abuse were not associated with NSSI in adolescents. The impact of the quality and structure of family relationships and other social factors on NSSI in adolescents requires further research.

Of note, parents of adolescents engaging in NSSI seem not to be aware of their children's self-harm behaviors or suicidal thoughts. This may be due to the emotional isolation of these adolescents, as it was found in this study that many of the adolescents reported a lack of being understood or having nobody to talk with. Another explanation is that Chinese traditional culture makes adolescents feel ashamed of

being mentally ill and parents unconsciously choose to ignore emotional and behavioral abnormalities in their children. Inadequate awareness of NSSI among parents may provide the conditions for adolescent NSSI.

There are several limitations in this study. First, the correlation between NSSI and other factors found in this study did not indicate any causality. Further analysis is needed to identify predictors of NSSI, which was beyond the scope of this study. Second, the sample size in this study was too small for detailed interpretation, and was limited to adolescents with mood disorders. We also did not record the clinical diagnosis of the participants, although a diagnosis of mood disorder was required for eligibility. Third, of the 70 adolescent participants, 8 were aged over 18 years and the maximum age was 25 years. Inclusion of these participants in the final analysis may also have had an impact on our results. Fourth, the actual prevalence of current or past NSSI in this population was difficult to estimate due to self-report or recall bias. Some adolescents may feel reluctant to report self-injury behaviors, and others may have difficulty in recalling these experiences.

In conclusion, NSSI is a common problem among Chinese adolescents with mood disorders. Given the perniciousness of NSSI, parents, schools, and public health authorities should recognize this issue and implement early and effective interventions to help these adolescents. Clinical monitoring for NSSI is also needed, especially in young patients with mood disorders.

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### Author contributors

Shaohua HU contributed to the conception and design of the study and provided administrative support. Yixin WANG, Jianbo LAI, Chanchan HU, Hongbo MENG, and Duo LYU participated in the collection and assembly of data. Yixin WANG and Duo LYU performed data analysis and interpretation. Yixin WANG and Jian-bo LAI were involved in the writing of the manuscript. All authors have given final approval of the manuscript for publication, and therefore have full access to all the data in the study and take responsibility for the integrity and security of the data.

### Compliance with ethics guidelines

Yixin WANG, Jianbo LAI, Chanchan HU, Hongbo MENG, Duo LYU, and Shaohua HU declare that they have no conflict of interest.

This study was approved by the Hospital Ethics Committee of the First Affiliated Hospital, Zhejiang University School of Medicine, Hangzhou, China. All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008 (5). Informed consent was obtained from participants for being included in the study.

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**Supplementary information**

Self-injury questionnaire (adolescent version); Self-injury questionnaire (parent version)