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EMPIRICAL RESEARCH

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Peer Acceptance and Nonsuicidal Self-injury among Chinese Adolescents: A Longitudinal Moderated Mediation Model

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Abstract

Peer relationship plays an important role in non-suicidal self-injury (NSSI). However, little is known about how and in what conditions peer relationship may influence NSSI. By integrating multiple theories (i.e., attachment theory, the emotional regulation model of self-compassion and NSSI, and the differential-susceptibility theory), the current study investigated two potential mediators (i.e., self-compassion and depressive symptoms) and one potential moderator (i.e., behavioral impulsivity) of the relation between peer acceptance and NSSI. Participants were 813 Chinese adolescents (43% female; *Mage* at Wave 1 = 13.15 years) from a two-wave longitudinal study with data spanning one year. The results revealed that the indirect pathways linking peer acceptance and NSSI were conditioned on the level of behavioral impulsivity. Specifically, for adolescents with lower levels of impulsivity, a higher level of peer acceptance was related to fewer depressive symptoms directly or indirectly through self-compassion; fewer depressive symptoms, in turn, were linked to fewer NSSI behaviors longitudinally. For adolescents with higher levels of behavioral impulsivity, peer acceptance was related to fewer NSSI behaviors only through self-compassion. Results indicate that increasing peer acceptance is important in reducing adolescent NSSI. Interventions designed to reduce adolescent NSSI may also be effective if they focus on promoting adolescent self-compassion, particularly for adolescents with higher levels of behavioral impulsivity.

Keywords Adolescents · Peer acceptance · Self-compassion · Depressive symptoms · Nonsuicidal self-injury · Behavioral impulsivity

Introduction

Nonsuicidal self-injury (NSSI), defined as the deliberate, direct, and socially unacceptable destruction of body tissue in the absence of suicidal intent, is a major health concern among adolescents (Nock 2010). The lifetime prevalence of NSSI among adolescents worldwide is 17.2% (Swannell et al. 2014). In China, the 12-month prevalence of NSSI among adolescents has reached 29% (Tang et al. 2018). NSSI is associated with many psychological disorders (e.g., borderline personality disorder, anxiety, depressive symptoms) and future suicidal behaviors (You and Lin 2015). Previous theoretical and empirical research has suggested that peer relationship plays a significant role in adolescent NSSI (Jiang et al. 2017). Many prior studies have demonstrated that poor peer experiences (e.g., victimization) are associated with higher probabilities of engaging in NSSI (van Geel et al. 2015). Although relatively under-studied, positive aspects of peer relationship can prevent adolescents from engaging in NSSI (Jiang et al. 2017). Given that peer relationship plays a salient role in NSSI, it is essential to reveal how and under what conditions peer relationship may influence NSSI. However, research on this topic is scarce. The current study aims to fill this gap by identifying important mediators and moderators of the link between peer relationship (i.e., peer acceptance—an understudied aspect of peer relationship, controlling for peer

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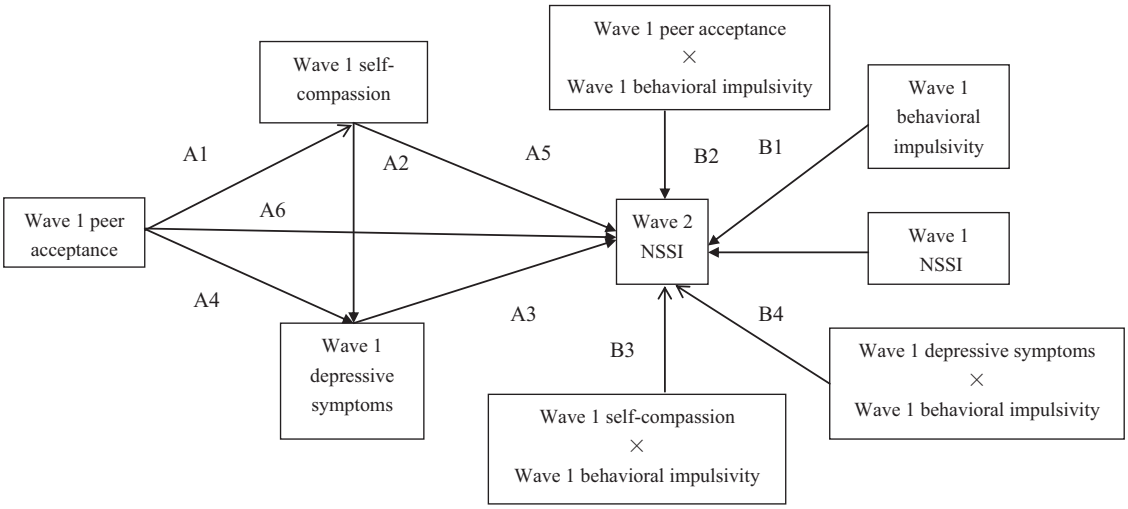

Fig. 1 Conceptual framework linking peer acceptance to nonsuicidal self-injury (NSSI)

victimization) and NSSI, leveraging multiple theories. The integrative conceptual model of this study is presented in Fig. 1.

Peer Relationship and NSSI

Previous studies and theories have suggested that interpersonal factors are critical for increasing or decreasing NSSI (Jiang et al. 2017; van Geel et al. 2015). The interpersonal model of NSSI has proposed that negative interpersonal events usually precede NSSI, and NSSI serves as a maladaptive coping strategy to reduce stress or tension resulting from these experiences (Nock 2010). In line with this theory, empirical studies have demonstrated that negative aspects of peer relationship, such as peer victimization, are related to a higher likelihood of engaging in NSSI (van Geel et al. 2015).

How positive aspects of peer relationship may relate to adolescent NSSI is relatively understudied. According to attachment theory, positive peer relationship would protect adolescents from NSSI because individuals with more attached relationships feel they are worthy of love and support and thus have better self-regulation (Bowlby 1982). However, the few existing empirical studies examining how positive peer relationship relates to NSSI have reported mixed findings. For example, some studies demonstrated that positive peer relationship was negatively related to NSSI (e.g., Tatnell et al. 2013), whereas other studies showed that positive peer relationship was not related to NSSI (e.g., Gandhi et al. 2015). Therefore, the current study focuses on the relation between positive peer relationship (i.e., peer acceptance) and NSSI, controlling for a well-studied negative aspect of peer relationship: peer victimization (van Geel et al. 2015). The current study aims to provide a comprehensive understanding of how positive aspects of peer relationship relate to adolescent NSSI by identifying the mechanisms and conditions under which peer acceptance relates to NSSI.

Self-compassion and Depressive Symptoms as Potential Mediators

Being accepted by peers may promote the development of self-compassion. Attachment theory proposes that individuals who have good relationships with significant others, such as caregivers and peers, tend to view themselves as worthy and lovable (Bowlby 1982). The sense of worth and connection experienced with the attachment figures may promote the development of self-compassion (Pepping et al. 2014). The evidence increasingly shows that adolescents who report greater social connectedness, and better relationships with significant others, tend to be more self-compassionate (Jiang et al. 2017).

The emotional regulation model of self-compassion proposes that self-compassion can decrease depressive symptoms through more healthy emotional regulation strategies that help adolescents cope with adverse or difficult situations (Finlay-Jones et al. 2015). According to Neff (2015), self-compassion entails six interrelated components: three are positive indicators of self-compassion (i.e., self-kindness, common humanity, and mindfulness) and the other three are their negative counterparts (i.e., self-judgment, isolation, and over-identification). The three components of self-compassion may exert their protective effects against depressive symptoms in different ways (Neff 2015). First, when individuals show kindness towards themselves (self-kindness), their experiences of pain and failure are not amplified and perpetuated, which may lower the incidence

of depressive symptoms (Neff 2003). Second, common humanity involves being open to one's own suffering and recognizing that one's own experience is part of the common human experience. This sense of common humanity helps individuals view failure, mistakes or hardships with greater equanimity, which may reduce depressive symptoms (Nock 2010). Third, mindfulness may help individuals reach a clear and balanced state of mind without ruminating over negative emotions in unproductive ways (e.g., depressive symptoms) (Heath et al. 2016).

Adolescents who have experienced fewer depressive symptoms tend to engage in fewer NSSI behaviors. The emotional regulation model of NSSI suggests that NSSI is a maladaptive strategy for regulating one's negative emotions (Nock 2009). Research has consistently found that depression, anxiety, sadness and distress were associated with more NSSI (Bresin et al. 2013; Richmond et al. 2017). Depression is a particularly salient trigger of NSSI (Marshall et al. 2013). A systematic review of thirty-nine longitudinal studies of adolescent NSSI, with samples from eight countries, concluded that depressive symptoms were a strong predictor of NSSI (Valencia-Agudo et al. 2018).

Therefore, incorporating attachment theory (Bowlby 1982) and the emotional regulation model of self-compassion and NSSI (Finlay-Jones et al. 2015; Nock 2009), peer acceptance is expected to first facilitate the development of self-compassion; subsequently, self-compassion may relate to fewer depressive symptoms, which in turn may decrease the likelihood of engaging in NSSI. The few existing studies examining the mediating processes linking peer relationship and NSSI have provided partial support for this hypothesis (Baiden et al. 2017; Jiang et al. 2017). Jiang et al. (2017) demonstrated that good peer relationships related to higher levels of self-compassion, which linked to fewer NSSI behaviors. Baiden et al. (2017) used cross-sectional data to demonstrate that peer victimization related to higher levels of depressive symptoms, which linked to more NSSI behaviors. The current study moves beyond these prior studies to test the hypothesis more comprehensively, by using a longitudinal design to examine the mediating roles of self-compassion and depressive symptoms simultaneously.

Behavioral Impulsivity as a Potential Moderator

Although peers play a significant role in adolescent NSSI, not all adolescents are equally influenced by peers (Jiang et al. 2016). Prior studies on peer relationship and NSSI have produced some mixed findings. Although most studies demonstrated the predictive role of peer relationship in adolescent NSSI (e.g., Tatnell et al. 2013), some studies did not find the significant link between positive peer relationship and NSSI (e.g., Gandhi et al. 2015). For example, positive experiences with peers (i.e., adolescents' positive perceptions of peer communication and peer trust) did not relate to their NSSI in a sample of high school students in Belgium (Gandhi et al. 2015). Thus, to untangle the mixed effects of peer relationship on NSSI, it is important to examine factors that may moderate the link between peer relationship and NSSI. Behavioral impulsivity—the tendency to engage in inappropriate or maladaptive behaviors—is a salient predictor of NSSI (You et al. 2016). It amplifies individual vulnerability to negative contextual influences or adverse experiences (You et al. 2015) When experiencing the same level of emotional distress, only adolescents with high levels of behavioral impulsivity would be likely to choose NSSI for emotional regulation. Adolescents with low levels of behavioral impulsivity may resort to other regulating strategies instead of NSSI (You et al. 2015). Differential-susceptibility theory proposes that individuals who are more vulnerable to the adverse effects of risk factors may be the same individuals who also benefit most from protective factors (Belskey and Pluess 2009). Therefore, adolescents with higher (vs. lower) behavioral impulsivity may be more susceptible to not only the detrimental effect of depressive symptoms but also the protective effects of peer acceptance and self-compassion on NSSI.

The Current Study

The current study examines the mechanisms and conditions under which peer acceptance relates to NSSI among a sample of Chinese adolescents over two waves, spaced 12 months apart. Specifically, there are two research questions (see Fig. 1 for the conceptual model). First, do self-compassion and depressive symptoms simultaneously mediate the relation between peer acceptance and NSSI? It is hypothesized that peer acceptance will be positively associated with self-compassion (Path A1); and self-compassion will be negatively associated with depressive symptoms (Path A2), which in turn will be positively related to NSSI (Path A3). Second, does behavioral impulsivity moderate the direct and indirect links between peer acceptance and NSSI—namely, the link between peer acceptance and NSSI (Path B2), the link between self-compassion and NSSI (Path B3), and the link between depressive symptoms and NSSI (Path B4)? It is proposed that among adolescents with higher (vs. lower) behavioral impulsivity, the links between peer acceptance and NSSI, between self-compassion and NSSI, and between depressive symptoms and NSSI will be stronger.

Methods

Participants

The current study used data from 813 adolescents (352 girls and 461 boys) from a larger longitudinal study on adolescent adjustment. At Wave 1, adolescents were between 11 and 16 years old (Mage = 13.15 years, SD = 1.10). The proportion of students in each grade, from Grade 6 to Grade 9, was 5.4% (n = 43), 34.9% (n = 279), 31.0% (n = 248), and 28.7% (n = 229), respectively. A small minority did not report their grades (1.7%). The majority of adolescents (76.5%) reported living with both parents. The remaining reported living with only their mothers (12.8%), only their fathers (3.93%), or others (5.1%). A small minority did not report whom they were living with (4.67%). The median parental education level was high school completion. Parents' occupations ranged from ordinary employee to boss; over half of fathers were bosses (62.5%).

Procedure

The study was approved by the ethical board of the principle investigator's university and was conducted in cooperation with the psychological counseling center of the participating school. The school is a private co-ed boarding school in Foshan. The majority of the students were from families with high socioeconomic status. Foshan is located in the south of China's Guangdong province. The city's annual gross domestic product of 939.9 billion RMB in 2017 (Foshan Bureau of Statistics of China) ranked it 15th out of 294 cities in China. The study used a cohort-sequential design. In the fall of 2013 (Wave 1), we invited all students in Grade 6 to Grade 9 in a private secondary school to participate (N = 935). Most of the students who were invited provided parental and personal consent, and participated in the study (86.9%, N = 813). About one year later, in the Fall of 2014 (Wave 2), we invited all students in Grade 7 to Grade 10 to participate (N = 1200), with 86.8% (N = 1041) providing consent and participating.

Students completed written questionnaires in classrooms during regular school hours. Questionnaires were administrated by trained research assistants or school psychologists. Students were informed about the confidentiality of the collected data, their right to not answer any questions that they didn't wish to answer, and the option to stop participating at any time. They were encouraged, but not required, to put down their student ID number (e.g., 0113533) for three reasons. First, their ID number could be used for longitudinal data matching; second, the psychological counseling center wished to obtain information regarding students' psychological well-being; and third, those who provided their ID number would have an opportunity to win a gift worth about $16 from a raffle held at each wave. With the exception of the school psychologists, who had full access to student information, no one was able to identify who the study participants were, even if they provided their ID number. Because some students may have transferred to other schools after the Wave 1 survey, and because some students did not provide their student ID number, we were able to match Wave 1 and Wave 2 data for 525 students. An attrition analysis was conducted to compare the 525 adolescents who had data at both waves with the 278 adolescents who did not have matched data at Wave 2 on all of the study variables. No significant difference between the two samples was found.

Measures

The questionnaires were all in Chinese. The scales without Chinese versions were first translated from English to Chinese and then back-translated to English. Inconsistencies between the two versions were resolved by two bilingual scholars with elaborate consideration of culturally appropriate meaning of items.

Peer acceptance

At Wave 1, peer acceptance was assessed using two items developed by Birkeland et al. (2014): "I am doing fine with others of my age" and "My peers seem to like me". Responses were on a 7-point scale ranging from 1 = *do not at all agree* to 7 = *agree very much*. The mean score of the two items was taken, with higher numbers indicating higher levels of peer acceptance (α = 0.86). Prior studies have demonstrated the high reliability and strong predictive validity of this scale; for example, it was significantly related to adolescent emotional outcomes (e.g., self-esteem) (Birkeland et al. 2014).

Self-compassion

At Wave 1, self-compassion was assessed by the Self-compassion Scale (Neff 2003). It is a 26-item scale with six subscales: self-kindness (five items, e.g., "I'm kind to myself when I'm experiencing suffering"), self-judgment (five items, e.g., "I'm disapproving and judgmental about my own flaws and inadequacies"), common humanity (four items, e.g., "I try to see my failings as part of the human condition"), isolation (four items, e.g., "When I fail at something that's important to me, I tend to feel alone in my failure"), mindfulness (four items, e.g., "When something upsets me I try to keep my emotions in balance"), and over-identification (four items, e.g., "When I'm feeling down I tend to obsess and fixate on everything that's wrong"). Responses were on a 5-point scale ranging from 1 = *not at*

all true to 5 = *very true*. The mean of the 26 items was taken, with the three negative subscales (self-judgment, isolation, and over-identification) reverse scored. A higher number indicated greater self-compassion ($\alpha = 0.86$). Previous research has indicated that the self-compassion scale has good predictive validity via its relations to social-emotional and behavioral outcomes (e.g., depressive symptoms and NSSI) among Chinese adolescents (e.g., Wong and Mak 2013).

Depressive symptoms

At Wave 1, adolescents' reports of their depressive symptoms were obtained using the Chinese version of the 18-item Depressive Symptoms Self-Rating Scale (Su et al. 2003) which was originally developed by Birleson et al. (1987). The Depressive Symptoms Self-Rating Scale assessed affective, cognitive, and behavioral components of depressive symptoms. Adolescents rated the frequency of these symptoms on a 5-point scale ranging from 1 = *never* to 5 = *every day*. Sample items include, "I look forward to things as much as I used to (reverse scored)", "I feel like running away", and "I feel so sad that I can hardly stand it". The depressive symptoms scores were calculated by averaging participants' scores on the 18 items ($\alpha = 0.86$). The Depressive Symptoms Self-Rating Scale has demonstrated good reliability and validity for use with Chinese adolescents. In previous studies, the depressive symptoms was significantly related to anxiety and behavioral problems (Su et al. 2003).

Behavioral impulsivity

Items on this scale were selected from the impulsivity section of the Diagnostic Interview for Borderlines-Revised; DIB-R developed by Zanarini et al. (1989). Ten kinds of impulsive behaviors were measured at Wave 1, including binge eating, impulsive buying, falling in love at first sight, arguing, fighting, injuring others, alcoholic intemperance, substance abuse, deliberate damage, and personal attacks. Responses were given on a 7-point scale ranging from 1 = *never* to 7 = *at least once every day*. The mean score of the ten items was taken, with higher numbers indicating higher levels of behavioral impulsivity ($\alpha = 0.76$). This scale has demonstrated good validity among Chinese adolescents (You et al. 2015). Behavioral impulsivity was strongly related to other psychopathology outcomes in previous studies (e.g., NSSI) (You et al. 2015).

Nonsuicidal self-injury (NSSI)

At both Wave 1 and Wave 2, twelve behaviors, i.e., self-cutting, carving, burning, severely scratching, inserting sharp objects into the nails or skin, pulling hair out, biting to injury, erasing skin, eroding skin, bleaching, punching, and banging the head or other parts of the body against the wall were assessed. These items were selected because they were found to be relatively common among adolescents (Nock 2010) and displayed good psychometric properties in previous studies with Chinese adolescents (Ren et al. 2018). At both waves, participants were asked, "In the past 6 months, have you engaged in the following behaviors to deliberately harm yourself, but without suicidal intent?" These items were rated on a 7-point scale ranging from 1 = *never* to 7 = *at least once every day*. The mean score of the twelve items was taken, with higher numbers indicating higher levels of NSSI ($\alpha = 0.75$ at both waves).

Peer victimization

Peer victimization was assessed with five items on a 7-point scale ranging from 1 = *never* to 7 = *at least once a day*. "How often has someone: (1) hit you in school or outside school; (2) excluded you from their group; (3) made threats to you; (4) threatened or injured you with a weapon in school or outside school; (5) stole or damaged your property in school?". These items were extracted from the School Bullying/Victimization Scale developed by Chang et al. (2013). This scale assessed children's bullying (four items) and experiences of victimization (five items) at school. Only the victimization subscale was used in this study. Mean scores of these items were used, with higher scores indicating higher frequency of being victimized ($\alpha = 0.75$). The scale has demonstrated good reliability and validity among Chinese adolescents. Peer victimization was significantly related to adolescents' emotional outcomes (e.g., depression and self-esteem) (Chang et al. 2013).

Analysis Plan

All continuous variables were standardized before testing the conceptual model (Fig. 1). The conceptual model was tested under the structural equation modeling framework using Mplus 7.0 (Muthen and Muthen 2017). Mplus uses the full information maximum likelihood estimation method, which enables full usage of all available data (Muthen and Muthen 2017). First, the main mediation paths in the conceptual model (only A paths) were tested. The indirect effects from peer acceptance to adolescent NSSI were tested using the delta method. Second, the moderated mediation model (both A paths and B paths) was tested. When an interaction effect was significant, simple slope analyses (1 SD above and below the mean of the moderator) were conducted (see Fig. 3 for the interaction plot) (Aiken et al. 1991). Age, gender, parental educational level, family structure, peer victimization and NSSI at Wave 1 were included as covariates predicting NSSI at Wave 2.

Results

Descriptive Statistics

Table 1 displays means, standard deviations, and bivariate correlations of all study variables. As expected, peer acceptance was associated negatively with NSSI at both Wave 1 and Wave 2, indicating that peer acceptance may be a protective factor for adolescent NSSI both concurrently and over time. Also consistent with expectation, positive associations were found between peer acceptance and self-compassion. Negative associations were found between peer acceptance and depressive symptoms, between self-compassion and depressive symptoms, between depressive symptoms and NSSI at Wave 2, and between self-compassion and NSSI at Wave 2.

Path Analysis

Mediating effects of self-compassion and depressive symptoms

First, the mediation model with all the A paths in Fig. 1 was tested. The model fit statistics are presented in Table 2 and the indirect effects linking peer acceptance and NSSI are presented in Table 3. The model fit the data well, χ^2 (12) = 66.92, $p < 0.001$, CFI = 0.93, RMSEA = 0.08 [0.06, 0.09], SRMR = 0.04. Consistent with the hypotheses, Wave 1 peer acceptance was positively related to self-compassion; and self-compassion was negatively linked to depressive symptoms, which were then positively related to NSSI at Wave 2. This indirect effect from peer acceptance to self-compassion to depressive symptoms to NSSI at Wave 2 was significant ($\beta = -0.03$, $SE = 0.01$, $p = 0.03$). The indirect link from peer acceptance to depressive symptoms and then to adolescent NSSI at Wave 2 was also significant ($\beta = -0.03$, $SE = 0.02$, $p = 0.03$). The direct links from Wave 1 peer acceptance and self-compassion to Wave 2 NSSI were not statistically significant.

Moderating effects of behavioral impulsivity

Second, the moderated mediation model with all the A paths and B paths in Fig. 1 was tested. The model fit the data well, χ^2 (16) = 83.65, $p < 0.001$, CFI = 0.92, RMSEA = 0.07 [0.06, 0.09]. Standardized path parameters for the model are presented in Fig. 2. There was a significant

Table 2 Model fit indexes for the conceptual model and the five alternative mediation models

	df	χ^2 (df)	CFI	RMSEA	SRMR
The proposed study model	12	66.82	0.93	0.08	0.04
Model 1	12	91.53	0.90	0.09	0.04
Model 2	12	91.53	0.90	0.09	0.04
Model 3	12	65.46	0.93	0.07	0.04
Model 4	12	65.46	0.93	0.07	0.04
Model 5	12	423.89	0.51	0.21	0.08

The proposed study model: T1 Peer acceptance –> T1 Self-compassion –> T1 Depressive symptoms –> T2 NSSI;

Model 1: T1 Self-compassion –> T1 Peer acceptance –> T1 Depressive symptoms –> T2 NSSI;

Model 2: T1 Self-compassion –> T1 Depressive symptoms –> T1 Peer acceptance –> T2 NSSI;

Model 3: T1 Depressive symptoms –> T1 Peer acceptance –> T1 Self-compassion –> T2 NSSI;

Model 4: T1 Depressive symptoms –> T1 Self-compassion –> Peer acceptance –> T2 NSSI;

Model 5: T1 Peer acceptance –> T1 Self-compassion –> T1 NSSI –> T2 Depressive symptoms

T1 = Wave 1, T2 = Wave 2

Table 1 Means, standard deviations, and zero-order correlations among study variables

	1	2	3	4	5	6	7	8	9
1. Wave 1 age	–								
2. Gender (0 = female, 1 = male)	0.04	–							
3. Wave 1 peer victimization	−0.14*	0.16*	–						
4. Wave 1 peer acceptance	−0.03	−0.04	−0.29*	–					
5. Wave 1 self-compassion	−0.10*	−0.02	−0.20*	0.42***	–				
6. Wave 1 depressive symptoms	0.15*	−0.04	0.16*	−0.47*	−0.63*	–			
7. Wave 1 behavioral impulsivity	0.12*	0.07	0.35*	−0.19***	−0.30***	0.32*	–		
8. Wave 1 NSSI	0.08*	−0.01	0.38*	−0.18***	−0.18***	0.27*	0.48***	–	
9. Wave 2 NSSI	0.02	−0.04	0.34*	−0.21***	−0.21***	0.26*	0.33***	0.42***	–
M	12.97	–	1.14	5.28	3.34	2.23	1.40	1.11	1.09
SD	1.01	–	0.81	1.37	0.57	0.60	0.58	0.38	0.23
Range	11–16	–	1–7	1–7	1.69–4.77	1–4.5	1–7	1–7	1–3.36

*$p < 0.05$, ***$p < 0.001$

Table 3 Standardized coefficients of the indirect links in the proposed study model and the five alternative mediation models

	β	SE	*p*
The proposed study model:			
Indirect Link 1: T1 Peer acceptance –> T1 Self-compassion –> T1 Depressive symptoms –> T2 NSSI	**−0.03**	**0.01**	**0.03**
Indirect Link 2: T1 Peer acceptance –> T1 Depressive symptoms –> T2 NSSI	**−0.03**	**0.02**	**0.03**
Indirect Link 3: T1 Peer acceptance –> T1 Self-compassion –> T2 NSSI	−0.01	0.02	0.41
Model 1:			
Indirect Link 1: T1 Self-compassion –> T1 Peer acceptance –> T1 Depressive symptoms –> T2 NSSI	**−0.01**	**0.01**	**0.04**
Indirect Link 2: T1 Self-compassion –> T1 Peer acceptance –> T2 NSSI	−0.01	0.02	0.59
Indirect Link 3: T1 Self-compassion –> T1 Depressive symptoms –> T2 NSSI	**−0.06**	**0.03**	**0.03**
Model 2:			
Indirect Link 1: T1 Self-compassion –> T1 Depressive symptoms –> T1 Peer acceptance –> T2 NSSI	−0.01	0.01	0.59
Indirect Link 2: T1 Self-compassion –> T1 Depressive symptoms –> T2 NSSI	**−0.08**	**0.04**	**0.03**
Indirect Link 3: T1 Self-compassion –> T1 Peer acceptance –> T2 NSSI	−0.01	0.01	0.59
Model 3:			
Indirect Link 1: T1 Depressive symptoms –> T1 Peer acceptance –> T1 Self-compassion –> T2 NSSI	0.003	0.004	0.42
Indirect Link 2: T1 Depressive symptoms –> T1 Peer acceptance –> T2 NSSI	0.01	0.02	0.59
Indirect Link 3: T1 Depressive symptoms –> T1 Self-compassion –> T2 NSSI	0.02	0.03	0.41
Model 4:			
Indirect Link 1: T1 Depressive symptoms –> T1 Self-compassion –> T1 Peer acceptance –> T2 NSSI	0.003	0.006	0.60
Indirect Link 2: T1 Depressive symptoms –> T1 Self-compassion –> T2 NSSI	0.03	0.03	0.41
Indirect Link 3: T1 Depressive symptoms –> T1 Peer acceptance –> T2 NSSI	0.01	0.02	0.60
Model 5:			
Indirect Link 1: T1 Peer acceptance –> T1 Self-compassion –> T1 NSSI –> T2 Depressive symptoms	−0.001	0.002	0.54
Indirect Link 2: T1 Peer acceptance –> T1 NSSI –> T2 Depressive symptoms	−0.003	0.004	0.54
Indirect Link 3: T1 Peer acceptance –> T1 Self-compassion –> T2 Depressive symptoms	**−0.05**	**0.02**	**0.01**

T1 = Wave 1, T2 = Wave 2

Significant paths are in bold

interaction effect between self-compassion and behavioral impulsivity at Wave 1 on Wave 2 NSSI ($\beta = -0.14$, $SE = 0.05$, $p = 0.01$). As shown in Fig. 3, decomposition of this interaction using simple slope analysis (Aiken and West 1991) revealed that only when youth reported higher levels of behavioral impulsivity (one standard deviation above the sample mean) was self-compassion related negatively to NSSI ($\beta = -0.17$, $SE = 0.07$, $p = 0.02$); in contrast, when adolescents reported experiencing lower levels of behavioral impulsivity (one standard deviation below the sample mean), self-compassion was unrelated to adolescent NSSI ($\beta = 0.09$, $SE = 0.07$, $p = 0.20$).

When a variable moderates one of the paths involved in the indirect pathways linking the independent variable and the dependent variable, the variable also moderates the indirect effects (Preacher et al. 2007). Thus, indirect effects from peer acceptance to NSSI were also moderated by behavioral impulsivity. At higher levels of behavioral impulsivity, only the indirect link from peer acceptance to self-compassion to Wave 2 NSSI was significant ($\beta = -0.07$, $SE = 0.03$, $p = 0.02$). At lower levels of behavioral impulsivity, the indirect link from peer acceptance to self-compassion to adolescent depressive symptoms to adolescent NSSI ($\beta = -0.02$, $SE = 0.01$, $p = 0.04$) and the indirect link from peer acceptance to depressive symptoms to adolescent NSSI ($\beta = -0.05$, $SE = 0.02$, $p = 0.04$) were both significant. There were no significant interactions between peer acceptance and behavioral impulsivity at Wave 1, nor between depressive symptoms and behavioral impulsivity at Wave 1 in predicting Wave 2 NSSI.

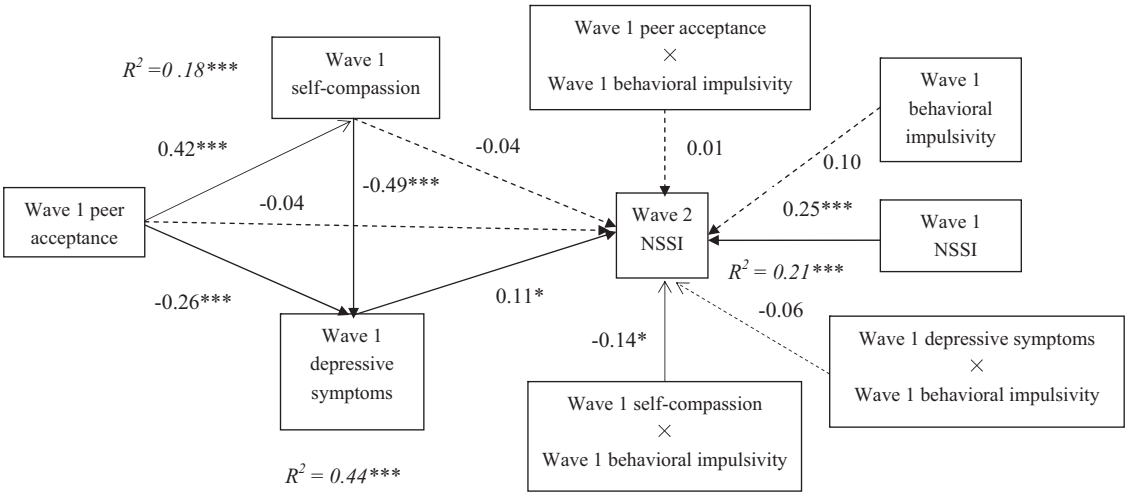

Fig. 2 Standardized path coefficients for the longitudinal moderated mediation model for nonsuicidal self-injury (NSSI). All continuous variables were standardized before they were entered in the path model; solid lines represent significant paths. Dotted lines represent nonsignificant paths. R^2 represents the percentage of variance explained by the model. The model also includes age, gender, parental educational level, family structure and peer victimization as covariates, which are not shown for clarity of presentation. Notes. $*p < 0.05$; $***p < 0.001$

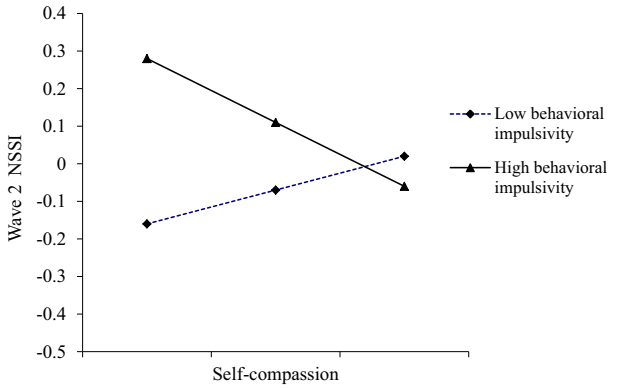

Fig. 3 Plot of behavioral impulsivity as a moderator between self-compassion and NSSI at Wave 2. Self-compassion and subsequent NSSI were associated negatively with each other when behavioral impulsivity was high (one standard deviation above the sample mean) but unrelated when behavioral impulsivity was low (one standard deviation below the sample mean)

Alternate Model Analyses

To better assess the directions between study variables, five potential alternative models were tested. Guided by attachment theory (Bowlby 1982), this study has proposed that peer acceptance promotes the development of self-compassion and decreases depressive symptoms; however, it is possible that self-compassion and depressive symptoms may also influence peer acceptance. The transactional model of child development (Sameroff 2009) suggests that child outcomes may also affect how others interact with them. Therefore, we altered the order of the study variables in the conceptual model to test (1) whether self-compassion relates to peer acceptance to depressive symptoms to NSSI (Model 1), (2) whether self-compassion relates to depressive symptoms to peer acceptance to NSSI (Model 2), (3) whether depressive symptoms relate to peer acceptance to self-compassion to NSSI (Model 3), and (4) whether depressive symptoms relate to self-compassion to peer acceptance to NSSI (Model 4). There may also be reciprocal relationships between depressive symptoms and NSSI. Prior studies suggest that depressive symptoms often decrease after engaging in NSSI, and the feeling of relief may further reinforce the use of NSSI as a way of coping with overwhelming depressive moods (Nock 2009). Hence, we tested whether peer acceptance related to self-compassion to NSSI (Wave 1) to depressive symptoms at Wave 2, controlling for depressive symptoms at Wave 1 (Model 5). The model fit of these alternative models are presented in Table 2. The indirect effects of these alternative models are presented in Table 3. The findings suggest that the proposed model has a better fit than models 1, 2, and 5, and has a model fit similar to models 3 and 4. However, Model 3 and Model 4 did not show any significant indirect effects. Considering the theory, the model fit, and the indirect effects, the proposed model is the best model.

Discussion

Theoretical and empirical studies have indicated the that peer relationship is a critical predictor of NSSI (e.g., Jiang et al. 2016). However, it is less clear through what mechanisms and under what conditions peer relationship relates to NSSI. The current study filled such gaps by (a) investigating self-compassion and depressive symptoms as

potential mediators of the link between peer acceptance and NSSI, incorporating attachment theory (Bowlby 1982) and the emotional regulation model of self-compassion and NSSI (Finlay-Jones et al. 2015; Nock 2009), and (b) examining behavioral impulsivity as a potential moderator between peer acceptance and NSSI, guided by the differential-susceptibility theory (Belskey and Pluess 2009). Consistent with the hypotheses, results demonstrated that higher peer acceptance was related to fewer depressive symptoms directly or indirectly through higher self-compassion. And subsequently, fewer depressive symptoms were related to fewer NSSI behaviors one year later. Such indirect pathways were more evident when adolescents' levels of behavioral impulsivity were lower. When adolescents' levels of behavioral impulsivity were higher, peer acceptance was related negatively to NSSI at Wave 2 indirectly through self-compassion.

Linking Peer Acceptance and NSSI

Consistent with prior research on the role of peer relationship in NSSI (Jiang et al. 2017), the current study revealed significant negative longitudinal indirect effects of peer acceptance on NSSI, even after adjusting for Wave 1 NSSI and peer victimization. Prior studies focused mainly on the role of negative aspects of peer relationship (e.g., peer victimization) in NSSI (van Geel et al. 2015), and relatively few longitudinal studies have examined the positive aspects of peer relationship (i.e., peer acceptance). The current study contributes to the current literature by showing the unique longitudinal effect of peer acceptance on NSSI. These findings imply that enhancing acceptance from peers would be beneficial in protecting adolescents against the onset and persistence of NSSI. Thus, schools are advised to provide more opportunities for adolescents to develop positive peer friendships in order to enhance peer acceptance.

More importantly, the current study shed light on the underlying mechanisms linking peer acceptance and NSSI by identifying two potential mediators: self-compassion and depressive symptoms. Consistent with attachment theory (Bowlby 1982), peer acceptance was related to higher levels of self-compassion. Self-compassion was then negatively related to depressive symptoms, in line with the emotional regulation model of self-compassion, which proposes that self-compassion is an effective emotional regulation strategy (Finlay-Jones et al. 2015). Subsequently, depressive symptoms positively related to NSSI, which is also consistent with the emotional regulation model of NSSI (Nock 2009). Incorporating these theoretical models, the current study moves beyond prior studies that examined only the mediating role of self-compassion (Jiang et al. 2017) or depressive symptoms (Baiden et al. 2017) to provide a more comprehensive understanding of how peer acceptance relates to NSSI. These findings highlight the importance of considering the active roles of emotional regulation strategies (e.g., self-compassion) and negative emotions (e.g., depressive symptoms) in the link between peer acceptance and NSSI.

The Role of Behavioral Impulsivity

Behavioral impulsivity, as a potential moderator acting on direct and indirect pathways from peer acceptance to NSSI, was also examined in the current study. A significant interaction effect was found between self-compassion and behavioral impulsivity in predicting NSSI about one year later. Specifically, self-compassion was negatively related to NSSI when behavioral impulsivity was high (but not low), suggesting that adolescents with higher behavioral impulsivity benefit more from self-compassion. Prior studies have demonstrated that adolescents with high (vs. low) levels of behavioral impulsivity are more likely to be influenced by the risk factors of NSSI (e.g., anxiety) (You et al. 2015). Taken together, these findings are in support of the differential-susceptibility theory, which states that individuals with certain characteristics can be susceptible to both the detrimental effects of risk factors and the beneficial effects of positive factors (Belskey and Pluess 2009).

By moderating the link from self-compassion to NSSI, behavioral impulsivity moderates the indirect effect from peer acceptance to NSSI as well. For adolescents with high levels of behavioral impulsivity, the indirect pathway linking peer acceptance and NSSI involves only self-compassion because self-compassion (but not depressive symptoms) has a significant unique effect on NSSI. In contrast, for adolescents with low levels of behavioral impulsivity, the effect of self-compassion is weaker, and depressive symptoms become a significant unique predictor of NSSI; hence, peer acceptance relates to NSSI indirectly through depressive symptoms or through self-compassion and depressive symptoms. These findings have important implications. For adolescents with higher levels of behavioral impulsivity, promoting the development of self-compassion could be particularly effective in preventing NSSI. Previous studies have demonstrated that self-compassion training (e.g., cultivating self-kindness, mindfulness, and sense of common humanity) can be effective in improving mental health (Trompetter et al. 2017). For adolescents with lower levels of behavioral impulsivity, promoting self-compassion is still important, as it plays a part in the mediating pathways. However, given that peer acceptance can also directly relate to depressive symptoms to link to NSSI, other interventions aiming to decrease depressive symptoms are also encouraged.

Limitations and Future Directions

The current study has some limitations, leaving opportunities for future research. First, it should be acknowledged that all the measures in this study are self-reported and thus may be subject to respondent bias. However, adolescents themselves may be the most reliable source when it comes to reporting on their own experiences and feelings (Trompetter et al. 2017). Second, no causal relationships can be determined given the correlational nature of the study. However, there is robust evidence for the proposed conceptual model given that the current study used a longitudinal design, tested multiple alternative models, and was grounded in strong theoretical frameworks. Still, the possibility of potential bidirectional relationships between some study variables cannot be excluded. Future research needs to employ more exacting longitudinal designs using multiple waves to better capture developmental changes and gain further insights into the directionality of the links documented in the current study.

Third, the current results are based on data from a sample with relatively high socioeconomic status (SES): adolescents attending a private boarding school. It is uncertain whether the findings generalize to other samples with different SES within China. Prior studies about the moderating role of SES on the relation between peer relationship and adolescent outcome have been mixed. Some researchers have proposed that high SES students are more likely to benefit the support offered by the school context because they are also more likely to have sources of support outside of school (Battistich et al. 1995). However, some studies found no SES differences in the relation between peer attachment and adolescent behavioral outcomes (Demanet and Van Houtte 2012). Therefore, future research examining adolescents from a variety of socioeconomic backgrounds in China would be helpful in elucidating SES-related variations in the link between peer acceptance and NSSI.

Fourth, it is unclear to what extent the findings are generalizable to other cultures. The links between peer acceptance and NSSI might be weaker among Western adolescents, given that Western culture emphasizes independence instead of interdependence (Pomerantz et al. 2009). Future research also needs to involve cross-cultural samples (e.g., China vs. the United States) to compare directly how the mediating and moderating roles documented in the current study in the link between peer acceptance and NSSI vary across diverse cultures.

Conclusion

Despite the important role peer relationship plays in adolescent NSSI, to date, it remains unclear through what mechanisms and under what conditions peer acceptance relates to NSSI. Integrating multiple theories, the current research filled in this gap by examining the mediating role of self-compassion and depressive symptoms, and the moderating role of behavioral impulsivity, in the link between peer acceptance and NSSI. The results demonstrated that the indirect pathways linking peer acceptance and NSSI were dependent on adolescent behavioral impulsivity. For adolescents with lower levels of behavioral impulsivity, peer acceptance was related to fewer depressive symptoms directly or indirectly through self-compassion; fewer depressive symptoms, in turn, were related to fewer NSSI behaviors. In contrast, peer acceptance was indirectly related to fewer NSSI behaviors only through self-compassion among adolescents with higher levels of behavioral impulsivity. The significant findings provide insight into the conditional mechanisms underlying the link between peer acceptance and adolescent NSSI. These findings also indicate that it would be useful for interventions aimed at preventing NSSI to enhance positive peer relationships in general, and to promote development of self-compassion particularly for adolescents with higher levels of behavioral impulsivity.

Author's Contributions N.W. conceived of the study, conducted statistical analysis, interpreted the data and drafted the manuscript; H.Y. participated in the design of the study and the interpretation of the data, and helped to draft the manuscript; P.C. participated in the review of the literature and conducted statistical analysis. J.Y. participated in the design of the study and edited the manuscript. All authors read and approved the final manuscript.

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Data Sharing and Declaration The data analyzed in the current study are not publicly available but are available from the corresponding authors on reasonable request.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent All the participants provided the informed consent.

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