



Your support is my healing: the impact of perceived social support on adolescent NSSI — a sequential mediation analysis

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Abstract

This study aimed to investigate the relationship between perceived social support and adolescent non-suicidal self-injury (NSSI) behavior. 3539 adolescents were recruited to complete the Multidimensional Social Support Scale, Hope Scale, Resilience Scale for Chinese Adolescents and NSSI Scale. The results showed that perceived social support significantly negatively predicted adolescent NSSI behavior, and resilience played a mediating role between perceived social support and adolescent NSSI behavior. In addition, perceived social support could also promote the levels of adolescent resilience through hope, thereby further reducing the frequency of adolescent NSSI behavior. The results suggest that the intervention of adolescent NSSI can start from providing a safe and effective external environment.

Highlights

1. This study revealed the internal mechanism of NSSI from the perspective of “environment-psychological ability-behavior” for the first time. The results showed that resilience played a mediating role between perceived social support and adolescent NSSI behavior.
2. In this study, we found that hope and resilience, which are both positive psychological traits, had different influence paths on adolescent NSSI behavior. Hope needed to affect NSSI behavior by promoting resilience, but resilience could directly affect NSSI behavior. This
3. From the perspective of positive development, this study explored the protective factors and their internal mechanisms that influence NSSI. On the one hand, it enriched the research on protective factors of NSSI. On the other hand, it provided a new idea for the intervention of adolescents’ NSSI.

Keywords NSSI · Perceived social support · Hope · Resilience · Adolescent

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Introduction

Non-suicidal self-injury (NSSI), defined as the behavior that an individual intentionally and repeatedly changes or harms his or her own body without explicit suicidal intention, and such behavior is not accepted by the society and is either non-lethal or less lethal (Gratz, 2001). Adolescents are at high risk of NSSI. Studies have shown that 22.1% of adolescents had engaged in non-suicidal NSSI in their lifetime, and 19.5% of them had done so in the past 12 months (Lim et al., 2019). Current data shows that the incidence of NSSI behavior is on the rise globally and has become a major public health problem in many countries (Thippaiah et al., 2020; Mummé et al., 2017), which has attracted wide attention from all walks of life (Brown & Plener, 2017). In addition to the physical harm caused by the behavior itself, recent studies have shown that the experience of NSSI behavior may also increase the risk of future suicidal ideation and behavior in adolescents (Fox et al., 2015; Kiekens et al., 2018). At the same time, a large number of studies have shown that NSSI behavior is significantly correlated with various psychological disorders such as depression, anxiety, substance abuse, eating disorders and personality disorders (Schatten et al., 2015). In addition, some researchers have confirmed that NSSI behavior has a significant “contagious” effect among adolescents (Brown & Plener, 2017; Syed et al., 2020), all of which pose a serious threat to adolescent socialization and future mental health (Kruzan & Whitlock, 2019). In view of the high incidence of NSSI among adolescents and the negative influence it brings to adolescents, it is necessary to conduct in-depth research on the influential factors and mechanisms of NSSI.

Previous studies have found that negative situations or experiences such as social exclusion, peer rejection or bullying and childhood abuse could positively predict adolescents NSSI (Wang et al., 2020; Esposito et al., 2019; Martin et al., 2016). However, these studies mainly focused on the correlation between negative situational factors and NSSI, and rarely explored the relationship between positive factors and NSSI and its internal mechanism. In other words, most of the existing researches focuses on the risk factors of NSSI, largely ignoring protective factors, such as a safe and effective external environment or positive personal traits, etc. These positive factors can buffer the adverse effects of negative factors, which is of great significance for the study of adolescents’ NSSI behavior. In addition, Positive Youth Development (PYD) pointed out that adolescents themselves have great potential and could develop in a positive direction, and the positive development of young people was benefited from the support of a good external environment (Benson et al., 2006). Therefore, this study focuses more on exploring the related factors and mechanisms of NSSI

among adolescents from a positive perspective. As individuals enter adolescence, the main people they spend time with are family members, friends, and significant others (Hombados-Mendieta et al., 2012), and adolescents begin to confide in and seek support from some of them (Narayanan & Onn, 2016). In relevant studies, social support was regarded as a buffer factor that can effectively reduce the adverse effects of negative emotional behaviors. It can increase the psychological motivation of individuals, and is beneficial to their emotional, cognitive and psychological status, thus promoting their physical and mental health. (Gülaçtı, 2010). The higher the level of perceived social support, the lower the possibility of NSSI among adolescents (Yamada et al., 2014). In view of this, from the perspective of promoting the positive development of adolescents, we will pay more attention to the relationship and underlying mechanisms between perceived social support and adolescent NSSI.

Perceived social support and NSSI

Social support includes actual social support and perceived social support. Compared with actual social support, perceived social support has a stronger impact on mental health than actual social support (Hefner & Eisenberg, 2009; Zhang et al., 2018). Perceived social support means an individual’s perceived respect, care and help from surrounding social relationships (such as families, friends, significant others, etc.) (Alloway & Bebbington, 1987). According to the main-effect model of social support, perceived social support has a general positive effect (Malecki & Demaray, 2003). For example, perceived social support could help alleviate individual psychological stress response, improve social adaptability and maintain individual mental health (Ren et al., 2019; Lin et al., 2020). Individuals are easy to fall into negative emotions when face stressful situations, and NSSI is often used by them to relieve negative emotions (Nock & Prinstein, 2004; Klonsky, 2007), which is clearly a negative coping way to solve a problem. While perceived social support could help alleviate the negative effects of various negative stimuli and avoid negative emotions (Etzion, 1984; Fried & Tiegs, 1993), to a certain extent, this may be helpful to reducing the frequency of NSSI among adolescents. In addition, as some scholars have pointed out, the more social support an individual perceived, the less likely he is to adopt a negative coping style such as NSSI when faced with stressful situations or negative emotions (Geng et al., 2018; Luo et al., 2020; Tian et al., 2021). Nemati et al. (2020) also confirmed that low level of social perception would increase the incidence of NSSI. To sum up, perceived social support may have a positive impact on

adolescent NSSI. However, in order to better carry out the prevention and intervention of adolescent NSSI behavior, it is necessary not only to explore the correlation between variables, but also to study the mechanism.

The mediating role of hope

While social support can directly affect NSSI, it may also indirectly affect NSSI behavior through individual internal factors. With the development of positive psychology, hope has attracted much attention from researchers as one of the important psychological qualities. Besides, among the many endogenous factors, hope is one that may have a positive effect on emotion. Hope is defined as a cognitive ensemble consisting of (1) agency (goal-directed decisions) and (2) pathways (planning of ways to achieve goals) (Snyder et al., 1991). Scholars regard hope as a future-oriented force and a motivational component in the cognitive process (Pacico et al., 2013), and believe that hope is a psychological activity process and cognitive state (Wu, 2011). According to the Environmental Function Model (Environmental Function Model), cognitive belief is another important factor affecting NSSI behavior, therefore, to a certain extent, hope may affect adolescent NSSI behavior. In addition, empirical studies have found that hope could cultivate and develop an individual's positive psychology and improve an individual's mental health (Rock et al., 2014). Another study also pointed that hope could significantly predict positive emotion (Ciarrochi et al., 2015), and positive emotion can help reduce the occurrence of NSSI behaviors in return (Hasking et al., 2017). Based on the above discussion, we can reasonably speculate that hope may have a positive effect on slowing down or inhibiting the adolescent NSSI behavior.

The construction of hope is closely related to the perceived social support. According to Snyder's hope theory, perceived social support is an important factor affecting hope (Kemer & Atik, 2012), for example, perceived support from parents and friends is good for the establishment and development of hope (Morley & Kohrt, 2013; Simmons et al., 2009). In addition, previous study found that there was a significant positive correlation between the perceived social support and hope (Li & Yin, 2015), and the more social support an individual perceived, the higher the level of hope (Wang et al., 2006). It can be seen that perceived social support has a positive effect on the improvement of hope.

The mediating role of resilience

The individual's psychological ability has also attracted the attention of many researchers as an internal path that affects individual behavior. Some researchers have found that social

support, as a situational factor, could not only directly affect individual behavior, but also indirectly through individual psychological ability (such as resilience) (Sun et al., 2013). This suggests that we may be able to explain the internal mechanism of NSSI behavior from the perspective of "environment-psychological ability-behavior". Resilience refers to the ability of an individual to recover and maintain good adaptive system function after experiencing a stressing event (Masten, 2014). According to PYD, the adolescents' own potential could promote the positive development of adolescents (Chang et al., 2020), and resilience, as a positive psychological potential, may be beneficial to reduce the occurrence of NSSI behaviors, thus allowing adolescents to return to a positive developmental track. Further, empirical studies have found that the main purpose of NSSI behavior is to release negative emotion in order to maintain the dynamic balance of the psychological level (Hasking et al., 2017). While resilience can make use of all available protective resources when facing stressing situations to restore the balance of individual psychological level and achieve good adaptation (Cha & Lee, 2018), so as to avoid adolescent NSSI. Moreover, Garisch and Wilson (2015) also found that lower levels of resilience were associated with NSSI behaviors among adolescents, and that resilience may be a useful target for further research and clinical interventions for NSSI in adults (Colpitts & Gahagan, 2016). Based on the above theory and literature, we can see that resilience have a certain impact on adolescent NSSI behavior.

The development of resilience in adolescents may benefit from perceived social support. As individuals enter adolescence, they begin to be more willing to disclose personal matters to their friends or significant others than to family members (Baharudin & Zulkefly, 2009). A person may think of receiving support from family, friends, or significant others, and that this perceived social support enables the individual to cope with hardships and recover from adversity (Mattanah et al., 2010). Studies have found that there is an intrinsic link between perceived social support and resilience, and great perceived social support contributed to the development of individual resilience (Ozbay et al., 2008), and more importantly, the more social support individual perceived, the higher levels of resilience will be (Southwick et al., 2016; Stewart & Yuen, 2011). Narayanan and Onn (2016) also showed that perceived social support significantly positively predicted adolescents' resilience. These studies suggest that individuals in a good social support environment can develop higher levels of resilience.

The mediating role of hope and resilience

There is also a link between hope and resilience. Ong et al. (2006) believed that hope may be one of the important sources of psychological resilience. Not only could hope reduce negative emotion and protect individuals, but also help to promote

social adaptation of individuals and recover from stress. Empirical studies have confirmed that there was a significant positive correlation between hope and resilience, the higher the level of hope, the higher the level of resilience (Kirmani et al., 2015; Mullin, 2019). Besides, previous studies also found that hope can significantly positively predict resilience (Satici, 2016) and hope could be an important factor to promote resilience (Granek et al., 2013). In addition, Condly's review of psychological research on children and resilience showed that resilient adults typically attributed their resilience as children to hope (Condly, 2006). Therefore, based on the previous discussion, it is reasonable to speculate that perceived social support may also affect psychological resilience through hope, thereby further affecting adolescent NSSI behavior.

The current study

Risk factors for NSSI have been relatively well studied. However, it is not enough to focus on risk factors alone for a comprehensive understanding of NSSI, the protective factors of NSSI such as safety environment and positive traits also should be paid attention to. Therefore, this study focused on exploring the impact of protective factors on adolescent NSSI behavior. According to the view of PYD (Benson et al., 2006) and the main-effect model of social support (Malecki & Demaray, 2003), a safe and effective external environment can promote the healthy development of adolescents. Based on above theory, this study investigated the impact of perceived social support on adolescent NSSI behavior and its internal mechanism. The study controlled for the effect of age and gender (Bresin & Schoenleber, 2015; Huang et al., 2021). Based on the above discussion, we proposed some hypothesis as follows:

Hypothesis 1: Perceived social support can negatively predict adolescent NSSI behavior.

Hypothesis 2: Hope may play a mediating role between perceived social support and adolescent NSSI behavior.

Hypothesis 3: Resilience may play a mediating role between perceived social support and adolescent NSSI behavior.

Hypothesis 4: Perceived social support may predict adolescent NSSI behavior through the sequential mediating effect of hope and resilience.

The hypothetical model as shown in Fig. 1.

Method

Participants

A total of 3629 adolescents were invited to participate in this study. Except for large-scale blanks and regular responses, etc., the final effective questionnaires used for data analysis totaled 3539, meaning that the effective recollection rate was 97.52%. 2247 (63.5%) males and 1292 females (36.5%) were included in the final sample, with the average age in the first experiment 16.22 ± 0.99 years old.

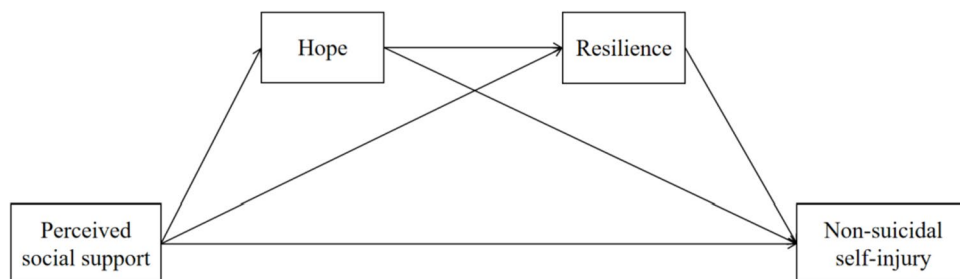
Procedure

The university's research ethics committee approved this study. We obtained the consent from students, parents and teachers before data collection. All participants completed the questionnaire collectively in the classroom under the guidance of professionally trained postgraduate and homeroom teachers. The questionnaire is completed online via smartphone and the results are confidential. After collecting the questionnaires, all students received individual brochures with contact details of various help-lines, as safety precautions. Besides, we also distributed some small gifts to them in return.

Measures

Perceived social support Perceived social support was measured through the Multidimensional Scale of Perceived Social Support (MSPSS) developed by Zimet et al. (1988) and revised by Zhao and Li (2017). This scale includes twelve items measuring the perceived social support from families, friends and

Fig. 1 The hypothetical model



others important. Participants rated each item (e.g., “I can talk about my problems with my friends”) on a seven-point Likert scale ranging from 1 (completely disagrees) to 7 (completely agrees). The higher the score, the higher level of the perceived social support. The good reliability and validity of the Chinese version of the scale has been confirmed among Chinese samples (Chen et al., 2020). The Cronbach’s α coefficients for families support, friends support and others important support were 0.934, 0.939, and 0.923, respectively. The Cronbach’s α coefficients for the total scale was 0.965.

Non-suicidal self-injury Seven NSSI behaviors, such as self-cutting, burning, scratching skin, inserting objects to the nail or skin, biting, punching, and banging the head or other parts of the body against the wall, were assessed in the current study. All seven NSSI behaviors were selected from the Deliberate Self-harm Inventory (DSHI; Gratz, 2001), and these seven NSSI behaviors were most common in adolescents (Nock & Favazza, 2009). Participants were asked to rate each item (e.g., “I scratched my skin”) on a 4-point scale, ranging from 1 = never, 2 = once or twice, 3 = three to five times, to 4 = six times or more. This scale has demonstrated sufficient concurrent and overtime validity among Chinese adolescents (Jiang et al., 2020). In this study, the Cronbach’s α coefficient of the scale was 0.930.

Hope Hope was assessed using a scale developed by Snyder (1996), which concluded two dimensions of hope: pathways and agency. Participants were asked to rate each item (e.g., “There are many solutions to my present problem”) on an 8-point Likert scale from 1 (incompletely agreed) to 8 (completely agreed). The good reliability and validity of the scale has been confirmed among Chinese samples (Li et al., 2022). Higher scores indicated higher levels of hope. The Cronbach’s α coefficients for pathways dimension and agency dimension were 0.848 and 0.772, respectively. The Cronbach’s α coefficients for the total scale was 0.893.

Resilience We used the Resilience Scale for Chinese Adolescents (Hu & Gan, 2008) to measure the adolescents’ resilience. The scale includes five sub-dimensions: goal-focused (e.g., my life has a clear goal), emotional control (e.g., failure always makes me feel discouraged), positive cognition (e.g., I think adversity has a positive effect on people), family support (e.g., my parents respect my opinion) and interpersonal assistance (e.g., I will talk to others when I have difficulties). Since the questions of the support force dimension and the perceived social support scale overlapped, this study selected only one of the questions related to the human force dimension. The good reliability and validity of the scale has been confirmed in previous study (Fan et al., 2018). Participants rated each item on a 5-point Likert scale (1 = strongly disagree and 5 = strongly agree).

Higher scores indicate greater resiliency. The Cronbach’s α coefficients for goal-focused, emotional control and positive cognition were 0.865, 0.718, and 0.858, respectively. The Cronbach’s α coefficients for the total scale was 0.741.

Data analyses

SPSS 22.0 was used for statistical analysis, and descriptive analysis and Pearson correlation were used to test the key variables. Structural equation models were applied to test hypothesis models. Missing data were handled with expectation maximization (EM) (Gold & Bentler, 2000). With gender and age controlled, we analyzed the total effect of perceived social support on NSSI.

Next, we assessed the mediating roles of hope and resilience between perceived social support and NSSI. The Model Indirect Command Model was adopted to assess the statistical significance of the indirect effects, i.e., the effects of perceived social support on NSSI via (a) the hope path and (b) the resilience. To examine the mediation effects and bias-corrected percentile confidence intervals (CIs), the bootstrapping test was used, employing 1000 samples (MacKinnon, 2008). A confidence interval containing 0 indicates that the relevant parameter is not significant.

Results

Descriptive statistics and correlations

Table 1 presents means, standard deviations, and correlations for all study variables. All the variables revealed significant associations with each other. As we can see, perceived social support, hope and resilience were positively associated with each other, while NSSI was negatively correlated with perceived social support, hope and resilience. These results provided a solid foundation for structural equation model analysis.

Measurement model

By controlling age and gender, we examined the direct effect of perceived social support on NSSI. The model fits well as a whole [$\chi^2/df=0$, CFI = 1.00, TLI = 1.00, SRMR = 0, RMSEA = 0]. The results showed that perceived social support significantly negatively predicted NSSI ($\beta = -0.121$, $SE = 0.019$, $p < 0.001$, 95% CI = [-0.158, -0.084]). That was, the higher the levels of perceived social support, the less NSSI.

Structural model

Next, we assessed the mediating roles of hope and resilience between perceived social support and NSSI, controlling for

age and gender. As shown in Fig. 2, the model revealed an acceptable fit to data: $\chi^2/df=7.879$, CFI=0.975, TLI=0.940, SRMR=0.019, RMSEA=0.044. Perceived social support significantly positively predicted hope ($\beta=0.403$, $SE=0.017$, $p<0.001$, 95% CI [0.368, 0.435]) and resilience ($\beta=0.232$, $SE=0.019$, $p<0.001$, 95% CI [0.195, 0.269]), while significantly negatively predicted NSSI ($\beta=-0.090$, $SE=0.023$, $p<0.001$, 95% CI [-0.136, -0.047]). And hope significantly positively predicted resilience ($\beta=0.186$, $SE=0.019$, $p<0.001$, 95% CI [0.149, 0.224]), while resilience significantly negatively predicted NSSI ($\beta=-0.110$, $SE=0.017$, $p<0.001$, 95% CI [-0.143, -0.077]). In addition, as can be seen from Table 2, for perceived social support, resilience probably mediated the link between it and NSSI. There was an acceptable fit for the pathways of perceived social support—resilience—NSSI (indirect effect = -0.026, 95% CI = [-0.034, -0.018]). For the serial mediation, hope and

resilience played a serial mediating role between perceived social support and NSSI (indirect effect = -0.008, 95% CI = [-0.012, -0.006]).

Discussion

The perceived social support and NSSI

This study examined both the effects and mechanisms of perceived social support on adolescents' NSSI within the framework of PYD and the main effect of social support. It was found that perceived social support could reduce adolescent NSSI behavior. In addition, perceived social support can reduce NSSI behavior by promoting resilience in adolescents. Last but not least, hope and resilience played a sequentially mediating role between perceived social

Table 1 Descriptive statistics, correlations and the internal consistencies for crucial variables ($N = 1214$)

	1	2	3	4	5	6
1. Perceived social support	1					
2. Hope	.442**	1				
3. Resilience	.314**	.289**	1			
4. Non-suicidal self-injury	-.121**	-.058**	-.138**	1		
5. Gender	.002	-.078**	.023	-.055**	1	
6. Age	-.005	-.012	.032	-.035*	-.023	1
$M \pm SD$	58.411 \pm 13.945	29.398 \pm 7.380	47.430 \pm 5.786	8.833 \pm 3.716	-	16.220 \pm 0.993

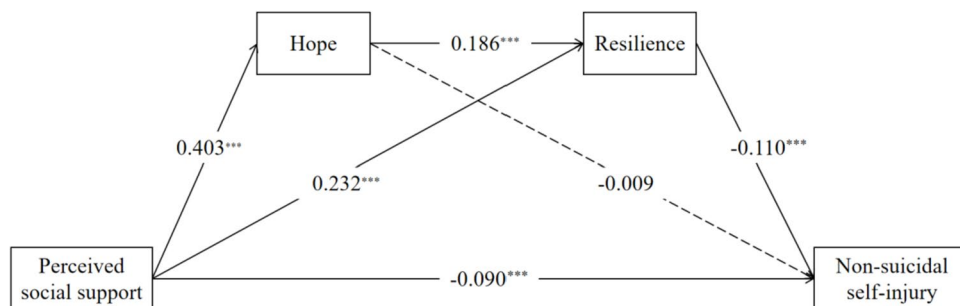
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. The same below

Table 2 Standardized path coefficients of perceived social support, hope, resilience and non-suicidal self-injury

Model Pathways	β	SE	95%CI	
			Lower	Upper
Perceived social support—Non-suicidal self-injury	-0.090***	0.023	-0.136	-0.047
Perceived social support—Hope—Non-suicidal self-injury	-0.004	0.009	-0.014	0.022
Perceived social support—Resilience—Non-suicidal self-injury	-0.026***	0.004	-0.034	-0.018
Perceived social support—Hope—Resilience—Non-suicidal self-injury	-0.008***	0.002	-0.012	-0.006

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Fig. 2 The structural equation model. Note. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$



support and adolescent NSSI behavior. The findings of this study will help us to further understand how perceived social support affects adolescents' NSSI behavior, and also inspire us to prevent NSSI by improving adolescents' hope level and psychological resilience.

Perceived social support could significantly negatively predict adolescents' NSSI behavior, which is consistent with previous research results (Park & Crocker, 2008). When individuals perceived more social support, they are more likely to have more positive coping styles, so it is possible to reduce the occurrence of NSSI. Besides, social support means that the individual is loved, cared for, and respected. When adolescents perceived more social support increases, the feelings of exclusion and rejection would be less, and the individual was placed in a relatively safe environment (Turner et al., 2016). At this time, the more social support an individual perceived, the more immediate planning and positive reappraisal were able to moderate emotional responses (Pejičić et al., 2018), which contributed to the reduction of negative emotion and thus reduced NSSI behaviors possibility of occurrence. This suggests that a safe and effective external environment may be beneficial to the reduction of adolescent NSSI behavior.

The mediating role of hope and resilience

After controlling for demographic factors such as gender and age, we found that resilience played a mediating role between perceived social support and adolescent NSSI behavior, supporting Hypothesis 3. It was found that perceived social support positively predicts mental resilience, which is consistent with previous research result (Kalaitzaki et al., 2021). The ability of resilience has been shown to be determined by environmental factors (Ungar et al., 2008), and social support (e.g., from family members) that individuals perceived at an early age could promote positive cognitive, social, and emotional development, including self-regulation skills and resilience (Masten & Gewirtz, 2006). When adolescents perceived social support from others, their self-confidence and self-esteem were improved to a certain extent, and they were able to interpret certain situations positively, and made use of available resources to solve problems and restore resilience (Pejičić et al., 2018). Resilience could negatively predict NSSI behavior in adolescents, which is also consistent with previous study (Hilt et al., 2008). Because adolescents with high resilience could interpret events more positively when faced with stressing situations (Greenberg, 2006), they were unlikely to adopt non-adaptive coping methods such as NSSI behaviors.

Furthermore, this study found that perceived social support can significantly positively predict hope, which was consistent with previous study (Zhang et al., 2010). Social networks provided individuals with positive experiences and relatively

stable social rewards (Fried & Tiegs, 1993), and perceived social support could improve a person's overall level of happiness and promote the establishment of positive qualities, including hope (Xiang et al., 2020). For example, perceived support from friends or teachers could help individuals overcome obstacles and establish goal-directed strategies, which can affect an individual's level of hope (Parker et al., 2015). However, hope was not significantly predictive of NSSI. A possible explanation is that, as Snyder argued, hope was an individual's cognitive motivation for the pursuit of one's own goals, with a future orientation that provided the basis for goal setting and planning (Snyder et al., 1997). The powerful psychological driving force and goal orientation brought by hope urged people to move forward in the direction of anticipation or desire (Snyder, 2000). This cognitive belief is the driving type, which may not directly affect NSSI, but can indirectly affect NSSI through other factors. For example, a study about hope and NSSI found that the effect of hope on NSSI was realized through the mediation of self-compassion (Jiang et al., 2021). Therefore, it is particularly important to explore the sequential mediation of hope promoting resilience.

A sequential mediation

It was worth noting that although the mediating effect of hope on the perceived social support and NSSI was not significant, hope could indirectly affect NSSI by affect individual's resilience, that is, hope and resilience played a sequential mediating role between the perceived social support and NSSI. As previous studies have pointed out, the more social support an individual perceived, the higher their levels of hope (Yucens et al., 2019). People full of hope typically judged situations in a positive way and evaluated stressing situations as challenging rather than threatening (Rubin, 2008), which allowed them to better recover from stressing situations. Therefore, adolescents with high levels of hope have strong resilience. Furthermore, Resilience can alleviate the negative impact of emotional distress on adolescent mental health (Min et al., 2013). Adolescents with high mental resilience may have higher flexibility and emotional regulation ability, which could help them avoid negative outcomes (such as NSSI) (Waugh et al., 2011), and this was consistent with our research results. The sequential mediation suggests that the intervention of adolescents NSSI could start from providing a safe and effective external environment. In a good environment, adolescents' own positive psychological traits could be well developed, so as to avoid NSSI behavior and other mental health.

Limitations and implications

This study has some limitations. First, the study was carried out on the basis of cross-sectional data, so we still need to be cautious in causal inference. In the future, we can continue

to carry out longitudinal investigation on the subjects in order to obtain more comprehensive data, so as to conduct in-depth discussion on the causal relationship between variables. Secondly, the self-report method was adopted in this study, which may have social approval effect, and multiple evaluation methods can be considered in the future. Finally, the average age of the participants is 16 years old, and the coverage group may not be fully representative of teenagers, so it can be considered to expand the sample group to include teenagers of different ages in the future.

Despite some of the above limitations, there are still some innovations in this study. From the perspective of positive psychology, this study is the first to explore and reveal the impact of perceived social support on adolescents NSSI behavior and its internal mechanism, enriching the research on the protective factors of adolescent NSSI behavior, and the results supported the PYD and the main-effect models. To a certain extent, it could promote the application of these theories in adolescent NSSI intervention. In addition, the results of the study suggest that if we provide adolescents with a safe and effective external environment, it can not only directly reduce the occurrence of adolescent NSSI behavior, but also promote the development of their psychological traits, which may also prevent or reduce the occurrence of adolescent NSSI behavior to a certain extent.

Conclusion

Perceived social support can significantly negatively predict adolescent NSSI behavior, that was, the more perceived social support, the lower the frequency of adolescent NSSI. Resilience played a mediating role between perceived social support and adolescent NSSI behavior, that was, the effect of perceived social support on NSSI behavior was achieved through the indirect effect of resilience. Furthermore, hope and resilience played a sequential mediating role between perceived social support and adolescent NSSI behavior.

Author contributions Zhifan Yuan (Conceptualization; Methodology; Validation; Software; Writing—original draft). Weijian Li (Supervision; Project administration; Writing—review & editing). Wan Ding (Supervision; Project administration; Writing—review & editing). Shengcheng Song (Formal analysis; Investigation). Lin Qian (Formal analysis; Investigation). Ruibo Xie (Supervision; Project administration; Writing—review & editing).

Data availability The dataset analyzed during the current study is available from the corresponding author on reasonable request.

Declarations

Ethical approval All procedures performed in this study involving human participants were in accordance with the ethical standards of

University and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication.

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